Om Swastiastu...
3rd FARO MEETING
BALI
3rd FARO Meeting Proceeding Book “Sharing, Empowering, Strengthening”

September 6 - 8, 2018
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3rd FARO Meeting Proceeding Book
“Sharing, Empowering, Strengthening”

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A Retrospective Study: Efficacy and Safety of Nimotuzumab Concurrent With Radiotherapy Versus Nimotuzumab Concurrent With Chemoradiotherapy in Locally Advanced Nasopharyngeal Carcinoma at Ciptomangunkusumo Hospital Jakarta

Andhika Rachman

Nimotuzumab is a therapeutic monoclonal antibody against epidermal growth factor receptor (EGFR). Nimotuzumab concurrent with radiotherapy and nimotuzumab concurrent with chemoradiation were found to be efficacious and safe as treatment of locally advanced nasopharyngeal cancer. Nimotuzumab has been used in Indonesia since 2008 but safety and efficacy of this treatment was very rare reported. Aim of this study is to compare the efficacy and safety of nimotuzumab concurrent with radiotherapy versus nimotuzumab concurrent with chemoradiotherapy in patients with locally advanced nasopharyngeal carcinoma (NPC) treated at Ciptomangunkusumo Hospital Jakarta. We retrospectively reviewed patients with locally advanced NPC from January 2009 to December 2017 treated at Ciptomangunkusumo Hospital Jakarta. All patients who received nimotuzumab concurrent with radiotherapy and nimotuzumab concurrent with chemoradiation (cisplatin and radiotherapy) were included. Nimotuzumab was administered at a dose of 200 mg intravenous infusion for 60 minutes, once a week for 6-8 weeks. Cisplatin was given weekly at a dose of 40 mg/m² for 6-8 weeks. Radiotherapy was given at a dose of 45-70 Gy (mostly 70 Gy) either by conventional radiotherapy or IMRT. From the clinical data of 78 NPC patients treated with nimotuzumab concurrent with radiotherapy or with chemoradiation at Ciptomangunkusumo Hospital Jakarta, only 15 patients received nimotuzumab concurrent with radiotherapy and 15 patients received nimotuzumab concurrent with chemoradiation had complete clinical and follow-up data. The ORR for nimotuzumab concurrent with radiation was 80% (12/15) (66.6% (10/15) CR, 13.3% (2/15) PR), and 6.6% (1/15) SD, 13.3% (2/15) PD, while the ORR for nimotuzumab concurrent with chemoradiation was 93.3% (14/15) (46.6% (7/15) CR, 46.6% (7/15) PR) and 6.6% (1/15) SD. The median follow-up was 79 months (range: 48 - 101 months) for nimotuzumab concurrent with radiotherapy, and the 5-year overall survival (OS) was 80% (12 patients still alive); whereas for nimotuzumab concurrent with chemoradiotherapy the median follow up was 29 months (range: 10 - 94 months) and all of patients still alive. The most common adverse events were mucositis and dry mouth. Hiperpigmentation was reported in 3 patients which might be related to nimotuzumab. There was no treatment-related death. In general, combining nimotutuzumab with radiotherapy or chemoradiotherapy was well-tolerated. Nimotuzumab concurrently combined with radiotherapy or chemoradiotherapy for treatment of locally advanced nasopharyngeal carcinoma showed encouraging outcomes and well-tolerated, without accumulated toxicity.

Keywords:
Nasopharyngeal carcinoma, Nimotuzumab, Radiotherapy, Chemoradiotherapy, Efficacy, Safety
Conquering Nasopharyngeal Cancer: Where are We Now?

Joseph Wee

National Cancer Centre Singapore and Duke-NUS Medical School Singapore.

Abstract

Nasopharyngeal Carcinoma (NPC) can increasingly be divided into an “urban” and more “rural” patterns. While the incidence is decreasing and cure rates increasing in the urban areas, patients hailing from the LMICs continue to face significant challenges of late diagnosis and access to treatment facilities. We will attempt to list the advances made in the management of NPC but at the same time suggest potential areas where patients from resource challenged areas might be impacted.
Personalized Medicine in Head and Neck Cancer

Junlin Yi

Personalized medicine or precision medicine was first emerge at 2000, and get very popular after US president Obama raise the concept in 2015. Actually, the glossary classes ‘precision medicine’ or ‘personalised medicine’ as technically interchangeable but the term ‘precision medicine’ is favored as it more accurately reflects the highly precise nature of new technologies that permit base pair resolution dissection of cancer genomes and is less likely to be misinterpreted.

What is personalized medicine or precision medicine? According to the ESMO glossary published in 2018, it means that the tailoring of medical treatment to the individual characteristics of each patient to classify individuals into subpopulations that differ in their susceptibility to a particular disease or their response to a specific treatment. Preventative or therapeutic interventions can then be concentrated on those who will benefit, sparing expense and side-effects for those who will not.

Why we need precision medicine in head and neck cancer? Standard treatment in head and neck squamous cell carcinoma (HNSCC) is mainly based on tumor location, histology, and stage with unsatisfied outcomes. The molecular complexity and intratumoral heterogeneity of the disease are not actively integrated into management decisions of HNSCC. The advent of the genomic era has delivered vast amounts of information regarding different cancer subtypes and is providing new therapeutic targets, which can potentially be elucidated using next-generation sequencing and other modern technologies.

Radiotherapy, as one of the most important method in the management of H&N cancer, In the past decade, has undergone considerable developments, including technological advances to sculpt radiation delivery, combined RT with concomitant cytotoxic agents, and use targeted therapeutics for biological optimization of radiation effects. Recently, the development of molecular and imaging associated radiobiology provides a unique opportunity for further improving patient treatment. This may include the identification of molecular, metabolic and imaging markers of treatment response and tolerability. In addition to providing an overview of clinical biomarker studies relevant for personalized radiotherapy, this communication will highlight principles in addressing clinical evaluation of combined-modality-targeted therapeutics and radiation.
Reirradiation in Recurrence Head and Neck Cancer: When and How?

Sarmani G. Laskar

Professor, Dept of Radiation Oncology, Tata Memorial Hospital, Parel, Mumbai, India

Abstract:
Cumulative estimated five-year incidence of loco regional relapse is 29-31% in high risk patients with head and neck cancers. In addition, the risk of second cancers is about 5% per year, the incidence being between 16-30%. With more aggressive multimodality management, the probability of developing second primary tumors and loco-regional recurrences increases. In the situation of recurrence, surgery followed by appropriate adjuvant therapy seems to be the treatment of choice. However, it is important to be able to classify recurrent disease into favorable and unfavorable groups to be able to decide on the optimum management protocol. In addition, an assessment of the comorbidity, sequelae of prior therapy, length of disease free interval and extent and stage of the present recurrence is important to decide on management. Several retrospective studies and prospective cohorts have established that longer disease-free interval (> 24 months), absence of organ dysfunction, smaller volume of recurrence, feasibility of surgery and larynx (subsite) are factors that have a good prognosis. While considering factors related to radiotherapy, treatment with conformal techniques, fractionated, conventional or hyperfractionated radiotherapy, limited volumes of radiation and doses above 50 Gy result in better controls. However, the most important parameter determining success is good patient selection. Literature reports on these aspects of re-irradiation and our own experience will be presented during the talk.
Current Status and Future Direction of De-Intensification Therapy for HPV + Oropharynx Cancer in Relation to New AJCC Staging System

Yong Chan Ahn

Department of Radiation Oncology
Samsung Medical Center, Sungkyunkwan University School of Medicine

Abstract Current status and future direction of de-intensification therapy for HPV+ oropharynx cancer in relation to new AJCC staging system Yong Chan Ahn, MD/PhD Department of Radiation OncologySamsung Medical Center, Sungkyunkwan University School of Medicine The prevalence of oropharynx cancer (OPC) that is associated with HPV infection has increased rapidly during the recent 2-3 decades. HPV+ OPC usually shows better response to ionizing radiation and chemotherapeutic agents, which is associated with better clinical outcomes following standard therapy. In this context, several efforts of de-intensification paradigm have been tried, which include all 3 modalities of cancer therapy: surgery, radiation therapy, and systemic therapy. Though the new AJCC staging system (8th edition) has changed specially for HPV+ OPC, therapeutic decision still is recommended to base on the old staging system (7th edition). The current status and future direction of de-intensification therapy for HPV+ OPC and pitfalls of the new AJCC staging system will be briefly addressed.
The advances in radiotherapy for high grade glioma

Junlin Yi

Glioblastoma multiform (GBM) is the most common and poor prognosis type of high grade glioma. During the past decades, many efforts in aim to improve the outcome have been done. Some progresses have achieved. In this talk, we will focus on the optimal interval between surgery and RT; the most common imaging tool and new functional imaging used to define the GTV; how to define and delineation the CTV? And give a brief introduction of the most common used target delineation guidelines (ESTRO/ASTRO/MD.Anderson Cancer Center) and the differences among them; and also the optimal dose and the evidence behind them.

AS a highly malignant tumor, GBM was suggest to received postoperative RT as soon as possible, recently data shows that there was no significant impact of delayed RT on the survival, patients received RT within 6 weeks after surgery have no difference in terms of OS. The most common imaging is T1WI with contrast which used to define the residue tumor. The new functional imaging such as functional MRI imaging and MET-PET/CT can decrease the target volume and shape and it may be used in the future practice. There two mainly practice guideline on how to delineation CTV, The ESTRO one and the ASTRO one. The main different between this two method is include the peritumor edema by ASTRO while ESTRO not. But the data shows there was no difference in term of OS and failure pattern between these two methods. Although many escalation dose trials have been done use various RT techniques such as RS/SRS as boost, Hypofractionation RT, hyperfractionation RT, IMRT, brachytherapy, implant seeds, etc. There was no improve was made on OS, so the recommended dose to the GBM is still 60Gy.
Radiosurgery in CNS Tumor

John G Wolbers

Primary brain tumors occur at an incidence of about 14/100,000. About half of the tumors are benign, mostly meningiomas (≈ 20%), vestibular schwannomas (≈ 10%), and pituitary tumors (≈ 10%). The point prevalence approximates 100/100,000.

For meningioma incidence increases up to 13-19/100,000 for people over 65. Mortality rate of meningioma surgery is low (2-4%) compared to e.g. abdominal surgeries. However, mortality numbers combined with not-being self-supporting anymore starts with 25% when over 60 years and goes up to 60% when over 80 years old (Bateman, 2005). With increasing survival-time the recurrences become substantial, even after complete resection. Therefore, non-symptomatic, small-medium sized meningiomas are a good indication for up-front radiosurgery at all ages, since the efficacy rate is over 90%, and serious complications occur less than 1%.

Vestibular schwannomas have an incidence of 2/100,000 and a prevalence of 20/100,000. The average growth is 1-2mm/yr, but it might be an unpredictable 5-10mm in the first year. A systematic review showed radiosurgery to be best practice for schwannomas smaller than 30mm (Wolbers, 2013). A second treatment becomes necessary in only 1-3% and serious complications are less than 1%.

Pituitary tumors have few indication for radiosurgery (residual, recurrent, cavernous sinus involvement), since quite often visual pathway compression by mostly non-secreting and larger tumors urges for decompression microsurgery, whereas smaller secreting tumors need a quick hormonal result. And after radiosurgery effect takes time.

Gradually treatment strategies on benign brain tumors shifts from tumor free towards tumor control and preservation of quality of life.
Radiation Therapy for Brain Metastasis
Koh Wee Yao

The management of brain metastases with radiotherapy has for years just been limited to whole brain radiation. This approach has limited evidence and a more recent study has called its utility into question. This talk examines the benefits and the problems with whole brain radiotherapy and examines some of the more recent publications regarding whole brain radiotherapy.

The focus in more recent years has been about more focal therapy with stereotactic radio surgery (SRS) or stereotactic radiotherapy (SRT). Some of the practical issues regarding SRS and SRT are discussed as well as the evidence for why it should be done are presented.
Radiotherapy in Low Grade Gliomas—Evidence and Contemporary Management Guidelines

Rakesh Jalali

Medical Director, Head of Radiation Oncology, Apollo Proton Cancer Centre, Chennai, India.

Email: rjalali@apollohospitals.com

Background: Low-grade gliomas (LGG) have traditionally long been taken to denote grade II diffuse gliomas, whereas the term high-grade glioma included grade III and IV tumours. Factors such as mitotic activity and the recognition that IDH mutations characterize the great majority of grade II and III gliomas but are distinctly uncommon in grade IV tumours, have led to the term “lower-grade glioma” to designate both grade II and III gliomas in adults. The 2016 WHO classification of lower-grade gliomas has been adopted to help modern management paradigms.

Current Management: Recent clinical and molecular insights are helping shape more evidence based optimal management of these difficult tumours. Treatment options have ranged from observation to a biopsy for histological confirmation to aggressive radical resections followed by adjuvant radiotherapy with or without additional chemotherapy to balance longer survivals with preservation of neurological function and quality of life. Various prognostic factors have been reported in the literature for LGG to help us design appropriate treatment strategies for individual patients. In older age (>40 years, extent of resection, etc). RTG 9802 RCT has shown significantly improved outcomes in ‘aggressive’ low-grade gliomas with the addition of chemotherapy to radiation.

Indian Data: Between February 2009 to March 2014, 47 patients with supratentorial aggressive LGG selected meticulously based on predefined high-risk features on pre-operative MRI (gadolinium enhancement or considerable heterogeneity on T2 images) and/or histomorphology (atypical histology, high cellularity, relatively higher MIB-1 index) were treated with postoperative focal conformal radiotherapy with concurrent and adjuvant TMZ for 6-12 cycles. All patients had either subtotal resection/biopsy or had ≥3 Pignatti’s adverse factors. Median RT dose was 55.8 Gy/31#, median adjuvant TMZ cycles were 6. Median MIB-1 index was 4 (range 2-15%), p53 protein overexpression seen in 19/25 tested samples, 1p19q co-deletion found in 11/22 and IDH1 mutation in 5/9 cases tested, respectively. At a mean follow-up of 31 months, 3-year overall survival (OS) was 86%, while PFS was 80%. For 31 patients having ≥3 Pignatti’s factors, 3-year OS and PFS were encouraging to the tune of 85% and 73% respectively.

Conclusions: Recent evidence from large cooperative group studies and molecular markers including revised WHO 2016 classification as well as imaging, has reinforced the use of radiation therapy especially in high-risk adult low-grade gliomas. Modern conformal RT with photons and even particle beam therapy may offer advantages in terms of maintaining functional outcomes and quality of life in these survivors.
Management Strategies for Oligometastases from Lung Cancer

Ivan Tham

The oligometastatic state is loosely defined as the presence of =3 to =5 distant metastases, where the patient’s prognosis may be better than for those with widespread distant metastases. Various clinical prognostic factors may be used for patients with metastases from NSCLC to identify sub-groups who may benefit from aggressive local therapy of the metastases. Oligometastases can be synchronous or metachronous, and the entity known as oligoprogression has also been described. We will briefly discuss current evidence and trends for local therapy in these clinical situations.
SABR for Lung Cancer

Koh wee Yao

SABR is a technique to give focal radiation to a limited volume of disease or tissue. There are a number of challenges in terms of implementation of SABR and we seek to highlight the main issues that need to be overcome to successfully do so.

Outcome data for SABR is also presented and compared against surgery and radical conventional radiotherapy.

Data from our center is also presented and compared against bigger studies.
Improving Quality of Cervical Cancer Care: Regional Exchanges of Experiences
Ekkasit Tharavichitkul

The division of radiation oncology, Department of radiology, Faculty of Medicine, Chiang Mai University

Cervical cancer is the most common cancer in many countries in Asia. The treatment of cervical cancer composed of surgery, radiotherapy and systemic treatment. Radiation therapy has the roles in cervical cancer treatment in curative and palliative intents. In curative setting, radical radiotherapy has the role in locally advanced disease and post-operative radiotherapy. With the new technologies in imaging, planning, qualifying and delivering, the treatment of cervical cancer in this decade has rapidly increased from x-ray based plan (2D) to volume-based plan (3D or 4D) in both external beam radiotherapy and brachytherapy. Some studies from Thailand showed the promising results with the new technologies.

To improve the treatment quality and balance the resources, each RT centers should consider their infrastructure (manpower/equipment) and workloads to balance of work-flow management. In Thailand, radiotherapy has improvement very much. Nowadays, we have 35 radiation oncology centers and at least 30 CT simulators has already equipped. Moreover, for cervical cancer, most radiotherapy centers can provide high technology techniques such as 3D-CRT, IMRT, in routine practices to patients. At least 3 centers in Thailand have MRI simulators to provide more accurate target identification and one proton center is under construction. For image-guided adaptive brachytherapy, it was implemented in medical universities (Chulalongkorn, Siriraj, Ramathibodi, ChiangMai, Songkhlanakarin, and Khonkhan), Military hospitals (Phramongkutklao, Bhumiphol) and regional cancer hospital (National cancer hospital, Lampang, Chonburi, Rachaburi).

Not only new technique, the quality of radiotherapy for cervical cancer was also improved by the coming of Quality Assurance Team for Radiation Oncology (QUATRO) program in our country. After the QUATRO mission tookplace in many countries (Mongolia, Srilanka, Thailand, Malaysia, Indonesia, Vietnam, China, and Phillpines). Later, there was QUATRO missions in Faculty of Medicine, Chiang Mai University in 2010. [4] Nowadays, in Thailand, the QUATRO program was strongly supported by (Thai Association of Radiation Oncology (THASTRO) to perform national training course in July 2018 and has a plan to launch QUATRO mission in all radiation oncology centers later. The government policy and public health strategy takes part to support progression of quality improvement in Thailand. With the national policy, new radiation oncology unit will be planned to support lacking area in the future.
How to improve the outcome of cervical cancer in Asia region?

Radiation Oncology project under the framework of Forum for Nuclear Cooperation in Asia (FNCA)

Masaru Wakatsuki1, Shingo Kato2, Tatsuki Ohno3, Noriyuki Okonogi4, Takashi Nakano3, Hirohiko Tsujii4

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Department of Radiation Oncology, Gunma University Graduate School of Medicine, Maebashi, Gunma, Japan
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Abstract

The Forum for Nuclear Cooperation in Asia (FNCA) is a Japan-led cooperation framework for peaceful and safe use of nuclear science and technology in Asia. Under this framework, eight projects are currently underway, and radiation oncology project is one of them. This project was launched in 1993, and recently eleven countries has been participating in the project, including BGD, CHA, IDN, JPN, KAZ, KOR, MAL, MON, PHL, THA, VTN. The purposes of the project are to establish optimal treatment protocols of radiotherapy and chemotherapy for predominant cancers in Asia, and to improve the quality of radiotherapy in the FNCA member countries, and finally to improve treatment outcomes for predominant cancers in Asia. For these purposes, we have been conducting several activities, including international multi-institutional clinical studies of radiotherapy (RT) or chemoradiotherapy (CRT) for various cancers and physical quality assurance and quality control (QA/QC) of radiotherapy.

Since the project started in 1995, we have conducted five multi-institutional clinical studies of RT or CRT for advanced cervical cancer among the FNCA member countries. In the first study (Cervix-I, 1996-2003), we standardized RT for cervical cancer, because various differences in RT techniques existed among the countries. We treated locally advanced cervical cancer patients according to the standardized protocol, and achieved favorable treatment outcomes. In the second study (Cervix-II, 1999-2006), we built a protocol of accelerated hyperfractionated RT to the pelvis and evaluated its toxicity and efficacy, because it was difficult to use CRT in some developing countries at that time due to technical and socio-economic constraints. In the third study (Cervix-III, 2003-2010), we conducted a phase II clinical study of CRT for locally advanced cervical cancer. We treated patients with locally advanced cervical cancer with concurrent RT and weekly cisplatin chemotherapy, and achieved favorable treatment outcomes with acceptable toxicities. In the fourth study (Cervix-IV, 2009-), we have been conducting a clinical study of concurrent extended-field RT and weekly cisplatin chemotherapy for node positive locally advanced cervical cancer.

When conducting the first clinical study, we experienced many problems and difficulties; 1) wide differences in the cultural and socio-economic status among countries, which may have resulted in large imbalance of patient enrollment, 2) wide differences in cancer imaging among institutions, which may have resulted in staining error, 3) poor compliance with the treatment protocol, and 4) poor follow-up rate. With the dedicated efforts of the physicians of the study group, these problems have been solved, and the quality of the recent Cervix-III and IV studies have been improved with the excellent compliance with the protocols and follow-up rates.

Cervix-III protocol has become one of the standard treatment protocols of CRT for cervical cancer in the FNCA member countries. Radiation Oncologists and medical physicists in the FNCA member countries have been trained through conducting clinical studies. And the network established by the FNCA project has the potential to promote and strengthen further international cooperation in the field of radiation oncology in Asia. We conducted a new clinical study of 3D image guided brachytherapy for cervical cancer last year.
Gynecological Cancer – Cervical Cancer Radiotherapy: Past present and Future

Richard Pötter

In the very past treatment of gynaecologic cancer was dominated by direct utero-vaginal Radium226 applications and additional orthovoltage external beam radiotherapy for lymph nodes (1st half of 20th century). Major Schools set the rules for treatment (Paris, Stockholm, Manchester (tandem, colpostats, plate, mgh)) based on their technical and clinical experience (overview in ICRU report 89).

With clinical evidence evolving for stage related outcome, a staging system for cervical cancer became finally international standard (later “FIGO”) with continuous collection of stage related data on treatment (surgery/radiotherapy) and outcome providing multicentre clinical evidence which was published from 1937 onwards through regular (tri-annual) FIGO reports (no. 26 in 2006).

During the second half of the 20th century artificial radionuclides (Co60, Cesium137, Iridium192), afterloading techniques, individualisation of application, new dose rates (MDR, HDR, PDR) and computerized treatment planning represented major steps in the development of BT (overview in ICRU report 89). For EBRT, megavoltage treatment was introduced (Co60, Betatron, Linac) and further developed through CT image based computerized treatment planning towards 3D conformal radiotherapy (3D CRT). The major drivers of these developments were (again) major Schools based on their institutional experience (Manchester, MD Anderson, Paris (IGR)). In parallel to the Radium226 mgh prescription and the Manchester Point A prescription (since 1938) traditions, the first major step was taken through ICRU 38 in 1985 towards joint international dose and volume reporting based on a 2D target (clinical and radiographical), on a 60 Gy reference volume, and on “ICRU rectum and bladder points”.

In 1999, cis-Platin based simultaneous radiochemotherapy became standard of care for locally advanced cervical cancer worldwide based on level 1 evidence from five prospective randomized trials (NEJM 1999).

During the last two decades volumetric imaging based brachytherapy (mainly MRI) was developed starting in some pioneer centres in Europe and then widely spreading throughout Europe, North America, Australia and also disseminating to several Asian countries and to some centers in South/Central America and Africa. An adaptive target concept for BT (CTVHR) formed the basis of this new approach based on response to radiochemotherapy assessed through repetitive gynaecologic examination and volumetric (MRI) imaging: Image Guided Adaptive Brachytherapy (IGABT). Combined intracavitary and interstitial transvaginal application techniques were introduced for large residual disease and unfavourable topography (Vienna/ Utrecht). Individualised volumetric imaging based computerized treatment planning was pioneered based on imaging with the applicator in place using a set of dose volume parameters such as D90 for CTVHR and D2cm3 for OARs for dose prescription and reporting in addition to TRAK, point A dose reporting and ICRU point dose reporting for rectum and bladder. Dose was recommended to be expressed as EQD2 based on the linear-quadratic model for tumour and normal tissue effects with an alpha beta of 10 Gy and 3 Gy, respectively. This new prescription and reporting system was first investigated within the Gyn GEC ESTRO Group (www.estro.org) and published as Gyn GEC ESTRO Recommendations (I:2005, II:2006) and then comprehensively published as ICRU/ESTRO Report 89 in 2016 (www.oup.com). This ICRU Report 89 includes beside other essential issues the important discrimination between Planning Aims and dose prescription during the process of IGABT and also ICRU dose reporting points along the vagina (PIBS).
In parallel to the development of technology and methodology of IGABT, retrospective and prospective mono-centre and multi-centre clinical studies have been set up, of which the (Retro)EMBRACE studies represent the most prominent at present comprising a total cohort of 2100 patients. From RetroEMBRACE evaluation a new standard could be defined for FIGO stage related outcome (mean 3y local control 91% (IB-IIIB: 98-79%)) and for quantitative dose volume parameters for CTVHR, CTVIR, GTVres and for OARs (rectum, bladder, vagina). These parameters are currently prospectively investigated in the hypothesis-driven EMBRACE II study (Pötter, Tanderup et al. 2018, ctRO, open access). For large volume disease a significant benefit (~10%) was found in RetroEMBRACE when using combined intravitary/interstitial BT (Fokdal et al. 2010). The adaptive target concept for BT could be validated through EMBRACE I.

For EBRT, the development (in EMBRACE II) is from 3D CRT to IMRT and daily IGRT with a tumour target concept (initial GTV, initial CTVHR and CTVLR) and a lymph node target concept (elective and boost) also addressing the para-aortic nodal target in case of lymph node involvement. ITV margins are individualized for the tumour target according to risk, PTV margins are 5 mm. The major aim for EBRT development is to decrease radiation related morbidity and to improve nodal control which is expected to have impact on survival.

The ongoing multi-centre EMBRACE II study (www.embracestudy.dk) altogether addresses various issues of IGABT and IMRT/IGRT as simultaneous radiochemotherapy for well-defined interventions/dose volume parameters and for multiple disease outcome, morbidity and QoL endpoints. Beside many centres from Europe, several centres from North America, India, China, Thailand and Australia are actively involved in EMBRACE II.


For the coming years outcome reports and analyses are expected from RetroEMBRACE and EMBRACE I, which will set further evidence based standards for overall treatment of LACC through definitive radiotherapy and the various physical and clinical aspects which are important for IGABT, EBRT and radiochemotherapy and which will allow even more individualised treatment approaches. Clinical results from EMBRACE II can only be expected after finalisation of accrual (earliest in 2023).

In addition to EMBRACE II, a registration study is considered to be planned allowing for centres interested in EMBRACE II standards, but not participating in EMBRACE II, to compare their performance with the performance of EMBRACE II active centres.

Further refinements in the workflow of IGABT and 3D CRT/IMRT/IGRT will facilitate the dissemination of this promising new approach. These developments will also include the more systematic use of Ultrasound and CT for application guidance (needle insertion) and BT treatment planning. New applicators allowing for parallel and divergent needles will facilitate appropriate treatment of large volume disease and/or unfavourable topography. Treatment Planning both for IGABT and EBRT will benefit from software developments including automatic planning tools and integration of the new terminology as suggested in ICRU 89 (e.g. Planning aims and dose prescription for IGABT). In vivo quality assurance for IGABT through on-line dose assessment (in vivo-dosimetry) and/or on line-imaging for BT are further important fields of research and development.

Currently, translational research is set up for the EMBRACE studies. The aim is to find prognostic and predictive markers in this large study cohort which will allow for further tailoring treatment according to individual risk. Such findings will also form the basis for the development of personalized drug treatment for cervical cancer patients. With the change of failure patterns from predominantly local to predominantly distant at present and in future, the need for effective adjuvant systemic treatment after IGABT is already significant and will further increase.
The Role and Timing for Radiotherapy in Rectal Cancer – How to Stay Relevant in The Setting of Effective Chemotherapy and Surgery

Jing Jin

Despite radiotherapy is recommended for stage II/III rectal cancer by NCCN guideline in both preoperative and postoperative setting, as the development of chemotherapy and surgery in recent decades, it is reasonable to applicate radiotherapy in individualized strategy for localized rectal cancer in order to stay relevant. The ESMO guideline (version 2017) present an optimal algorithm based on the risk stratification to guide the treatment choice, which is principally dependent on the standardized MRI, TME and pathological evaluation, especially the quality control for the entire process.

For the very early to intermediate risk group, preoperative radiotherapy can be omitted if there is no need for organ preservation. However, saving the rectum with appropriate radiotherapy would be revolutionary with a lot of benefits such as dramatic improvement of quality of life. Several retrospective and prospective cohort studies have presented the favourable results with these strategy (observation for patients with CCR or local excision combined with CRT). By watch and wait (W&W), 15% to 30% of regrowth occurred which was usually salvaged by radical surgery. Recently the largest series treated with W&W from IWWD study provides a reliable reflection of the real-world risks and benefits of W&W. With local excision combined with CRT pre or post operatively, single and multicenter studies have shown 0~20% local recurrence with patients staged in p/yp T1-2, the result of randomized phase III trial GRECCAR 2 confirmed the comparative oncological results by this strategy with total mesorectal excision.

For the bad group (high risk but resectable), short-course preoperative RT (SCPRT, 5Gy×5f) or CRT is recommended. SCPRT has been directly compared with CRT in two phase III trials, the Polish trial and Trans-Tasman Radiation Oncology Group 01.04 trial. Both studies uniformaly indicated that the significant higher pCR rate was achieved in CRT group with more early radiation toxicity, without differences in local recurrence, DFS and late toxicity between groups. Hence the decision should be balanced between the requirements for degrading of tumor and the tolerance of patient.

As ugly group (any MRF+, any cT4b, lateral node positive) remains challenging, preoperative CRT is still necessary approach because of significantly improvement on R0 resection compared with RT alone in several RCTs. Recently, encouraging results from a Polish trial comparing short-course RT followed by consolidation chemotherapy prior to surgery versus CRT in clinically unresectable tumor was reported. R0 resection rates and pCR rates were similar, and 3-year OS favored the short-course treatment. The other two similar and elegant designed RCTs (named RAPIDO and STELLAR) with promising preliminary results suggest this strategy may provide a win-win scenario (earlier systemic therapy and shortened duration of radiation). Another category of approaches (Induction or consolidation chemotherapy with CRT, prior to surgery, referred to as TNT) is worthy to note. Several centers including MSK reported results with following benefits: improved delivery of treatment plan, increased downstaging. However, the level 1 evidence is needed in the future.
Overview of SABR in HCC management based on BCLC staging system

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External beam radiotherapy (EBRT) is a well-established cancer modality in most major solid cancers. In hepatocellular carcinoma (HCC), its role hasn’t been recognized enough due to lack of high level evidence. However, its efficacy has been witnessed by soaring number of papers reporting beneficial clinical outcome as well as increasing level of evidence. Consequently, major treatment guidelines start to either consider EBRT as one of the treatment options (NCCN guideline 2018) or just mention (AASLD guideline 2017) depending on disease status.

EBRT can be administered in various ways. For small tumors, high dose focal radiation can be given in short term, which is referred to stereotactic ablative radiotherapy (SABR) or stereotactic body radiotherapy (SBRT). It needs precision technology involving image-guided beam delivery (image guided radiotherapy) as well as motion control. For HCC beyond early stage, EBRT can be given using conventional or hypo-fractionation scheme, which is adopting preferably combination scheme with other modality, either as an additional treatment for HCCs showing incomplete result to TACE or as a combination of EBRT and vascular therapy for HCC accompanying vascular invasion.

Currently SBRT is applied rather as a salvage aim than a primary definitive aim. However, its efficacy is proven through recent studies, expecting wider use of SBRT targeting primary aim as well as bridging treatment prior to liver transplantation. In this presentation, overview of SBRT will be discussed particularly based on BCLC staging system.
Intraoperative Radiotherapy in Breast Cancer

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Whole-breast irradiation (WBI) following breast-conserving surgery (BCS) has been used as an alternative to mastectomy in the treatment of localized breast cancer. However, WBI requires several weeks of treatment, and can be a source of inconvenience and cost. Accelerated partial-breast irradiation (APBI) has been developed as an alternative to WBI for selected patients with early breast cancer. Intraoperative radiotherapy (IORT) delivered as a single fraction at the time of lumpectomy is the most convenient APBI strategy. The rationales for IORT include: the vast majority of local recurrences occur in the index quadrant, logistical advantage to patients, potential less toxicity to heart and lung, and cost effectiveness.

Several trials comparing IORT and WBI following BCS for low risk early breast cancers have been conducted. There have been concerns regarding potentially higher local recurrence rate in the IORT arm, inadequate radiation dose to tumour bed, inadequate long term follow up data as well as increased skin and soft tissue toxicities. Nevertheless, there is a subgroup of low risk early breast cancer patients who may benefit from IORT.

At the University of Malaya Medical Centre in Kuala Lumpur, we started IORT for breast cancer in February 2016 using the 50KV photon spherical applicator following the TARGIT A protocol (JS Vaidya et al.). Up to the time of writing this abstract, we have treated around 25 patients. We are also participating in the TARGIT B study, a randomised clinical trial comparing IORT boost with EBRT boost in early breast cancer, for which we have recruited around 22 patients since April 2017. We would like to share some of our experiences in using 50KV photon for breast IORT in terms of practicality and acute toxicities. We do not have any meaningful data, as yet, in terms of local control rate due to the short follow up period and small number of cases.
Regional Nodal Irradiation in Breast Cancer: Current Perspective

Johann Tang

The role of radiotherapy for regional nodal irradiation is evolving with the recent publication of several large clinical trials. Given that surgical techniques regarding axillary management become more advanced and established, controversy now exist with regards to the indications for radiotherapy treatment, patient selection and the extend of regional nodal irradiation. This talk will review the recent clinical evidence and discuss these controversial issues in depth.
Breast BT in Asian Perspectives
Johann Tang

Accelerated partial breast irradiation is a collection of different modalities of radiotherapy techniques: from the traditional multicatheter brachytherapy, Mammosite, Intraoperative and External beam radiotherapy technique to the more advanced hybrid catheters such as Contura or SAVI. This talk examines the current clinical evidence of each technique as well as discusses which modality would be best adapted in the Asian population.
Hypofractionated radiation therapy in breast cancer: Korean experience

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Radiation schedule of 50 Gy/25 fractions in 5 weeks used in earlier trials demonstrated the efficacy of breast conserving surgery (BCS) and adjuvant whole breast radiotherapy to be equivalent to that of mastectomy. The support of standard fractionated whole breast irradiation (SF-WBI) for breast cancer is based on the radiobiologic consideration that radiation damage to normal tissue is greater with larger fraction size without additional tumor control. As a result, SF-WBI in the adjuvant treatment after lumpectomy has been the standard for several decades. However, some of the challenges of SF-WBI are cost and inconvenience of the patient involved with daily treatment courses from 5 to 7 weeks. This has led to the suggestion of short fractionation as a new standard following BCS for early stage breast cancer.

Hypofractionated whole breast irradiation (HF-WBI), based on precedent studies over the past two decades, offers an opportunity for improved patient convenience, lower healthcare costs, and greater access to care without sacrificing treatment outcomes. Up until now, 4 randomized trials—the Royal Marsden Hospital/Gloucestershire Oncology Center (RMH/GOC) trial, the UK Standardisation of Breast Radiotherapy (START) trial A and B, and the Canadian trial—have supported the establishment of HF-WBI with recent publication of 10-year outcomes.

Based on these studies, ASTRO published an evidence-based guideline for HF-WBI in 2011. The guideline states that the panel reached a consensus on supporting HF-WBI for patients who meet all of the following criteria: age older than 50 years, stage T1-2N0 disease, no use of chemotherapy, and central axis dose of 93% to 107%. This criteria is based upon the inclusion criteria and outcomes of the key studies stated above, but this recommendation is relatively conservative. This criteria will be revised soon. Recommended dose-fractionation scheme is 40-42.5 Gy in 15-16 fraction by NCCN guideline.

HF-WBI has been proved its effectiveness and safety. The 50 Gy in 25-28 fractions prescription does not have the advantage of convenience for patients nor the advantage of a reduced biological effectiveness associated with the ‘extended’ fractionation schedule. HF-WBI shows even better late or acute radiation toxicity for early breast cancer. But in Korea, further investigation to identify the current practice pattern or cost effectiveness is warranted under the national health insurance service system. HF-WBI could be new standard for whole breast radiotherapy in early breast cancer after BCS.
Patterns of Radiotherapy Practices in Breast Cancer in Asia: A Challenge in Diversity

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Purpose: The aim of this lecture is to give an overview of the current patterns of practice in radiotherapy for breast cancer management in Asia.

Methods: A survey was conducted during the International Atomic Energy Agency (IAEA)/Regional Radiation Oncology Societies (RCA) Kick-off and Project Coordination Meeting in Gunma, Japan last May 2018. The event was attended by radiation oncologist representatives from 22 countries from the Asia-Oceania region. A total of 19 survey questionnaires were sent to the corresponding representatives which consisted of 22 multiple choice questions divided into 12 categories.

Results: The survey had a 100% response rate. Out of the 19 respondents, 18 were from Asia and 1 from Oceania. Majority of the participants came from lower middle income countries (56%) and the remaining were either high income (22%), upper middle income (17%), and low income countries (5%). Majority are government operated facilities (89%). Most of the breast cancer patients were diagnosed with locally advanced disease (78%). Surgical procedures for early staged breast cancer (stage I-II) were usually via breast conserving surgery (71%) while locally advanced stage diseases were mostly treated with modified radical mastectomy (90%).

In terms of radiotherapy, early and locally advanced breast cancer patients were predominantly treated using external beam radiation in 82% and 95%, respectively. Majority of which were 3D-CRT in 45% and 41%, respectively, followed by IMRT in 21% and 26%, respectively. Most radiation oncologists still utilize conventional fractionation (mostly 50 Gy in 25 fractions) in treating early (50%) and locally advanced diseases (60%). However, hypofractionation (mostly 40 Gy in 15 fractions) are increasingly being adopted in 45% and 50%, respectively. Timing of radiotherapy usually starts at 4-6 weeks after chemotherapy or surgery (83%) and more than half reported to deliver adjuvant radiotherapy after breast reconstruction or flap placement. Most common acute side effect of breast radiotherapy is radiation dermatitis (94%) while the most common chronic side effect is telangiectasia (47%).

Palliative radiotherapy in breast cancer is most commonly offered for pain (32%), brain metastases (30%), bleeding breast mass (21%) and bone metastases (17%). Brain metastases is usually treated with whole brain radiotherapy using 2D conventional radiotherapy delivering 30 Gy in 10 fractions (50%), while bone metastases is also commonly treated using 2D conventional radiotherapy with 8 Gy in 1 fraction (36%).

Conclusion: Patterns of practice for breast radiotherapy are widely varied in Asia. Technological advancements, accessibility to treatment, socioeconomic status, and, physician and patients’ choice contribute to the different practices employed in breast cancer radiotherapy in Asia. Radiotherapy for breast cancer in Asia continues to evolve with constant research, professional education and training, creation of practice guidelines, and regional/international collaborations tailored to the Asian population.
Hypofractionated radiotherapy after breast conservative surgery or mastectomy

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The survival benefit of postmastectomy radiotherapy (PMRT) in patients with locally advanced or lymph node-positive disease has been demonstrated by randomized trials and meta-analyses. PMRT to the chest wall and nodal regions is typically delivered in 25 fractions of 2 Gy over 5 weeks (conventional fractionated radiotherapy, CFRT). There is a growing interest in delivering PMRT with hypofractionated schedules. Several randomized studies have demonstrated that hypofractionated radiotherapy (HFRT) after breast conservative surgery, delivered at approximately 3 Gy per fraction, for a total of 13–16 fractions, provides equivalent long-term efficacy and toxicity, compared with CFRT.

A randomized phase III non-inferior open-label study was conducted in China. Patients with high-risk breast cancer who had undergone mastectomy were randomly assigned to receive chest wall and nodal irradiation at a standard dose of 50 Gy in 25 fractions over 5 weeks or at a dose of 43.5 Gy in 15 fractions over 3 weeks. 820 patients were recruited. 409 patients in the CFRT group and 401 in the HFRT group underwent intention-to-treat analyses. The 5-year cumulative incidence of LRR was 8.1% in the CFRT group and 8.3% in the HFRT group (90% CI, 0.0 to 2.6; HR, 1.0; 90% CI, 0.72–1.69). The 5-year OS and DFS rates were 83.2% and 74.6% in the HFRT group, compared with 85.6% (P=0.526) and 70.7% (P=0.429) in the CFRT group, respectively. There were no significant differences in treatment-related toxicities, except that the HFRT group had less acute skin toxicity than the CFRT group.
Integrating Palliative Care in Cancer Treatment

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Pain is one of the most feared symptoms of cancer. Worldwide, 39.3% suffer from cancer pain after curative treatment and as high as 55% during anti-cancer treatment. A good number of them suffer moderate to severe pain. In Asia, the enormity of the cancer pain pose so much problem. Asia accounts for 60% of the world population and half of the global burden of cancer. The incidence of cancer cases is estimated to increase from 6.1 M in 2008 to 10.6 M by 2030, (Sankaranarayanan et al, Medicine for Global Health, 2014). Since cancer care has improved the past decade, increased life expectancy is seen, and problems like chronic pain has become more common.

Causes of cancer pain

1. The tumor itself
2. Secondary to the treatment of cancer (surgery, chemotherapy, radiotherapy)
3. Immunocompromised state of the patient leading to infection like acute herpes zoster which may further lead to post-herpetic neuralgia

Focusing on pain from radiotherapy:

Radiation toxicity may be seen as both early and late effects. The late effects are the ones that are problematic. These include connective tissue fibrosis, neural damage and occurrence of secondary malignancies (Burton et al, AAPM, 2007).

Mucositis is one of the most common painful side effects of RT and can be disabling.

Radiation therapy is a risk factor for breast cancer patients due to connective tissue fibrosis and neural damage. Brachial plexopathy is a common occurrence in women treated for breast cancer.

Chronic pelvic pain has been reported as a consequence of prostate brachytherapy. It is believed that post-radiation pelvic pain syndromes are underreported.

Radiation myelopathy may be caused by ionizing radiation. It may present with pain or dysesthesia at or below the level of injury.

Pain flare may be seen in EBRT or SBRT. It is a temporary worsening of bone pain in the treated metastatic site. The enormity of cancer pain from all sources is further worsened by the status of opioid use and opioid restrictions in most Asian countries. Most cancer-related pain may be controlled by a combination of paracetamol or NSAIDs or COX-2 inhibitors plus opioids and adjuvant drugs (TCA, SSRI, SNRI, and anticonvulsants). Today, various barriers are still seen in the use of opioids in Asia. Pain management remains to be inadequate and if this is not resolved, a lot of cancer patients will have very poor quality of life.
Palliative Radiation Therapy: impressive 3 cases of bone metastases

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Background: The role of palliative radiation therapy (PRT) is to control symptoms caused by cancer and so giving the patient a better QOL. Here we present impressive cases of PRT for bone metastases during 30 years of experience. Case Presentation: 1) A 44-year-old woman with endometrial cancer previously treated with surgery developed gait disturbance and sensory loss of bilateral lower extremities occurring 2 days ago. Just a night before admission, she could not even stand up. Thoracic MRI revealed bulky bone metastases at Th1-3 heavily compressing her spinal cord. Emergency PRT was started from the day and continued up to 38Gy. After 6 months of bedridden, she gradually recovered her sensory and could stand up again at 9 months. She is still alive without progression at 10 years. 2) A 38-year-old woman with cervical cancer treated with chemoradiation developed painful Th2-3 oligometastasis at 40 months. Cyberknife stereotactic RT of 20 Gy followed the conventional RT. Complete response was obtained and she is still NED at 6 years. 3) A 44-year-old medical doctor with disseminated breast cancer was approaching her end-of-life. She had severe hip joint pain due to bone destruction by metastatic tumor not responding to opioid medication. She was moved by bed and treatment port was set directly at Linac treatment room. A single fraction of 8 Gy was delivered. Next day, she said “Hip pain is completely gone. Thank you, doctor.” She died a week later. Conclusions: PRT can provide further benefits beyond symptomatic relief for cancer patients.
ICRU 89, The effect of BT treatment

Christian Kirisits

The ICRU/GEC-ESTRO report number 89 describes the current state of brachytherapy for cancer of the cervix. Introduction chapters present the essential background, including a clinical introduction, historical and current techniques including the concepts of volumetric imaging for cervix cancer. One key element is the 4D adaptive target concept including detailed definitions for a High, Intermediate and Low Risk Clinical Target Volume (CTVHR, CTVIR, CTVLR). It is based on clinical examination and volumetric imaging, preferably using MRI. The definition for treatment planning with the applicator in place can be adapted also for CT, ultrasound or radiographic imaging. Brachytherapy, using state of the art application techniques (e.g. combined intracavitary/interstitial), can deliver high doses to these target volumes and even increased dose levels for the residual GTV inside. The treatment is guided by a comprehensive set of dose and volume parameters which also take into account the main organs at risk, which are the rectum, bladder, sigmoid, adjacent bowel and vagina with their different morbidity endpoints and related substructures within the organ (e.g. bladder neck, anal sphincter). The effect of brachytherapy can be correlated to total doses using the linear-quadratic model EQD2 concept as the current best option. In this context it is important to describe the heterogeneous dose distribution resulting from brachytherapy in addition to external beam treatment by a set of dose parameters. In addition to the dose delivered to at least 90% of the target volume D90 the D98 as the near minimum dose and the D50 as high dose parameter are recommended. As these parameters are reported for the different GTV and CTV volumes the different heterogeneous dose levels are described and taken into account in outcome analysis. For OAR D2cm³ and D0.1cm³ are the main parameters for the 3D volumetric approach, however, it is emphasized to report additional dose parameters sensitive to the intermediate dose region and dose points for sub-structures. For the vagina a set of dose points are proposed to report the dose close to the brachytherapy applicators, but also at different reproducible positions within the vagina to take into account the external beam fields. The report includes detailed chapters on treatment planning, especially for 3D volumetric approach, but also the underlying concepts of dosimetry which remains essential for volumetric and radiography based planning.
Image – Guided Brachytherapy: What’s Next?

Christian Kirisits

The use of 3D volumetric imaging with CT, MRI or ultrasound has improved brachytherapy techniques substantially. It became possible to define target volumes taking into account the status at diagnosis and the actual situation at time of brachytherapy. By visualizing the applicators and their relation to target volumes and organs at risk it is possible to optimize dose distributions taking into account the full potential of brachytherapy dose delivery. This is the basis for recent developments in applicator geometry, either innovative new combinations of intracavitary and interstitial techniques or also the use of 3D printing. The integration of imaging can be performed at different levels. Current developments enable the combination of different image modalities at different time points to improve logistics. The use of ultrasound at time of applicator insertion combined with CT, MRI or PET images allows precise target definition and even real-time application guidance. However, for most techniques, the imaging used for the final dose delivery treatment plan is performed after applicator insertion and only before actual dose delivery. There have been several studies analysing potential variations between these time points. The current clinical routine could further benefit from dose delivery verification. Emerging technologies could include on-line imaging just before and after, or even in parallel to the afterloader treatment. In-vivo dosimetry measuring not only dose, but dose-rate at different points and over time can reconstruct the actual irradiation geometry. Tracking technology can trace the position of applicators or source positions in the treated region. Such systems might not only quantify variations of the finally delivered dose, but also detect failures which can arise because some steps of the whole brachytherapy irradiation are by now not verified or recorded by technology but only treating personnel. Treatment planning for certain clinical disease sites can benefit from new dose calculation algorithms taking into account any non-water equivalent material. Treatment planning systems should integrate the possibility of planning aim and constraints definition, automatic planning and detailed recording and reporting of the finally prescribed plan. The achievement of the last decades in brachytherapy using image-guidance were substantial, but there is still place for further improvement of technology, but also education and training for its appropriate use.
MRI, CT, US guided brachytherapy for radiotherapy of cervical cancer (for Chiang Mai Experiences)

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Brachytherapy for cervical cancer is one of the long-term developments of radiotherapy in the history. The concepts of point A in intracavitary brachytherapy (ICBT) was published in ICRU no.38 reporting details the dose prescription and limitation. [1]

At that time, with point-based planning, the results of treatment was very good but when the new images came (MRI, CT, or US comes), the fixed the point A caused over-or under-treatment in ‘too small’ or ‘too large’ situations. [2-3]

Image-guided brachytherapy (IGBT) for cervical cancer with Magnetic Resonance Imaging (MRI) guidance have begun for 20 years. After development processes, the 2 issues of GEC-ESTRO to identify the targets (HR-CTV, IR-CTV) and Organs at risks (OARs) were published and the first clinical impact study of IGBT by Potter et al. was revealed. [4-6] For Faculty of Medicine, Chiang Mai University, IGBT was implemented in 2008. At that time, due to infrastructure, CT-based brachytherapy in 17 cervical cancer patients was begun first and showed the promising results in reduction of Organs at risk (OARs) dose. [7] After we gained experiences in CT-IGBT, the project of MRI-guided brachytherapy was launched in 2009, MRI at Diagnosis, MRI at First brachytherapy and 3-month after treatment were designed. With MRI guidance, the treatment result was promising and MRI can showed some treatment responsiveness during treatment. The third project came from the Whole pelvic Intensity-modulated radiation therapy plus CT-based brachytherapy and showed the good results also.[8-9] For long-term follow-up, our experiences in IGBT showed good results and toxicity profiles. [10-11]

Not only the volume-based approaches for brachytherapy, the research project on trans-abdominal ultrasound (TAUS), in 2.5D, guidance was also researched in BT. The using of TAUS for planning in intracavitary brachytherapy started in Peter MacCallum Cancer Centre in Australia to show the promising results of TAUS-guided brachytherapy by Van Dyk et al and Narayan et al. [12-13] With TAUS guidance, the treatment of point-based planning (2.5D) showed improvement of dose to OARs in comparison to point A based planning. [14] These modalities improve the quality of treatment from the conventional BT, however, investments in equipments, manpower, and times need to manage for technology implementation.
The 4th Generation Low-Dose-Rate (LDR) Implant for Prostate Cancer

Jaeho Cho
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Recently, low-dose rate (LDR) brachytherapy has become a major treatment for localized prostate cancer. This treatment is thought to have equal or superior 5-and 10-year disease control rates compared to surgery or external beam radiation therapy, while side effects are considered to be relatively low. LDR brachytherapy results in fewer impotence and incontinence that are common after surgery. Compared to external beam radiotherapy (EBRT), LDR brachytherapy can deliver a substantially higher radiation dose to the prostate and even lesser radiation dose to the surrounding normal tissue. LDR brachytherapy uses Iodine-125, Paladium-103, and Cesium-131 as the most suitable isotopes.

The clinical use of brachytherapy for prostate cancer has a history of more than 100 years. There have been several breakthroughs in the development of this long-standing LDR brachytherapy to become the treatment of choice for localized prostate cancer. These include the introduction of transrectal ultrasound to visualize the prostate gland during the procedures, the discovery of suitable radioactive iodine, and the modernization of the dosimetry protocol.

More recently, stranded seeds have been developed that minimize seed migration and improve postoperative dosimetric outcome, and dynamic optimization functions also have been developed in real time during the procedure. The so-called fourth-generation LDR brachytherapy, combining these two advanced features, has been introduced into the clinic to provide better control of tumors and lower side effects.

Although LDR brachytherapy is the most conformal treatment in terms of radiotherapy quality, the frequency of this treatment is a bit decreasing due to less reimbursement of the insurance, the difficulty of performing this treatment, and the introduction of various competitive therapies. In Asia, Prostate brachytherapy has not been as active as the West. There are many reasons for this, but most importantly because of the low incidence. However, due to the westernization of food culture, the incidence is increasing in many Asian countries including Korea and Japan.

LDR brachytherapy is expected to be actively used as one of treatment choices in localized prostate cancer in Asia, where its incidence is likely to increase in the future due to its excellence in terms of treatment efficacy.
Treatment planning and optimization in MR image based Adaptive Brachytherapy(IGABT) for Gynaecological cancers.

Jamema Swamidhas

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Most Brachytherapy(BT) centers in the world have followed a traditional concept based on the Manchester or Fletcher loading patterns. The rationale behind the Manchester approach is to achieve a consistent dose rate at point A, by applying a set of strict rules with regard to the position and activity of radium sources for the different combination of sizes for the uterine tandem and ovoids. With the introduction of HDR remote after loaders, the rules of Fletcher and Manchester systems were extended from the milligram radium equivalent activity distribution to a pattern of dwell positions where a single stepping source is positioned at programmable dwell times. With the introduction of computers and sophisticated mathematical models, HDR BT has brought in more advances in to field of BT. One such advance in the process of treatment planning is the application of optimization algorithms in HDR BT, which offers a great flexibility in shaping the desired dose that adequately covers the tumour and minimizes the dose to normal tissues.

The objective of any treatment planning in radiotherapy is to deliver the maximum dose to the tumour and minimum elsewhere. One of the basic pre requisite to meet this objective is the knowledge of the spatial location of tumour volume with respect to OARs. In 2D orthogonal images, the OARs with respect to the target volumes were not clearly seen, The integration of CT or MR imaging for treatment planning in 3D IGABT serves the purpose of identifying the target volumes in 3D geometry. The introduction of IGABT, has also added a new dimensions in terms of both volume to the target and OAR and how these volumes change with time, providing an improved understanding compared with the limited information available with radiographic localization.

The second pre-requisite to meet the planning objective in BT treatment planning, is to achieve certain dose volume parameters or constraints, which are considered as the dose tolerance for the organs. The method to achieve these constraints in HDR BT may be termed as optimization. Optimization in HDR BT is nothing but adjusting the dwell positions and dwell times in an iterative process until the best compromise for target and OAR constraints is achieved. Dose could be done either by manual forward planning or inverse optimization. Inverse planning algorithms was first introduced in brachytherapy for prostate. The major aim of the inverse planning algorithms was to improve the dosimetric results, make reproducible plans, and decrease the time to prepare a treatment plan. However, at this moment, these inverse planning algorithms were not robust enough especially for intracavitary brachytherapy for gyn cancers. For example, the loading pattern resulting from these algorithms has a large deviation from the traditional pattern which may not be clinically acceptable. Dosimetric and clinical evidence have to be collected to obtain as much knowledge as possible which then will be integrated into future inverse planning tools.

Forward planning staring with the standard loading pattern and normalization to point A, followed by manual optimization to meet the dose constraints is the current recommendation by ICRU 89. Although, the dose prescription in IGABT is on HRCTV, it is recommended to report the dose to point A. Generally, it is advisable, that large deviation from the standard loading pattern or the pear shape dose distribution is avoided. If Interstitial + intracavitary approach is being used, it is important to maintain the loading of the interstitial needles to a maximum of 20-30% so that the major part of the dose is delivered from the intracavitary applicator and the high dose region remains inside the uterus/GTV. By means of optimization the prescription isodose can be expanded typically by 5mm in intracavitary applications. By introduction of additional interstitial needles parametrial involvement can be targeted and it is possible to provide prescription depth upto 15mm from point A without increasing the dose to OARs significantly.
Interstitial Brachytherapy (ISBT): Is it still needed?

Naoya Murakami

Interstitial multi-catheter brachytherapy (ISBT) with transperineal approach for locally advanced uterine cervical cancer is a well-established method. Recently combined intracavitary and interstitial brachytherapy (IC/IS BT), which applies only a few interstitial needles along with conventional intracavitary applicators and is much easier to perform compared with ISBT, has introduced for locally advanced cervical cancer. Yet, there exists no clear guideline or criteria defining which kind of locally advanced patients are suitable for IC/IS or IS brachytherapy.

Between December 2008 to October 2014, 209 patients received definitive radiation therapy for cervical cancer. Among them, 142 (67.9%) and 42 (20.1%) received intracavitary brachytherapy (ICBT) and IC/IS BT, respectively. Remaining 25 (12%) patients received ISBT. Although median tumor size at initial presentation for patients treated with ISBT was as large as 7 cm (range, 4-14 cm), a favorable three-year local control of 87.8% was achieved.

Even if the percentage of patients who require ISBT is small, there exists locally advanced patients who certainly requires ISBT to obtain good local control.
Current Issue in BT for Endometrial Cancer

Richard Pötter

For endometrial cancer surgical removal of uterus, salpinx and ovaries remains the standard management (preferably nowadays through laparoscopy) and cures the majority of patients. Since decades beside FIGO stage prognostic factors (e.g. grade of differentiation, depth of myometrial invasion) have been used to select patients who could benefit from adjuvant treatment and its different forms, thereby stratifying in low, intermediate and high risk patients.

Postoperative brachytherapy

In stage I low risk endometrium cancer patients no benefit can be expected from adjuvant radiotherapy according to current evidence.

In stage I intermediate risk patients level 1 evidence showed, that radiotherapy decreased the risk of pelvic recurrence threefold, from approximately 15% to 5% at 5 years. This improvement, however, did not lead to a survival benefit and came at the cost of increase in toxicity, mainly gastro-intestinal. The subgroup of patients with ‘high-intermediate risk’ factors (≥2 of the following: grade ≥2, ≥50% myometrial infiltration, age >60 years) has the largest benefit in pelvic recurrence. Since the majority of recurrences in patients who did not receive postoperative radiotherapy are seen in the proximal vagina, subsequent studies have focused on the role of vaginal vault brachytherapy. Both the PORTEC-2 trial and a Swedish trial found that vaginal vault brachytherapy provides similar high vaginal control (97-98%) but with less treatment related side effects and less impact on quality of life. For women with high-intermediate risk features, postoperative vaginal vault brachytherapy alone is therefore the currently recommended treatment.

High risk endometrial cancer patients (stage I high risk, stage II/III/IV; clear cell and serous histology) are at increased risk of nodal and distant metastasis and endometrial cancer related death. Therefore postoperative external beam pelvic radiotherapy/chemotherapy are often indicated. No benefit can usually be expected from additional vaginal vault brachytherapy.

For postoperative vaginal brachytherapy target is the upper third of the vagina (3-4 cm target length) as most recurrences occur in this region. Treatment is through standard vaginal cylindrical applicators with one central channel which are introduced into the vagina to reach direct contact with the vaginal vault mucosa. Standard dose prescription and reporting is at 5 mm depth with some possible adaptation at the vaginal vault apex based on 2D treatment planning. Dose should also be reported at the applicator surface. The benefit of individualised image based 3D treatment planning (US, CT, MRI) is in quality assurance and adjusting/reducing target depth which can impact vaginal morbidity. Fractionation schedules frequently recommended are 3x7 Gy, 4x6 Gy, 5x5 Gy at 5 mm. Assuming an alpha beta value of 3 Gy for endometroid cancer 3x7 Gy (~3x10.5 Gy at the surface) results in a total equi-effective dose of 42 Gy EQD23 at 5 mm depth and 62 Gy EQD23 at the surface.

Local vaginal failure in intermediate risk patients after postoperative brachytherapy alone is low (2-3% at 5 years). The main late side effects are mild to moderate vaginal dryness, shortening and rarely consequential stenosis. Chronic cystitis, proctitis, sigmoiditis and enteritis are infrequent. Only rarely grade 3 events such as vaginal necrosis or fistula (between vagina and bladder/rectum) have been reported.
Definitive intrauterine brachytherapy

Definitive intrauterine brachytherapy replacing surgery is indicated for patients with endometrial cancer who are unfit for surgery, either as brachytherapy alone (stage I or II) or with external beam therapy (stage III). Excellent local control can be achieved, about 90% local control with image based brachytherapy. This indication is increasingly registered in the US at present due to an increasing number of very obese and unfit patients for whom intrauterine brachytherapy represents a valuable treatment option.

The target is the whole uterus and the upper third of the vagina. Accurate tumour localisation and staging are essential using MRI. The GTV and the whole uterus are delineated. The GTV should receive ≈90 Gy EUD23 (e.g. 6x7.5 Gy) and the uterus 60-70 Gy EQD23. Vaginal dose prescription follows guidelines for adjuvant treatment. Appropriate brachytherapy requires usually specific applicators, either Heyman or Norman Simon capsules, or the Rotte Y applicator to ensure good coverage of GTV and CTV. Tandem alone is feasible in limited size tumours and uterus. In selected cases (large volume disease) additional needles can be beneficial, forwarded through an additional ring with holes at the cervix (Vienna I applicator type for cervical cancer).

Outcome in definitive treatment is predominantly defined by patients’ comorbidities rather than through endometrial cancer, as local control reaches 70-95%. Toxicity is mainly vaginal dryness and shortening with occasional grade ≥3 urinary and bowel morbidity (<5%).

Definitive treatment for vaginal recurrence

For the treatment of local vaginal recurrence definitive brachytherapy is indicated. Depending on the site, extension, volume of recurrence, and previous treatment, endovaginal and/or interstitial brachytherapy is performed, with or without external beam therapy. Application technique, treatment planning and performance are similar to treatment of early or advanced vaginal cancer.
Quality Audit in Radiotherapy – Physicist Perspective (Summary of IAEA TECDOC 1543)
Wahyu Edy Wibowo

Radiation treatment is a complicated process which has many error potential at every step. To minimize the possibility of error occurrence and identify them at earliest possible opportunity, a Quality Assurance program is needed. Quality audit as a part of comprehensive approach to Radiotherapy Quality Assurance, has been widely recognized as an effective method in improving institution’s quality of activities. Physicist plays an important role in some part of the on-site audit, e.g. dosimetry audit, brachytherapy audit, and treatment planning process audit. In this presentation, focused to three kind of on-site audit mentioned, both of physicist role and audit’s process will be explained starting from preparation of visitation, interview, safety and mechanical check, physics parameter functionality, equipment comparison, dosimetry measurement, until audit case trial completion. Assessment form, passing criteria, and case explanation will also covered in this presentation. Moreover, audience, especially physicist, will be encouraged to learn more using IAEA TECDOC 1543.

Keywords: audit, physicist, dosimetry, brachytherapy, treatment planning process, IAEA TECDOC 1543.
The future of radiotherapy in pediatric cancer
Arnold Paulino

In the past half a century, it has become evident that radiotherapy is a major contributor to late complications in childhood cancer survivors. Many different strategies have been used to limit radiotherapy volumes and doses, and in favorable subsets of patients, eliminate radiotherapy in different pediatric tumors. In the era of more conformal radiotherapy and other advances in radiotherapy delivery, radiotherapy is currently being used in children < 3 years of age with brain tumors. Likewise, reirradiation and treatment of oligometastatic disease have become new indications in the setting of recurrent and metastatic disease. More centers are also offering proton therapy for childhood cancer with the hope of decreasing late radiation toxicity.
Challenges in Pediatric Oncology:

Dennis Doromal

The practice of a pediatric radiotherapy is doubly challenging especially in a 3rd world setting. Pediatric cancers in general are challenging because they are uncommon, with their own variety of unfamiliar histologies, and after treatment you are then faced with peculiar toxicities and serious late effects which maybe as daunting as the primary disease itself. In addition there is also the emotional baggage that comes with treating kids. In the third world setting these difficulties are further amplified by lack resources, financial or infrastructure inadequacies, or the lack of expertise for proper management. All this add to a perfect storm of a challenge to any radiation oncologist.
Local Treatment for Pediatric Sarcoma (Ewing’s Tumor)

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Abstract: Ewings sarcoma is the 2nd most common primary osseous malignancy in children with an incidence of approx. 2/million population in the US. Almost 65% occur in the 2nd decade of life. The median age at presentation is approx. 14 yrs (range: 2-45Yrs). Pain & swelling the commonest presenting features with pelvis & lower extremities being the commonest sites of involvement (50%). Multiagent chemotherapy (CTh) followed by surgery (Sx) with or without radiation therapy (RT) has been the standard treatment of Ewings sarcoma. Site, metastatic status, size, & post CTh tumour necrosis have had significant impact on outcomes. The local treatment modality that results in optimal disease control has been an area of unresolved controversy. Although most clinical management guidelines would recommend surgery as the preferred choice over radiation therapy for local control, there is absence of robust randomised data comparing the two modalities. Retrospective reports to indicate improved local controls with Sx compared to RT but with inferior functional outcomes and vice versa. Most large co-operative group studies report primary Sx alone in 40%, Sx followed by post-operative RT in 30%, & RT alone in 30% patients. Improved surgical techniques & rehabilitative measures have resulted in better organ & function preservation amongst pts undergoing Sx as local treatment while improvements in RT techniques & technologies have resulted in better preservation of organ/ function & reduced toxicities in patients undergoing RT without compromising on disease control. The current & future studies are looking at better integrating CTh, Sx, & RT for achieving the optimal therapeutic ratio.
Retinoblastoma – They Live and See – Recent Trends in the Management of Retinoblastoma

Vijay Anand Reddy

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Retinoblastoma was first described by Pawius in the 16th century. Wardrop suggested enucleation as a life-saving treatment for retinoblastoma. X-rays to treat retinoblastoma was pioneered in the early twentieth century and was the sole eye-saving treatment until mid-90s when the use of chemotherapy in retinoblastoma was introduced. Since then, numerous advances in the eye-salvage treatment of retinoblastoma have evolved. However, enucleation is still indicated in advanced cases, and specific indications necessitate the use of external beam radiotherapy (EBRT).

Conclusions: The management of retinoblastoma revolves around having a sound knowledge of the disease, choosing the best treatment for the patient among the various available options and careful monitoring for recurrences.
Update on Radiotherapy for Hodgkin Lymphoma in Children

Yavuz Anacak

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Introduction: The management of Hodgkin’s lymphoma (HL) has evolved from extended-field radiation alone as the main therapy to a combined-modality approach with chemotherapy and radiation. HL at pediatric ages have several distinct features in relation to geographic distribution, gender, association with Epstein-Barr virus (EBV), and histological subtype when compared to adults. It has a relatively higher incidence in developing countries and in males and nodular lymphocyte predominant subtype is more frequent.

Most contemporary programs for the management of pediatric HL are based on clinical staging and use chemotherapy alone or combined-modality therapy with low dose irradiation. Each patient should be evaluated for multimodal treatment individually and should be treated with certain protocols. Children treated with these programs are reported to achieve 5-year OS rates of approximately 90% and relapse-free rates of at least 80%.

Diagnosis and staging: After the introduction of FDG-PET imaging, this modality quickly evolved to be the standard imaging technique for staging and response evaluation. Since FDG-PET imaging gives information on both anatomy and metabolic activity it should be preferred over CT, MRI and other imaging techniques and should be used to reduce the radiation fields. Bone marrow biopsies in selected patients with clinical stages III and IV disease or B symptoms should be performed. Staging laparotomy is rarely necessary, but biopsy of specific sites with equivocal findings by clinical staging should be considered where results would alter therapy. Overall 2/3 of children are at stage I or II, and 1/3 have B symptoms.

Treatment: Stage based, risk adapted therapy with minimum use of radiotherapy and chemotherapy to avoid late effects replaced the irradiation of old fashioned extended fields with high radiation doses and use of highly toxic alkylating agents. Today research on pediatric HL focused on omitting radiotherapy in early stages and reducing the intesity of chemotherapy without compromising the survival. Involved fields covering the enlarged lymph-node regions has become the standard radiation volume. However it can be even reduced to involved-node fields in carefully staged patients with the help of PET-CT imaging. Typical radiation doses are 15-20 Gy in case of complete response to chemotherapy and 25-30 Gy for residual disease. Radiotherapy can be omitted in selected stage I to IIA patients, where PET-CT imaging is used for imaging.

Late effects: Children have a relatively increased risk, compared with adults, for long-term cardiopulmonary compromise, musculoskeletal growth impairment, and subsequent malignant neoplasms. Available data for pediatric HL obtained from a couple of decades ago where almost all patients are irradiated with higher doses to extended fields, which gave a negative perspective to radiotherapy with high rates of developmental problems, cardiac troubles and secondary cancers. After the less intensive use of radiotherapy and chemotherapy a significant reduction in late–effects can be expected.

Conclusions: Radiotherapy continues to be an important part of the treatment for pediatric HL. Survival is around 90% for all stages combined. Radiotherapy can be omitted in early stage cases only after creful staging with PET-CT imaging. A reduction in late toxicities thanks to smaller radiation volumes and doses is anticipated.
Elucidation of the molecular mechanism underlying PD-L1 expression after DNA damage for precision radioimmunotherapy

Atsushi Shibata

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Immune checkpoint therapy has recently emerged as a promising next-generation treatment for cancer. Recent studies suggest that, in cancer cells, exogenous cellular stress upregulates PD-L1 expression, which may contribute to the formation of an immunosuppressive tumor environment. DNA double-strand break (DSB) is the most critical type of genotoxic stress; however, the involvement of DSB repair in PD-L1 expression is yet to be investigated. Here, we demonstrate the upregulation of PD-L1 expression in cancer cells, which is mediated by ATM/ATR/Chk1 kinase activities, in response to DSB. By targeting DSB repair genes in an siRNA library, we noted enhanced PD-L1 upregulation by the depletion of either BRCA2 or Ku70/80 after X-ray. Moreover, DSBs activated the signaling of STAT1/3 and upregulated the expression of IRF1, both of which are regulators of PD-L1 expression. Thus, our findings reveal that DSB repair regulates PD-L1 expression, providing a mechanistic insight into DSB-induced upregulation of PD-L1. This presentation will also discuss our latest findings regarding PD-L1 upregulation following heavy-ion irradiation or oxidative DNA damage.
Global and Regional Needs for Radiotherapy Treatment
Bhadrasain Vikram

Worldwide access to radiotherapy is unacceptably low. We present evidence that quantifies the worldwide coverage of radiotherapy services by country. We show the shortfall in access to radiotherapy by country and globally for 2015-35 based on current and projected need, and show substantial health and economic benefits to investing in radiotherapy. The cost of scaling up radiotherapy in the efficiency model the costs is: $14.1 billion in low-income, $33.3 billion in lower-middle-income, and $49.4 billion in upper-middle-income countries-a total of $96.8 billion. Scale-up of radiotherapy capacity in 2015-35 from current levels could lead to saving of 26.9 million life-years in low-income and middle-income countries over the lifetime of the patients who received treatment. The economic benefits of investment in radiotherapy are very substantial.
The Use of Surface Imaging in SRS/SBRT Treatments

Joshua D. Lawson

The usage and applicability of Stereotactic radiosurgery (SRS) and Stereotactic Body Radiation Therapy (SBRT) continue to grow, offering an appealing treatment option for selected patients with primary and metastatic disease within the brain, lungs, spine, liver as well as additional body sites. These highly precise treatments place an emphasis on motion management and target localization. From frame-based solutions to frameless approaches, there are multiple technologies for motion management and treatment delivery available today. Surface Guided Radiation Therapy (SGRT) offers a noninvasive method of tracking patient positioning for both setup and intrafraction motion monitoring. SGRT can be incorporated into radiosurgery treatments of both body and brain, and can be an integral part of an efficient radiosurgery program.
Advanced Technologies in Radiotherapy – A Medical Physicist Perspective

Brendan Healy

National Director of Physics, Icon Group, Brisbane, Queensland, Australia

Technology continues to transform the practice of radiotherapy, including software and associated changes in treatment techniques. With specific education and training in the physical aspects of radiotherapy, medical physicists play a crucial role in the safe and effective introduction of new technology and techniques. According to the IAEA, the roles and responsibilities of the medical physicist in radiotherapy relate to radiation safety, commissioning of equipment, patient dosimetry, dose optimisation, quality management and collaboration with other radiotherapy health professionals. Advances in technology are driven by a goal for improved quality of treatment and are often associated with a greater complexity of treatment technique. This places additional burden on medical physicists in ensuring safety and quality considering both process and equipment, and including risk assessment. While the IAEA advocates for additional staffing as new technology is introduced, evidence suggests that this is often not the case; all existing staff including medical physicists are expected to absorb the workload associated with new technology. Perhaps the onus is on the radiotherapy workforce to find efficiencies in their work, for example through going paperless, automating QC procedures and reviewing QC procedures through risk assessment.
Understanding Uncertainties in Radiotherapy Planning and Delivery

Brendan Healy

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The IAEA recently published Human Health Series No. 31 “Accuracy Requirements and Uncertainties in Radiotherapy” as an update to international recommendations in the field. Radiotherapy, including brachytherapy, is a complex process with uncertainties inherent in many steps in the process, both dosimetric and geometric. The IAEA publication attempts to quantify these uncertainties based on published evidence, but also makes the point that uncertainties will be unique to each radiotherapy department and the responsibility thus rests with each radiotherapy department to develop their own uncertainty analysis. The IAEA publication makes a number of recommendations for achieving accuracy in radiotherapy and reducing uncertainties, including adhering to international recommendations for prescribing and reporting radiotherapy, participating in external dosimetry audits, adhering to comprehensive quality assurance, and ensuring adequate education and training of radiotherapy staff including applications training. Image-guided radiotherapy is a good example of a technique which has had an impact on treatment accuracy and even allows for CTV-to-PTV margin reduction in external beam radiotherapy. But image-guided radiotherapy comes with its own uncertainties, particularly geometric, which users need to aware of and quantify in their own setting.
Linking Clinical Needs with Innovation and Research in Radiation Oncology: Development of Gimbaled-head Radiotherapy System

Masahiro Hiraoka

President Japanese Red Cross Wakayama Medical Center Emeritus Professor of Kyoto University

Radiation therapy is recognized as one of 3 major cancer treatment modalities for cancer, and its importance is increasing with the increase in cancer patients.

Innovation of radiation oncology should be pursued so that it is delivered to patients more effective, safe and with low cost. Development of medical devices have been mostly realized through clinical needs including radiation therapy equipment.

Department of Radiation Oncology and Image-applied Therapy of Kyoto University Hospital has been working for development of radiation therapy and associated equipment including hyperthermia machines (microwave, RF, US), a CT simulator, and gimbaled head radiotherapy system.

This new radiotherapy system allows us to realize two innovations. First, dynamic tumor tracking irradiation for moving tumors like tumors in the lung, liver and pancreas. Secondly, dynamic wave arc therapy now available for brain or prostate tumor which is possible with 2-axis movement.

In this symposium, I would like to introduce our experiences of innovations based on clinical needs.
The Cost Benefit Evaluation in The Era of Modern Radiotherapy Techniques

Ramesh Billimagga

The economic evaluation has become an integral part of healthcare services in recent years. The field of radiotherapy is no exception to it. The RT technology has seen a sea change in the past 3 decades; it has resulted in escalating the RT costs.

There are four major methods to evaluate the health care system, i.e. cost-minimization analysis, cost-effective analysis, cost-utility analysis and cost-benefit analysis. They basically deal with the efficacy of the treatment employed in terms of outcome including its consequences. They are assessed in terms of Quality Adjusted Life Years (QALY). There are several models or trials to assess each of these technologies. In the RT field, Marco’s model is popularly employed. This article gives various published data on diseases like breast, prostate, lung, brain, and bone metastases using different modern technologies and assessing their cost benefits.

It boils down to judicious application of the above methods by various stakeholders such as policymakers, payers, medical establishments, patients. Finally, the responsibility is with the professionals (Radiation Oncologists) to appropriately assess the benefit of the modern RT techniques, not only in terms of outcome, consequences i.e. morbidity but also the overall cost involved in delivering the same.
Competency-based education in radiation oncology – where have we come from and where are we going?

Sandra Turner

Modern training program curricula in radiation oncology are mostly based on well-established curriculum frameworks such as CanMEDS1. These highlight the need for all doctors to develop skills outside the traditional medical expert domains including scholarship, communication, collaboration and leadership. In addition, they lay out specific learning outcomes (knowledge, skills and attitudes or competencies) to provide structure and guidance to learners. For optimal learning, competency sets must be complemented by a structured program incorporating supervisor feedback and measurement of trainee progress through various forms of assessment.

This presentation will outline the features of an optimal training program based on the medical educational literature, and provide some examples of these principles in action. Future trends and developments in the area of health professional training will be outlined indicating how these may impact on future training programs within the field of radiation oncology.

Miscellaneous
**Moderate and extreme hypofractionation for localised prostate cancer. Experience and innovation from Australia**

Sandra Turner

Australian and New Zealand sites have contributed to international trials testing moderate (PROFIT) and extreme fractionation schedules (SPARK) for the curative management of localised prostate cancer. The Trans-Tasman Radiation Oncology Group (TROG) has successfully collaborated and initiated prostate cancer trials which have changed practice in these countries. Trial participation has allowed new techniques to be safely implemented more widely. The implications for patients and treatment centres will be discussed in this presentation.

Real-time image tracking is a requirement for safe delivery of prostate SBRT though lack of specialised equipment for this purpose had been a barrier to widespread adoption of this technique in Australia, despite evidence of efficacy and safety. The Kilovoltage Image Motion (KIM) system, an Australian innovation for adaptive real-time tracking during radiation therapy suitable for use with all modern linear accelerators, was evaluated as a key component of the TROG 15.01 SPARK trial. Early outcomes of this Phase 2 trial will be presented.
Improving The Applicability of IMRT & Other High Precision Radiotherapy Techniques in Budget Constrained Settings – Physicist Perspective

Sha Cang

Abstract Nearly two-thirds of the global 8.2 million cancer death in 2012 occurred in low and middle-income countries (LMICs), where cancer patients are twice as likely to die compared to high-income countries (HICs). Sadly, at least 30% of the LMIC cancer death is avoidable as the world already has the knowledge, skills, and technologies to cure many cancers and to reduce the suffering of patients and their families. Most advanced cancer treatment technologies today are developed only for the HIC market and cost millions of dollars, which are unfeasible for LMIC cancer clinics to procure, operate, and sustain. One such technology is intensity-modulated radiation therapy (IMRT), where the intensity of the cytotoxic radiation is modulated to focus on the tumor only and not causing unnecessary damage to the healthy critical organs nearby. Depending on the cancer location the healthy tissue damage can significantly affect patient’s quality of life and weaken the body’s fighting chance against the cancer. Clinical benefits of IMRT have been well-established in clinical trials for many cancers including the common types in LMICs – cancers of oral cavity, pelvic region, esophagus, and cervix. Despite the demonstrated needs and clinical benefits of IMRT, LMICs simply do not have the colossal resources required to procure commercial IMRT solutions at a large-scale. Today, approximately 80% of the radiation therapy clinics in LMICs have no IMRT capability. We at EmpowerRT innovatively provide a clinically proven recyclable compensator-IMRT solution, that is affordable and sustainable in LMIC settings. EmpowerRT is a US-based university startup social enterprise organization. Our mission is to help people in budget-constraint settings to improve cancer radiation therapy without spending millions of dollars. Our comprehensive solution has four-prongs: software, hardware, service, and training including training on patient safety and process improvement. Our inhouse developed clinical solution was used to treat 25,000 patients (software) and 1,500 patients (solution) using basic machines that are still widely used in LMICs. Compensator-IMRT is not an experimental treatment: it is an accepted clinical treatment and reimbursed by the US government Medicare Insurance and it has benefitted tens of thousands of patients in the US and other HICs. In this presentation, we will discuss this and other innovative and feasible enabling approaches to advance cancer radiation therapy in low-resource settings on a large scale. Spatially fractionated radiation therapy: an experimental radiotherapy with potential for breakthrough cancer treatment Abstract Spatially fractionated radiation therapy (SFRT) is characterized by its dose distribution and dose prescription. The dose distribution has many small regions of a very high dose separated by very low dose regions within the treatment volume. GRID therapy is the one type of SFRT that was first reported in 1900s using kV x-rays to treat deep seated tumor without severe skin toxicity. During the last decade renewed interest in GRID therapy using MV x-rays arose. This treatment is reported to benefit patients with large and late stage tumors with no observed added toxicity when GRID is used together with the conventional course of chemoradiation. Exciting preclinical research on microbeam radiation therapy, a form of SFRT with small scales, indicate SFRT is superior to conventional radiation in terms of enhancing anti-cancer immunotherapy, tumor delivery of nanoparticle chemotherapy, and other anti-cancer drugs. In this presentation, we will discuss the current SFRT research and the feasibility and benefit of SFRT in low- and middle-income countries.
Spatially Fractionated Radiotherapy: When Old Concept Meets Contermorary Technology

Sha Cang

Abstract

Spatially fractionated radiation therapy (SFRT) is characterized by its dose distribution and dose prescription. The dose distribution has many small regions of a very high dose separated by very low dose regions within the treatment volume. GRID therapy is the one type of SFRT that was first reported in 1900s using kV x-rays to treat deep seated tumor without severe skin toxicity. During the last decade renewed interest in GRID therapy using MV x-rays arose. This treatment is reported to benefit patients with large and late stage tumors with no observed added toxicity when GRID is used together with the conventional course of chemoradiation. Exciting preclinical research on microbeam radiation therapy, a form of SFRT with small scales, indicate SFRT is superior to conventional radiation in terms of enhancing anti-cancer immunotherapy, tumor delivery of nanoparticle chemotherapy, and other anti-cancer drugs. In this presentation, we will discuss the current SFRT research and the feasibility and benefit of SFRT in low- and middle-income countries.
The sustainability of radiotherapy services in Asia: How does FARO contribute to it?

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Cancer has been a common disease in recent years. In 2030, the incidence and mortality of cancer will rise to 21.6 million new cases and 13 million deaths. Asia, representing 60% of the world population, has the highest cancer burden in the world with 6.76 million incidences and 4.5 million deaths in 2012.

Radiotherapy, as an essential part of cancer treatment, faces numerous challenges. More than 50% of cancer need radiotherapy as primary, adjuvant, or palliative treatment. In term of services, 70% of Asia consisted of Low and Low Middle Income Countries (LMICs) with lack of basic infrastructure and human resources to treat cancer. With five countries (Afghanistan, Timor Leste, Turkmenistan, Bhutan and Palestine) has no access to radiotherapy and there are many countries still having insufficient radiotherapy capacity to address their cancer burden.

Nowadays, with this inequity and the high burden of patients, Asia faces a great challenge to achieve global access for radiotherapy treatment. Funding is an essential part of sustaining and developing radiotherapy in the world. Globally, cancer consumes approximately 5% of the national health expenditure and investment in radiotherapy absorbs only 5% of the total cancer cost. A country with high Gross National Income (GNI) per capita has a high health expenditure and better capacity to build a good healthcare system. On the other hand, in LMICs, lack of income leads to lower health expenditure and inadequate health facilities. Based on Global Task Force on Radiotherapy for Cancer Control (GTFRCC), expanding the access to radiotherapy services in Low and LMIC’s must be prioritized, because radiotherapy services do not only save the life, but also give economic benefit.

Federation of Asian Organizations for Radiation Oncology (FARO), as a federation which comprises of radiation oncology societies in Asia, aims to foster the role of radiation oncology to improve the basic level of radiotherapy in the Asian region. FARO consists of Bangladesh, China, India, Indonesia, Japan, Korea, Malaysia, Philippines, Singapore, Sri Lanka, Thailand and Pakistan. Role of FARO can be shown from its purposes to promote cooperation and communication, develop the standard of education/training and research, promote advancement in status and standard of practice, organize international conferences/meetings/courses and collaborate with other scientific or professional global organizations. In conjunction, the 3rd FARO Meeting, with the theme “Sharing - Empowering - Strengthening”, reflects our needs to share knowledge, empower and increase the capacity of Asian resources for comprehensive cancer treatment.

In conclusion, there is huge variation among RT needs in Asian countries. Moreover, funding is an essential part for the sustainability of RT services. To overcome those problems, FARO, as a union of national radiation oncology societies in Asia, should work together, build a strong relationship among country members and cooperate with the global radiation oncology societies to bring high-quality cancer treatment in Asia through research, education, and training.
Moderate Hypofractionated External-beam Radiation Therapy for Localized Prostate Cancer

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In the late 1990’s, it was recognized that the α/β value of the prostate cancer was very low (around 1.5 Gy). Therefore, hypofractionated approaches have been tested on patients with localized prostate cancer treated with external-beam radiation therapy (EBRT), because hypofractionation is theoretically better than conventional fractionation in terms of the balance between the anticancer effect and the risk of adverse events. There has been two major streams in hypofractionated EBRT approaches for prostate cancer; one is moderate hypofractionation, and the other is ultra hypofractionation (stereotactic body radiation therapy). In this presentation, I would like to focus on the moderate hypofractionation.

So far, three large randomized controlled trials with non-inferiority design have demonstrated the non-inferiority of moderate hypofractionation compared to conventional fractionation in terms of disease control, late toxicity, and patient-reported outcomes at 5 years. As a result of these trials, hypofractionation is considered to be a new standard EBRT approach for patients with localized prostate cancer instead of conventional fractionation. The dose-fractionations tested in the trials are 60 Gy in 30 fractions or 70 Gy in 28 fractions for hypofractionation, and 73.8-78 Gy in 37-41 fractions for conventional fractionation.

On the other hand, most of the randomized trials with superiority design failed to demonstrate the improvement of disease control nor reduction of late adverse events, when compared with conventional fractionation. Therefore, dose escalation by hypofractionation is not recommended at this point.

At Kyoto University, we selected a shorter schedule, in which 54 Gy was delivered in 15 fractions over 3 weeks. Noninvasive approach without implanted marker has been successfully applied by means of CB-CT image-based guidance. So far, we have observed excellent short-term disease control and a very mild profile of adverse events. We believe that this approach is well balanced in terms of not only overall treatment time and non-invasiveness, but also the radiobiological point of view.

However, optimal dose-fractionation, as well as the optimal duration of the combined hormone therapy by each risk group have not been studied well. These issues should be solved in the future studies.
Local Treatment for Oligometastatic Carcinoma Prostate

Vedang Murthy

Historically, Stage IV prostate cancer has been incurable. Advanced imaging techniques like PSMA PET with increased sensitivity have led to a new category called ‘oligometastatic state’ which is thought to be an intermediate stage between localized disease and widespread metastases with possibly different biology and could be amenable to aggressive local therapy. This state needs to be better defined considering genomic and biological basis for effective therapy. There is a lack of randomized evidence, but retrospective studies suggest that radical local therapy (radiotherapy or prostatectomy) may improve progression free survival in these patients and help in delaying the need for potentially toxic systemic therapies that have a bearing on the quality of life of patients. Local therapy to the prostate and metastases directed therapy or a combination of the two have been tried. This is an area of current research interest and prospective randomized trials are in progress to help define the optimal treatment plan for these patients.
Postoperative radiotherapy for prostate cancer

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The use of radical prostatectomy as the initial treatment of locally advanced prostate cancer has increased in the past decades. However, patients with positive margins or pT3 have a 40% to 70% risk of biochemical recurrence. Three randomized clinical trials, including EORTC 22911, ARO 9602, and SWOG 8794, compared postoperative radiotherapy with observation in these patients with high-risk features. These trials demonstrated a benefit of progression-free survival, but only SWOG 8794, with a longer follow-up, found a benefit of overall survival. A recent large, multicenter retrospective study demonstrated that adjuvant radiotherapy, compared with early salvage radiotherapy, was associated with decreased biochemical recurrence, distant metastases, and mortality for high-risk patients. These findings suggest that a great proportion of patients with prostate cancer who have adverse pathological features may benefit from postoperative radiotherapy rather than surveillance or early/delayed salvage radiotherapy. The consensus guidelines of the AUA, ASTRO, and EAU recommend physician-initiated, multidisciplinary discussions of the potential benefits and risks of postoperative radiotherapy for patients with adverse pathological features. Once patients developed biochemical recurrence after prostatectomy, salvage radiotherapy are suggested to deliver as early (PSA = 0.1 ng/ml) as possible.
Combination therapy of Radiotherapy and Immunotherapy: Basic and Clinical aspects

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Along with recent progress of tumor-immunology and great success of immune checkpoint inhibitors (anti-PD-1 antibody, anti-CTLA-4 antibody, etc.), the development of the cancer treatment based on tumor immunology became very important. There have been several reports that radiotherapy surely activates tumor specific anti-tumor immunity in the clinical setting. An extreme example of the immune activation by radiotherapy must be the phenomenon called “abscopal effect”, the regression of a metastatic tumor located at a distance from the irradiated tumor. Although the phenomenon is a quite rare, it has recently been reported that the effects are often seen in patients with radiotherapy in a combination with immune checkpoint inhibitors such as anti-CTLA-4 antibody in several types of cancer. Furthermore, anti-PD-L1 antibody significantly improve the prognosis in stage III lung cancer patients who were treated with chemoradiotherapy (PACIFIC trial). Also, from another point of view, for a long time, it has been believed that radiotherapy exerts a therapeutic efficacy via its ability of DNA breakage. However, recent studies have demonstrated that radiotherapy induces tumor-specific immunity and the therapeutic efficacy can be augmented by the modification of the immunity. These finding can thoroughly change the treatment strategy of radiotherapy. The new strategy will be developed on the basis of the knowledge in radiobiology and in tumor immunology, as the “Immune-radiotherapy”, in the future generation. This time, I will present our research and clinical activities about the combination therapy of radiotherapy and immunotherapy.

Miscellaneous
Oral Abstract
The dosimetric research of comparing 3D printing applicator with single-channel and multi-channel column applicators

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Purpose] To evaluate the dosimetric advantages of using 3D printing applicator vs. cylinder for high-dose-rate vaginal cuff brachytherapy. [Method] 49 patients with postoperative endometrial carcinoma, cervical cancer and vaginal stump recurrence were enrolled in from Mar 2016 to Jun 2017 in our hospital. All patients were located by CT with vagina inserted 7 channels cylinder and packed contrast agent gauze individually. Simulated 3D brachytherapy single-channel plans and multi-channel plans were designed for center single channel and surrounding six channels of cylinder dwelled. Simulated 3D printing plans were designed for pre-set dwell positions on vagina packed gauze images. CTV was defined as a 0.5cm uniform expansion of the applicator or gauze surface for upper 1/3 or 1/2 vaginal. CTV-1cm, the true vaginal cuff volume, was defined as proximal 1cm of CTV from vaginal apex. For dosimetric comparison, we normalized prescription dose per fraction to 500cGy and optimized each plan to reach D90CTV =500cGy. Vaginal shapes and air gaps were analyzed. [Results] V100 of CTV were significantly higher for 3D printing group compared to single-channel group and multi-channel group (90.01% (90.00%, 90.18%) vs90.01% (90.00%, 90.11%), p=0.003, 90.01% (90.00%, 90.18%) vs90.01% (90.00%, 90.14%), p=0.004), V100 of CTV-1cm were more significant (D90: p=0.054, p=0.000; V100: p=0.000). DHI,DNR,OI were significantly lower for 3D printing group compared to other two groups (p=0.000). Mean dose of vagina mucosa in CTV were significantly lower for 3D printing group compared to other groups (1066.48±160.48±1199 (975,1786), 1066.48±160.48±1236 (1036,1662), p=0.000). However, D2cc of bladder and rectum for 3D printing group was between other 2 groups, single-channel group was highest. In addition, air gaps were found in 51.02% images by cylinder, volume 0.17cc (0.01,0.79), cause D90 coverage decreased by 3.30% and 4.11% in single-channel and multi-channel plan (p=0.00), while air gaps were not found in 3D printing group. 5 types of vagina shape was found in 49 patients, conical column (48.86%), flat column (26.53%), dog-ear column (12.24%), flat cone column (10.2%),and wide below narrow column (8.16%). The type of air gap often found form high to low were dog-ear column, flat column, vaginal stump recurrence, flat cone column, wide below narrow column. [Conclusion] Compared to cylinder, 3D printing applicator reduces air gap, offers a more conformal and homogeneous target volume. Some cases such as Dog-ear column has obvious advantage.

[Key words] Vaginal brachytherapy, applicator, 3D printing technology, gynecological malignant tumor

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5-year results of a Japanese multi-institutional prospective feasibility study of multi-catheter brachytherapy accelerated partial breast irradiation

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Introduction: While multi-catheter accelerated partial breast irradiation (APBI) has established level I evidence in Europe, little is known about appropriate techniques for APBI for smaller breasts in Asia. We are aiming for a P2 study in Asia. In Japan, we previously performed a feasibility study on multi-catheter APBI (UMIN 000001677), of which the strengths and weaknesses were explored to reflect in the upcoming P2 protocol. Materials and Methods: From 2009 to 2011, 46 low-risk breast cancer patients from 6 institutions participated. Essential eligibility criteria were histological tumor size ≤30 mm, negative surgical margin, pNO, and positive estrogen receptor. Cylindrical resection, a typical Japanese breast conserving surgery that cylindrically removes gross tissue between the skin and chest wall muscles, followed by suturing resection margins together to avoid collapse, was performed. A dose of 36 Gy/6 fr/3 days was delivered to the target, containing a 15 mm rim around the margin. Clinical data was recorded using CTCAE v3.0 and the Harvard 4-point scale, analyzed in 2016 the 5-year results including factors affecting cosmesis.

Results: No recurrences of any types were reported. G3 sequelae was recorded for 2 items among 12: fibrosis, 6%; pain, 2%. As for cosmesis, Excellent/Good rates diminished from 100% (pre-implant) to 76% (30 months), plateaued at 74% (60 months). The occurrence of G2/3 fibrosis, leading to poor cosmesis, was associated with larger resection in smaller breasts (Bra-cup A/B), while resection volume had no impact in larger breasts (≥C) (p < 0.01).

Conclusions: No breast cancer recurrence with only few, mild sequelae, suggesting proper patient selection and radiation. Poor cosmesis compared with the European series that displayed Excellent/Good rates >90%, suggesting excessive resection in smaller breasts. We are planning a P2 APBI study that would achieve better cosmesis by refining surgical techniques.

Keywords: APBI, multi-catheter, cylindrical resection, cosmesis
The impact of age on the risk of ipsilateral breast tumor recurrence after breast-conserving therapy in early breast cancer patients with negative surgical margin treated without boost irradiation

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[Introduction]

EORTC analysis suggested that a tumor-bed radiation boost following whole-breast irradiation (WBI) reduced the risk of ipsilateral breast tumor recurrence (IBTR). However, in Japan, a ‘negative’ surgical margin is defined as a margin >5 mm, which is wider than in Western countries. Thus, institutional guidelines on utilizing boost for patients aged <=40 or <=50 years vary. We investigated the rate of IBTR to assess the appropriate age for boost.

[Materials and Methods]

From January 1993 to December 2010, 419 patients with early-stage breast cancer, with negative margins, received breast-conserving surgery followed by WBI, without boost irradiation. The Gray test was used to compare the cumulative incidence (CIs) of IBTR among those aged <=40, 41–50, and >=51 years. We estimated hazard ratios (HRs) using the Fine and Gray models.

[Results]

The median follow-up time was 9.3 years. On multivariate analysis, only age predicted the IBTR (HR 0.37, p=0.047). The numbers of patients <=40, 41–50, and >=51 years were 43, 98, and 278, respectively. The 10-year CI for IBTR was 15.7% in those aged <=40, 3.8% in those aged 41–50, and 2.0% in those aged >=51 years. The difference between those aged <=40 and 41–50 years was significant (p=0.045), whereas that between those aged 41–50 and >=51 years was not (p=0.21).

[Conclusion]

The IBTR rate after WBI without a radiation boost was significantly higher in those aged <=40 years, who should thus receive boost. The situation in patients aged 41–50 years requires longer follow-up.

Keywords: breast cancer, tumor bed, boost, IBTR, age
Histologic subtype influences tumor response of Gamma Knife radiosurgery in brain metastases from non-small cell lung cancer

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Objective: To evaluate whether histologic subtypes predict clinical outcomes of Gamma Knife radiosurgery (GKS) for the patients with brain metastases (BM) from non-small cell lung cancer (NSCLC).

Methods: Consecutive patients with BM from NSCLC who attended Seoul National University Hospital between July 1998 and December 2017 were recruited to this retrospective study. Patients who were newly diagnosed without surgical resection or whole brain radiotherapy and had sufficient pathological information were eligible.

Results: Three hundred forty five patients were identified for analysis during the study period. The median overall survival for all patients was 13.2 months, and patient with adenocarcinoma had a statistically significantly longer survival time compared with squamous cell carcinoma (p<0.001). The median period of distant brain failure for all patients was 8.3 months, with no statistical differences according to histologic subtypes. The patient with squamous cell carcinoma (p=0.024), heavily treated patient with more than three kinds of chemotherapy (p=0.026), and high radiation dose of more than 20 Gy (p=0.001) were prognostic factors for poor local control in the univariate and multivariate analyses.

Conclusions: In this study, histologic subtype was a prognostic factor for tumor local control and overall survival after GKS for newly diagnosed BM from NSCLC. Future studies should focus on analysis of histologic subtypes and efficacy outcomes to determine which patients will benefit from particular treatment and better understand the role of histology.

Key words: Gamma knife radiosurgery, non-small cell lung cancer, squamous cell carcinoma, adenocarcinoma, tumor response

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Validation of a novel molecular RPA classification in glioblastoma (GBM-molRPA) treated with radiotherapy and concurrent temozolomide: an Asian multi-institutional study

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Purpose: A novel molecular recursive partitioning analysis classification has recently been reported by Korean investigators integrating the MGMT methylation (MGMTmethyl) and IDH1 mutation (IDH1mut) status for glioblastoma (GBM-molRPA) patients treated with temozolomide-based chemoradiation. The current study was initiated to validate the model in Korean and Japanese patients as a multi-institutional study.

Methods: Four-hundred seventy-one newly diagnosed GBM patients from eight institutions were allocated to classes I–III of the previously reported GBM-molRPA model. All patients had known MGMTmethyl status and were treated by the standard temozolomide-based chemoradiation after surgery or biopsy. Of the patients, 74 (15.7%), 264 (56.1%), and 133 (28.2%) patients were GBM-molRPA class I, II, and III, respectively. MGMTmethyl and IDH1mut was observed in 32.3 and 8.8% of patients, respectively.

Results: The median follow-up for survivors and the median survival (MS) of patients was 23.3 and 18.4 months, respectively. The MS for GBM-molRPA class I, II, and III was 49.7 (95% CI, 22.8–76.6), 19.2 (95% CI, 16.2–22.1), and 13.8 months (95% CI, 11.8–15.4) (p<0.001 for all comparisons).

Conclusions: This study has proven the validity of a previously reported GBM-molRPA integrating MGMTmethyl and IDH1mut status. Given the prognostic significance of molecular subtypes in GBM, this GBM-molRPA classification can be useful to guide patient stratification in future clinical trials.

Key words: Glioblastoma, MGMT, IDH1, Recursive partitioning analysis, Validation
OP007*

Validation of previously reported predictors for radiation-induced hypothyroidism in nasopharyngeal cancer patients treated with intensity modulated radiation therapy, a post hoc analysis from a phase III randomized trial

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This study aimed to validate previously reported dosimetric parameters, including thyroid volume, mean dose, and percent thyroid volume, receiving at least 40, 45 and 50 Gy (V40, V45, V50), absolute thyroid volume spared from 45, 50, 60 Gy (VS45, VS50, VS60), and clinical factors affecting the development of radiation-induced hypothyroidism (RHT). A post hoc analysis was performed in 178 euthyroid nasopharyngeal cancer (NPC) patients from a phase III study comparing sequential versus simultaneous integrated boost intensity modulated radiation therapy. RHT was determined by increased thyroid stimulating hormone (TSH) with or without reduced free thyroxin, regardless of symptoms. Median follow-up time was 42.5 months. The 1-, 2-, and 3-year freedom from RHT rates were 78.4%, 56.4% and 43.4%, respectively. The median latency period was 21 months. The thyroid gland received a median of mean dose of 53.5 Gy. Female gender, smaller thyroid volume, higher pretreatment TSH level (≥1.55 μU/ml) and VS60 <10 cc were significantly associated with RHT in univariate analyses. Only pretreatment TSH ≥ 1.55 μU/ml and VS60 <10 cc were significant predictors in multivariate analysis. Our results suggested that patients with pretreatment TSH ≥ 1.55 μU/ml should be cautious for the risk of RHT. The VS60 ≥10 cc is recommended for treatment planning.

Keywords: Intensity modulated radiation therapy; nasopharyngeal cancer; hypothyroidism; dosimetric predictors
Utility of Magnetic Resonance Imaging (MRI) in determining treatment response and local recurrence in Nasopharyngeal Cancer (NPC) treated curatively

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Background: The utility of MRI assessment is not well defined localised NPC post radical intent radiotherapy (RT).

Methods: Patients with non-metastatic NPC with at least one post-treatment MRI (ptMRI) at our institution from Jan 2013-Dec 2017 were reviewed. Reports were categorised as complete response (CR), partial response/residual disease (PR) or indeterminate (ID). Univariate and multivariate logistic regression were performed to identify independent factors associated with CR.

Results: 265 patients were eligible. Median follow-up was 2.4 years (range 0.08-4.6). 24 had stage I disease (9%), 48 (18.1%) stage II, 81 (30.6%) stage III, 70 (26.4%) stage IVA, 44 (16.6%) stage IVB. 88 (33.2%) of ptMRIs were CR, 133 (50.2%) ID, 44 (16.6%) PR. A second ptMRI was done in 104/133 (78.2%) of patients with initial ID status. 77 (57.9%) of the subsequent MRI were determined to be CR, 21 (15.8%) remained ID and 6 (4.5%) PR. T1 tumour stage was associated with increased CR rates on first ptMRI. Median time to the first ptMRI was 93 days (range 32-719). ID status is more likely at 75-105 days versus 106-135 days post RT (OR 2.13, 95% CI 1.16-4.12, p=0.024). 27 (10.1%) patients had locoregional recurrence. 20 (74.1%) were detected by MRI, 3 (11.1%) by nasoendoscopy, 2 (7.4%) by PET-CT.

Conclusion: MRI is useful for detecting local recurrence/persistent disease after RT. Most patients need more than one ptMRI to arrive at a definitive status. The rate of ID ptMRIs may be reduced by delaying the first scan to after 105 days post RT.

Keywords: nasopharyngeal carcinoma, nasopharyngeal cancer, nasopharynx cancer, nasopharyngeal carcinoma radiotherapy
Dosimetric analysis of 3D conformal, Intensity Modulated Radio Therapy, and Helical Tomotherapy in Craniospinal Radiation Technique

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Background: Craniospinal radiation is a method of radiation that is often used in cases of malignancy of the central nervous system that spread to cerebrospinal fluid. Due to the large area of radiation, the radiation area must be divided into several fields that produce difficulty in overcoming the inter-field junction. In addition, the number of critical organs involved and the age of patients with the majority of children result in separate considerations in the choice of craniospinal radiation techniques. Currently there is no research data that analyzes craniospinal radiation with 3D-CRT, IMRT, and Helical Tomotherapy (HT) in Indonesia. Method: exploratory experimental study by planning intervention on 10 CT plan data of craniospinal patients radiated in Radiotherapy Department of Cipto Mangunkusumo General Hospital. Dose 36 Gy is given in 20 fractions. Cranial and spinal PTV coverage was evaluated using the conformity index (CI) and homogeneity index (HI). Performed recording of critical organ parameters, the number of MU and the duration of the beam. Results: The Helical Tomotherapy technique is the best technique for achieving HI and CI figures and protection of critical organs, but has the highest bodywide radiation exposure compared to CRT and IMRT 3D techniques in addition to the highest MU values and longest exposure duration so should be considered in children high risk of secondary malignancy. 3D CRT has the worst HI and CI values with limited ability to protect critical organs but has the lowest total body radiation, MU exposure and the shortest duration of irradiation. Keywords: Dosimetric comparison, craniospinal, 3D conformal technique, Intensity Modulated Radiotherapy (IMRT), Helical Tomotherapy (HT), secondary malignancy.
Oral Abstract

OP010*

Induction Chemotherapy followed by Neoadjuvant Chemoradiation versus Neoadjuvant Chemoradiation Alone in Locally Advanced Carcinoma Rectum: a Prospective Randomized Study

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Background - This study aimed to compare efficacy, compliance and toxicity profile between two groups - one receiving induction chemotherapy followed by pre-op CRT and another receiving the current standard treatment with pre-op CRT alone.

Methods - This was a prospective open-label randomized single institutional study in which 56 patients of locally advanced rectal adenocarcinoma (cT3-4N0M0 or T1-4N+M0) were randomly assigned to either arm A - Induction chemotherapy (3 cycles of CAPOX) preceding long course Capecitabine based chemoradiation followed by surgery or arm B - neoadjuvant long course Capecitabine based chemoradiation followed by surgery.

Results - Comparable rates of R0 resection were observed in arms A and B (92.9% vs. 89.3%, p = 0.64). Objective response rate and pathologic downstaging were significantly better in the induction chemotherapy arm (ORR: 82.1% in arm A vs. 53.6% in arm B, p = 0.02. Downstaging: 85.7% in arm A vs. 60.7% in arm B, p = 0.03) without significant difference in PCR (14.3% in arm A vs. 10.7% in arm B, p=0.68). Grade 3/4 toxicities were more frequent in the induction chemotherapy arm (25% in arm A vs. 14.3% in arm B, p = 0.3); notwithstanding, all the patients in both the arms completed neoadjuvant treatment.

Conclusion – Induction chemotherapy followed by pre-op chemoradiation is a feasible approach which improves locoregional response without adding major toxicities, long term follow up data from this study should reveal whether that translates into better survival.

Keywords: rectal cancer, induction chemotherapy, neoadjuvant chemoradiation, objective response rate, pCR
The Efficacy and Tolerability of S-1 in the Treatment of Preoperative Chemoradiotherapy for Locally Advanced Rectal Cancer

Nobuki Imano

Objective: The purpose of this study is to assess the efficacy and tolerability of S-1 in the treatment of preoperative chemoradiotherapy (CRT) for Locally Advanced Rectal Cancer (LARC).

Materials and Methods: We retrospectively evaluated 45 LARC patients who underwent preoperative CRT with S-1 alone in our institution between 2005 and 2016. The median age was 63 years. The clinical tumor stage was cT2 in 5, cT3 in 21 patients, cT4a in 7 and cT4b in 10; 26 patients had clinical evidence of lymph node metastasis; cStage II in 11 patients and cStage III in 32 patients. In principle, S-1 with a dose of 80 mg/m2/day was orally administered twice a day. A total dose of 45-50.4 Gy was delivered in 25-28 fractions (median: 50.4 Gy). Surgical resection was scheduled 6–8 weeks after the completion of CRT (median: 55 days).

Results: The completion rate of oral S-1 administration was 90%. The completion rate of planned RT was 98%. A pathological complete response was observed in 5 patients, Pathological downstaging was observed in 32 patient. R0 resection was achieved in all patients. With a median follow-up time of 45 months, the 3-year overall survival and progression-free survival rates were 91% and 65%, respectively. The 3-year local control rate was 95%. Six patients had Grade 3 acute toxicities for CRT, including diarrhea in two, neutropenia in two, anal mucositis in one, anemia in one patient.

Conclusions:
S-1 alone can be an effective and safe treatment option in preoperative CRT for LARC.

KEYWORDS: Rectal cancer, Preoperative chemoradiotherapy, TS-1
Methyl jasmonate enhances the radiation sensitivity of esophageal carcinoma cells by inhibiting the 11-ketoprostaglandin reductase activity of AKR1C3

Li Xiaoying

Purpose: In our previous study, we found that AKR1C3 was a radioresistance gene in KY170R cells. Down-regulating the expression of AKR1C3 could enhance the radiosensitivity of esophageal carcinoma cells. In this study, we investigated whether methyl jasmonate (MeJ), an inhibitor of Aldo-keto reductase family 1 member C3 (AKR1C3), could overcome radiation resistance in AKR1C3 highly expressed cells.

Methods and Results: We found that AKR1C3 was highly expressed in radioresistant esophageal carcinoma cells. Methyl jasmonate inhibited the expression of AKR1C3 and enhanced the radiation sensitivity of esophageal carcinoma cells with high levels of expression of AKR1C3 (P<0.05). Methyl jasmonate could inhibit the 11-ketoprostaglandin reductase activity of AKR1C3 in a dose-dependent manner in KY170R cells. Incubation of KY170R cells with 200 μmol/L methyl jasmonate for 24 h reduced the expression of PGF2 by roughly 30% (P<0.05). The PPAR pathway inhibitor GW9662 prevented the radiation sensitivity enhancement imparted by methyl jasmonate. After adding GW9662, there were no significant differences between the radiation sensitivities of methyl jasmonate-treated and untreated KY170R cells (P>0.05). The radiation sensitivity effect of methyl jasmonate also depended upon the generation of ROS in KY170R cells; 48 h after irradiation, ROS levels in the methyl jasmonate group was 2-fold higher than in untreated KY170R cells (P<0.05). The ROS scavenger, NAC, could reverse the radiosensitivity effects of methyl jasmonate (P>0.05).

Conclusion: Our results indicate methyl jasmonate can increase the radiation sensitivity of AKR1C3-overexpressing KY170R cells by inhibiting the 11-ketoprostaglandin reductase activity of AKR1C3 and increasing cellular ROS levels.

Keywords: radiosensitivity, esophageal carcinoma, methyl jasmonate, AKR1C3
Role of Definitive Chemoradiation Therapy versus Surgery as an Initial Treatment for Potentially Resectable Esophageal Carcinoma

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This study was aimed to compare the therapeutic efficacy of definitive chemoradiotherapy(dCRT) and esophagectomy as an initial treatment for resectable esophageal cancer by meta-analysis. Databases of PubMed and Web of Science were systematically searched. Combined odds ratio(OR) and 95% confidential interval (CI) were computed to assess the comparison effects. A total of thirteen studies with 2071 patients were included, consisting of the dCRT group (n=869) and surgery group (n=1202). 90.39% were esophageal squamous carcinoma(ESCC). No statistically significant difference on 2-year (OR 1.199, 95% CI 0.922 to 1.560; P=0.177) and 5-year overall survival (OR 0.947, 0.628 to 1.429; P = 0.796) for dCRT compared to surgery were found. No statistical difference was found between dCRT and surgery on 2-year OS among patients with stage I (OR 1.397, 0.740 to 2.638; p=0.303) or stage II-III (OR 0.418, 0.022 to 7.833; p=0.560). Additionally, there was a trend that patients with lymph node metastasis could benefit on 5-year OS from dCRT (OR 0.226, 95% CI 0.044 to 1.169; P=0.076). Western patients receiving dCRT experienced poor prognosis than the patients receiving surgery (1.522, 95% CI 1.035 to 2.238; P=0.033). As for progression-free survival (PFS), dCRT was equivocal with surgery in long-term result (OR for 5-year PFS: 1.06, 95%CI 0.79 to 1.42; p=0.70). In summary, therapeutic effects of dCRT as the initial treatment is similar to that of surgery. Patients with positive lymph nodes may benefit from dCRT. However, these results should be applied mostly to non-western countries which include a high percentage of ESCC patients.

Key words: Esophageal cancer; Definitive chemoradiotherapy; Esophagostomy
Survival Benefit of Radiotherapy in Advanced Esophageal Cancer: A Population-Based Study

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Objective. The aim of the current study is to analyze survival benefit of radiotherapy to patients with advanced esophageal cancer.

Methods. Patients diagnosed with advanced esophageal cancer between 2010 and 2014 were chosen from the Surveillance, Epidemiology, and End Results (SEER) database. The covariates included radiotherapy status, age, sex, insurance, histological type, differentiation, metastatic sites (bone, brain, liver, lung), chemotherapy. 1-year relative survival rates were compared and Cox regression analysis were performed.

Results. A total of 4761 patients with advanced esophageal cancer met the selection criteria. 1-year survival rate in radiation group was significant higher than non-radiation group (25.8% vs. 18.3%, P<0.001) subgroup analysis yielded the same conclusion, except for patients with age younger than 40 years, well differentiated type according to pathology examination, bone and liver metastasis or 3-4 metastatic sites. Cox regression demonstrated that radiotherapy was significantly associated with a decreased all-cause mortality (HR 1.229, 95%CI [1.151, 1.313], P<0.001) and esophagus cancer-specific mortality (HR 1.221, 95%CI [1.147, 1.313], P<0.001). Besides, on multivariate analysis, age, sex, insurance status, differentiation, chemotherapy were also found to be significantly associated with overall survival.

Conclusions. The population-based study revealed that patients with advanced esophageal cancer appeared to benefit from radiotherapy, thus providing a novel concept for the change of traditional treatment modality to metastatic esophageal cancer.

Keywords Advanced Esophageal Cancer, Radiotherapy, Prognosis
Simplistic 1: 1 combination of 3DCRT with VMAT for radiotherapy of carcinoma oesophagus- is it worthwhile?

Anindya Mukherjee

Background: It is well known that hybrid arcs (mixing fixed beam IMRT to VMAT) achieves best conformity for radiotherapy of carcinoma oesophagus. However, planning is cumbersome and often time consuming. A simpler and faster approach is to combine 3DCRT with VMAT in 1:1 ratio, a technique practised in many institutions. In this dosimetric study we have compared 3DCRT (AP-PA fields), VMAT (2 planar arcs) and combined technique (CT) in terms of doses received to heart and lung.

Methods: 15 locally advanced cases of carcinoma oesophagus were planned with each of these 3 techniques to give a radical dose of 45Gy in 25 fractions. 3DCRT and VMAT were combined in 1:1 ratio (90cGy delivered by each technique per fraction) in the CT. The dose calculations were done using Anistropic Algorithm (AAA). The dosimetric indices of heart (V5, V10, V20, V30, V40, maximum and mean doses) and lung (V5, V20, V30 and mean dose) were compared among these techniques by one way ANOVA technique.

Results: Mean values of all these indices were mostly highest with CT and least with VMAT. On plot of means, heart V10, lung V30 and lung mean dose showed consistently decreasing values from CT to VMAT to 3DCRT. But ANOVA showed no significant differences between and within the 3 techniques. Tests for homogeneity of variances were also statistically non-significant except V5-lung (Levene statistic 3.379 and p= 0.044).

Conclusion: Although not significantly inferior to VMAT or 3DCRT, the simplistic 1:1 combined technique is better to be avoided.

Keywords: 3DCRT, VMAT, combined technique, radiotherapy, carcinoma esophagus
**Evaluation of re-irradiation with carbon-ion radiotherapy for in-field or marginal lymph node recurrence of gynecological cancers after definitive radiotherapy**


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**Abstract**

Objective. To evaluate the safety and efficacy of re-irradiation with carbon-ion radiotherapy (C-ion RT) for lymph node recurrence of gynecological cancers after definitive radiotherapy.

Methods. The eligibility criteria of this study were as follows. 1) The patient had the recurrent tumor from gynecological cancer after definitive radiotherapy. 2) There was only one lesion of recurrence within or at the edge of the previously irradiated field. 3) In principal, the distance between the tumor and the nearest intestinal tract was more than 10 mm. 4) The tumor was unresectable. 5) The patient had no other active malignancy. Total dose of C-ion RT was 48-57.6 Gy (RBE) in 12 or 16 fractions.

Results. Between May 2008 and October 2016, 20 patients received re-irradiation by C-ion RT according to the criteria of this study. Median follow-up of all patients was 37 months (range, 3-103 months). The number of patients with the primary cancer type of uterine cervical cancer, endometrial cancer and ovarian cancer were 12, 7 and 1, respectively. Median tumor size was 25 mm (range, 13-80 mm). All patients completed the treatment, and no patients developed acute toxicities and Grade 3 or higher late toxicities. The 3-year overall survival, local control and disease-free survival rates after C-ion RT were 74%, 87% and 53%, respectively.

Conclusion. Re-irradiation with C-ion RT for lymph node recurrence of gynecological cancers after definitive radiotherapy could be safe and effective. This result suggested that C-ion RT could be a curative treatment option for conventionally difficult-to-cure patients.

Keywords. Carbon-ion radiotherapy, re-irradiation
OP017*

**Prophylactic extended-field irradiation for cervical cancer patients treated with concurrent chemoradiotherapy:**

**A propensity-score matching analysis**

Weiping Wang

Abstract

Objective: To evaluate the efficacy and toxicity of prophylactic extended-field radiation therapy (EFRT) for cervical cancer patients treated with concurrent chemoradiotherapy (CCRT).

Methods: Cervical cancer patients without para-aortic metastatic lymph nodes (MLNs) and treated with definitive radiotherapy or CCRT between January 2011 and December 2014 were reviewed. Patients were classified into pelvic radiation therapy (PRT) group and EFRT group. An additional dose of 50.4Gy in 28 fractions was delivered to para-aortic lymph nodes regions for patients in EFRT group. Cox regression and propensity-score matching (1:1) were used to compare the overall survival (OS), disease-free survival (DFS), distant failure (DF) and para-aortic lymph nodes failure (PALNF) between PRT and EFRT groups.

Results: A total of 778 patients were analyzed. Of them, 624 patients were treated with PRT and 154 patients received EFRT. The median follow-up period was 37.5 months. In multivariate analysis, EFRT was an independent prognostic factor of DF (HR 0.49, 95%CI 0.26-0.90, p=0.023) and PALNF (HR 0.012, 95%CI 0.00-0.49, p=0.019). However, it is not significant in predicting OS (p=0.546) and DFS (p=0.187). With propensity-score matching, 108 pairs of patients were selected. The 3-year OS, DFS, DF and PALNF rates in PRT and EFRT groups were 87.1% and 85.7% (p=0.681), 71.0% and 80.6% (p=0.199), 21.7% and 7.0% (p=0.016), 6.6% and 0% (p=0.014), respectively. The incidences of ≥grade 3 chronic toxicities were 3.5% and 6.5% in PRT and EFRT groups (p=0.097).

Conclusion: Prophylactic EFRT was associated with decreased DF and PALNF, and had a trend to improve DFS in cervical cancer patients treated with CCRT.

Key words: cervical cancer; extended-field radiation therapy; para-aortic lymph nodes; survival; toxicity
Measurement of Cervical Regression and Optimizing Brachytherapy Schedule Concurrently with External Beam Radiation Therapy in Carcinoma Cervix

Kannan Periasamy

Background and Purpose: The study aimed to measure the regression of cervix during external beam radiation and to optimize the scheduling of brachytherapy in carcinoma cervix.

Materials and methods: 50 consecutive patients with carcinoma cervix stage IIA to IIIB treated with concurrent chemoradiation were included in the study. Cervical regression was evaluated by means of serial computed tomography (CT) scans obtained before and during the treatment. High dose rate (HDR) brachytherapy was delivered after 30 Gy of external beam radiation at 3rd, 4th and 5th week of external beam radiation. Cervical volumes were recorded from the CT scan for cervical regression and dose volumes were obtained from the Dose Volume Histograms.

Results: The mean cervical volume at baseline, at the end of 3rd, 4th and 5th week was 85.53cc 28.95cc, 24.92cc and 21.80cc respectively. The time for 50% cervical regression was calculated to be 18 days and occurred around 27 Gy of external beam radiation therapy. The mean dose received by at least 90% of the volume (D90) for High Risk Clinical Target Volume (HRCTV) differed significantly between the three brachytherapy applications (P<0.05). Logistic regression analysis showed cut off value for HRCTV to increase the plan acceptability (D90>100%) was 25cc.

Conclusion: It is ideal to introduce brachytherapy at the end of 3rd week keeping in mind total duration of treatment is within six weeks. Conventional point based plan is adequate if the volume is less than 25cc, but HRCTV greater than 25cc requires optimization or a combination of Intracavitary and Interstitial brachytherapy.

Keywords: Carcinoma cervix, cervical regression, external beam radiation therapy, brachytherapy.
OP019

A retrospective study of shrinking field radiation therapy plus image-guided brachy therapy in stage I-II non-bulky cervical squamous cancer (≤4cm)

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Background and Aims:
To investigate clinical outcomes of early stage cervical cancer treated with shrinking field irradiation plus image-guided brachy therapy (IGBT).

Methods:
Thirty-four patients with stage I-II non-bulky cervical squamous cancer (≤4cm), no pelvic/para-aortic lymphadenopathy, treated with definitive RT between February 2009 and September 2016, were retrospectively analyzed. The RT consisted with shrinking field pelvic irradiation (traditional whole pelvis minus common iliac lymph node area) of 20 Gy/10 fractions followed by the pelvic irradiation with midline block of 30 Gy/15 fractions, and IGBT of 24 Gy/4 fractions (6 Gy/fraction for high-risk CTV D90). In-room CT imaging with applicator insertion was performed for treatment planning; physical examinations and MR imaging were also referred for determining high-risk CTV.

Results:
After a median follow-up of 41.5 months (range, 7-79), 3 patients developed distant recurrence and 1 developed a combination of local and distant recurrence. 1 patient died because of cervical cancer and 2 of another disease. No pelvic/para-aortic lymph node recurrence was observed. The 2-year LC rate was 100%, PFS was 94.1%, and OS was 94.1%. The late complication (RTOG/EORTC) was observed in 2 patients with small intestine G1; 4 with large intestine/rectum G1; 1/2 with bladder G1/G2. No G3 or higher was observed. The 2-year late complication rates were 6.5% for small intestine, 13.2% for large intestine/rectum, and 9.7% for bladder.

Conclusions:
The results suggest that a combination therapy of pelvic irradiation without common iliac lymph node and IGBT can provide excellent local control without severe toxicity in non-bulky (≤4cm) cervical cancer.

Keywords: cervical cancer, radiation, non-bulky
**ORAL ABSTRACT**

**OP021**

**Effects of 7 Gy x 3 fractions Vs 6 Gy x 4 fractions of HDR Brachytherapy Schedules in locally advanced cervical cancer**

Taslima Begum

Background: To compare the therapeutic gain and acute toxicity obtained by using two High Dose Rate Brachytherapy Schedules 7 Gy x 3 fractions versus 6 Gy x 4 fractions following concurrent chemoradiation for patients with locally advanced, Stage IIB squamous cell cervical carcinoma.

Methods: In this quasi-experimental study 60 subjects were enrolled to compare the effectiveness of two High dose rate of Brachytherapy. Arm A: 7 Gy x 3 fractions, n=30. Arm B: 6 Gy x 4 fractions, n=30.

Results: The study subjects were from poor socio-economic class, primary level education and multigravida. Mostly married below 20 years of age and majority of them used oral contraceptive pill for more than 5 years. It was observed that 25 (83.3%) subjects had complete response in Arm A (7 Gy in 3 fractions) while in Arm B (6 Gy in 4 fractions) 22 (73.3%) had complete response. This difference of response between two arms were no statistically significant (p=0.4759). Common toxicities related to treatment were gastrointestinal and genitourinary toxicities.

Conclusion: This study concluded that two HDR Brachytherapy following concurrent chemoradiation is effective and safe in achieving complete response in locally advanced stage IIB carcinoma cervix. Acute toxicities were observed having no statistically significant difference in both arms.

Keywords: Cervix carcinoma, EBRT, Cisplatin, Brachytherapy.
Validation of New FIGO staging of cervix Cancer

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Tumour volume and the presence of metastatic lymph nodes are the most important prognostic factors in cervix cancer. FIGO staging (2018) of cervix cancer has taken cognizance of this fact and has incorporated the nodal status and tumour sizes in stage description.

Aim: The primary aim was to validate the new FIGO staging of cervix cancer in light of a prospectively collected dataset of cervix cancer patients who had pre-treatment tumour volume and nodal status available and were treated with curative intent. Secondary aims were: 1) Describe the prognostic factor heterogeneity in this new FIGO staging. 2) Fashion iso-prognostic groups on the basis of survival data.

Methods Patient’s clinical, radiological and pathological characteristics have been distributed according to FIGO 2009 and FIGO 2018 staging schema. A 3rd staging system based on crude relapse rates was also fashioned. All three staging schema were analysed. Both overall survival (OS) and relapse-free survival (RFS) were estimated.

Results: Eight hundred and one patients were available for analysis. There was a good concordance of survival data in early stage disease where 2 cm cut-off of tumour size has been recommended and in stage 3 and 4 disease where the stages were divided by nodal status. There was still a considerable prognostic heterogeneity in new stage 1b3, 2a2 and 2b in which nodal status has been ignored. Conclusion:

Metastatic nodes are the most powerful prognostic factor in the treatment outcome of cervix cancer patients and should be uniformly incorporated in the staging of all patients.

Keywords: FIGO, Staging, Cervix Cancer, lymphnodes, tumour volume
A retrospective study of image-guided brachytherapy in elderly patients with cervical squamous cell carcinoma

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[Purpose] To investigate clinical outcomes of elderly cervical cancer patients treated with external beam radiation therapy (RT) plus image-guided brachy therapy (IGBT) without chemotherapy.

[Methods] Twenty-six patients aged 75 years or older with FIGO IB – IVA cervical squamous cancer, treated with definitive RT between 2009 and 2016, were retrospectively analyzed. The RT consisted of pelvic external beam RT (50 Gy with central shielding after 20-40 Gy) and IGBT (24 Gy/4 fractions for high-risk CTV D90). In-room CT imaging with applicator insertion was acquired for treatment planning; physical examinations and MR imaging were also referred for determining the high-risk CTV. No patients received chemotherapy.

[Results] The median age was 77 years old (range, 75-92 years). The FIGO classification of the patients with IB, II, III, and IVA were 4, 10, 8, and 4, respectively. The median tumor maximum diameter was 49.5 mm. With a median follow-up of 23 months (range, 2 - 74 months), 3 patients died because of cervical cancer, and 3 died because of another disease. No pelvic/para-aortic lymph node recurrence was observed. The 2-year local control, progression-free survival, overall survival rates were 90%, 86%, and 86%. The late complications (RTOG/EORTC) of Grade 3 or higher were not observed in small intestine, large intestine, and bladder.

[Conclusion] The results suggest that a combination therapy of pelvic irradiation plus IGBT without chemotherapy can provide good local control in elderly cervical cancer patients. No severe late complication was observed.

Keywords: cervical squamous cell carcinoma, IGBT, image-guided brachy therapy
OP024

Prospective Randomised Study Comparing Concurrent Chemoradiation With Weekly And Three Weekly Cisplatin In Locally Advanced Oropharyngeal Carcinoma

Giri G V

Introduction: Management of locally advanced HNSCC is extremely challenging and aggressive treatment approach is necessary to achieve cure. A combination of radiotherapy and concomitant chemotherapy improved response rate and allowed for the organ preservation. The chemotherapy schedules with cytotoxic dose or weekly regimes are still challenging, weighing the benefits versus toxicities. This prospective randomized study is an attempt to assess the efficacy of two schedules of cisplatin.

Objectives: The objectives of this study was to evaluate tolerance, tumour response and toxicities of concurrent chemoradiation with cisplatin in weekly and three weekly regimes.

Methods: Locally advanced oropharyngeal squamous cell carcinoma patients fit for concurrent chemoradiation with cisplatin 40mg/m2 (weekly) and 100mg/m2 (3 weekly) were randomized to Arm A and B concurrently with radiotherapy of 70Gy/35frs/7 weeks.

Results: Between December 2010 and January 2013, 59 patients were enrolled. The median cycles of cisplatin in Arm-A was 5 and 2 in Arm-B. The complete response of 80.9% vs 75% and partial response of 14.3% vs 12.5% was observed in both arms respectively. There was no statistical difference in acute radiation & hematological toxicities between the two groups. With median follow up of 28 months, the 2 and 5 years overall survival was 55% & 58%; 41.6% & 32.3% in arms A & B respectively.

Conclusion: Our prospective randomized control study of locally advanced oropharyngeal carcinoma treated with radical radiotherapy comparing concurrent chemotherapy with cisplatin weekly 40mg/m2 vs 3 weekly 100mg/m2 had no statistical significant difference in overall response, complete response and acute toxicities.

Keywords: Locally advanced oropharyngeal carcinoma, concurrent chemoradiation, 3 weekly cisplatin, weekly cisplatin, Toxicities.
An analysis of multimodal treatment outcomes and patterns of treatment failure of mucosal melanoma of the head and neck: 194 cases from a single institution

Shiran Sun

Objective: This study aimed to evaluate the treatment outcomes and patterns of treatment failure of mucosal melanoma of the head and neck (MMHN) in a single institution.

Methods: One hundred and ninety four patients with non-metastatic MMHN treated in our institution from 1982 to 2017 were retrospectively analyzed. The patients’ clinical characteristics, treatment modalities, outcomes and failure patterns were retrospectively analyzed.

Results: In all patients, the 5-year overall survival (OS), local recurrence-free survival (LRFS), regional recurrence-free survival (RRFS) and distant-metastasis free survival (DMFS) were 41.4%, 57.8%, 76.5% and 46.5%. Regarding the different treatment modalities, the 5-year OS was 42.3% in the surgery group and 42.5% in the surgery combined with radiotherapy group, while, the 5-year LRFS rate was 39.3% in the surgery group and 75.6% in the surgery combined with radiotherapy group (p < 0.001). Treatment failed in 141 (74.6%) out of 189 patients. In patients with failed treatment, 40% (56/141) had distant metastasis as first pattern of treatment failure, 37% (52/141) had local relapse, 15% (21/141) had regional relapse, 5% (7/141) had concurrent distant metastasis and local/regional relapse and 3% (5/141) had concurrent local and regional relapse.

Conclusions: Surgery combined with radiotherapy is still the recommended multimodal treatment regimen for MMHN. The multimodal treatment achieves promising local control rate. The major pattern of treatment failure is distant metastasis.

Keywords: Mucosal melanoma of the head and neck; Treatment outcomes; Failure pattern
A prospective randomized study of two palliative radiotherapy regimens in advanced squamous cell carcinoma of head and neck: a clinical and radiobiological comparison

Kakali Choudhury

Objectives: The aim of the study is to compare two different palliative radiotherapy regimens – standard hypofractionated regime and split course hypofractionated regime in advanced head and neck cancer.

Methods: 122 untreated patients of advanced squamous cell carcinoma of head and neck who were treated with palliative intent were randomized into two arms: Arm A (n=58) patients received 30 Gy in 10 fractions in two weeks; Arm B (n=64) patients received 17.5 Gy in 5 fractions followed by a 3 weeks gap and then again 17.5 Gy in 5 fractions, treatment completed in 5 weeks. Symptom palliation, tumor control, toxicity profile and health related quality of life were assessed.

Result: The response were comparable in both arms. Symptom palliation was also similar. Pain relief was 76% in both arms and relief of dysphagia 73% in arm A vs 79% in arm B. Partial response rate was equivalent (69% vs 62%). Mucositis and upper GI toxicity did not show any significant difference. Patient drop out was only 4 in arm B compared to 3 in arm A. The BED10 values are 39 and 37.84 in arm A and arm B respectively whereas BED3 values are 60 AND 75.8. Improvement of quality of life score was also comparable in two arms.

Conclusion: We conclude that the second regimen can also be used in palliative setting in some selected patients.

Key words: hypofractionated radiotherapy, palliative, Squamous cell carcinoma, head neck cancer
The Evidence for Radiotherapy Dose Escalation in the Primary Treatment of Nasopharyngeal Carcinoma: A Sytematic Review and Meta-analysis


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Purpose/Objective(s): Dose escalation in nasopharyngeal carcinoma remains underutilized despite significant advances in methods of radiation delivery. Brachytherapy, EBRT or SRT boost during primary treatment has been shown to improve local control rates, which could have an impact on survival. Our objective is to summarize the currently available evidence for dose escalation in nasopharyngeal carcinoma.

Materials/Methods: Databases were systematically searched for eligible studies with dose escalation (BED >68-70 Gy) in the form of brachytherapy, EBRT or SRT boost for primary treatment of nasopharyngeal cancer after EBRT. Single-arm, non-English and studies published before 1990 were excluded. LRFS, OS, PFS, DFS, toxicities and relevant factors for the chosen studies were then pooled and analyzed.

Results: 2 RCTs and 7 retrospective cohort studies with a total of 2145 patients were included in the final analysis. 988 patients received dose escalation, mainly in the form of brachytherapy (90%). Patients were mostly male, from Southeast Asia, had T1-T2 disease (80%), underwent radiotherapy via 2D techniques (87%), but less than half received concurrent chemotherapy. From the 2 RCTs, 3-year LRFS (RR 1.04; 95% CI: 0.85 – 1.28, p=0.71), OS, PFS and DFS were not significantly improved with dose escalation. However, the subset of patients pooled from the retrospective studies who did not receive concurrent chemotherapy showed significant 3-year LRFS (RR 1.04; 95% CI: 1.01 – 1.07, p=0.003), PFS and DFS benefit with dose escalation. Toxicities were not significantly increased with dose escalation.

Conclusion:

Radiotherapy dose escalation may be an option patients who are unable to undergo concurrent chemotherapy during definitive treatment of nasopharyngeal cancer.

KEYWORDS: nasopharyngeal carcinoma, dose escalation
Efficacy and feasibility of re-irradiation with CyberKnife radiotherapy as a salvage treatment for in-field neck lymph node recurrence after conventional radiotherapy

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[Purpose/Objective]
Neck lymph node (LN) recurrence in the irradiated field occurs in about 15% patients, and there is no established standard treatment. We investigated the efficacy and toxicity of CyberKnife (CK) treatment for neck LN recurrences after radiotherapy (RT).

[Material/methods]
Between 2008 and 2016, 59 neck LN recurrences after RT in 19 patients were treated with CK. All of the recurrences were unsuitable for other treatment due to medical reasons. The treatment fractions were decided depending on tumor and surrounding critical structures’ volume. The dose to the 10 cm3 of skin and mucosa was limited to be < 14 Gy given as stereotactic radiosurgery (SRS) to avoid adverse effects.

[Results]
The follow up period after CK ranged from 2 to 53 months (median, 19 months). The previous RT dose ranged from 50 to 70 Gy (median, 66 Gy). The target volume ranged from 0.05 to 91 cm3 (median, 1.3 cm3). The marginal dose as EQD2 (a/b = 10) ranged from 40 to 58 (median, 50 Gy) using CyberKnife. The local recurrence was observed in 10 lesions of 7 patients. The 1-year LC and OS rates were 83% and 63%, respectively. Fatal bleeding was observed in one patient who had huge (91 cm3) and widespread tumor invasion to carotid artery before CK.

[Conclusion]
CyberKnife treatment for neck LN recurrence is feasible and effective in most cases. It is recommended to take account of the adverse event when the large and widespread tumor invasion is observed.

Keywords: CyberKnife, in-field neck lymph node recurrence, stereotactic radiosurgery
OP029*

Study of Hypofractionated Palliative Radiotherapy and Oral Chemotherapy in Inoperable Locally Advanced Head and Neck Cancer

Tusar Das

Introduction: Carcinoma of head and neck is a common clinical entity. Unfortunately in our country, most of the patients with HNC attend the radiation oncology department in advanced stages. Standard treatment for inoperable advanced head and neck squamous cell carcinoma (HNSCC) is chemoradiotherapy. A significant proportion of patients are not suitable for curative treatment due to factors including tumour stage, performance status and co-morbidity of the patient. Hypofractionated radiotherapy for head and neck cancer is widely used. Chemotherapy with Methotrexate has a useful role in the control of primary tumour as well as control of pain and other local symptoms. Aim: To assess the effectiveness of treatment with hypofractionated radiotherapy and oral chemotherapy in locally advanced inoperable HNSCC. Material and Method: A cross sectional hospital based study was carried out in the Department of Radiation Oncology, NICRH, Dhaka, during the period Jul, 2017 to Feb, 2018. Patients with histologically or cytologically confirmed HNSCC without distant metastasis were included in this study. A total of 25 patients, each patient received 24 Gy in 4 fractions at 6 Gy single fraction per week over 4 weeks and oral chemotherapy with Tab Methotrexate(10 mg) daily for five days in a week. Every patient was evaluated routinely to see the response and toxicities. Result: At the end of treatment 90% patients with pain; 70% patients with insomnia; and greater than 50% patients with hoarseness of voice and dysphagia had been relieved after radiotherapy. CR was observed in 02 case, PR in 19 cases and PD in 04 cases. Acute and late reactions were acceptable. Conclusion: Hypofractionated palliative radiotherapy and oral chemotherapy is effective in relief of symptoms and loco-regional control of disease in locally advanced HNSCC.

Keywords: Hypofractionated Palliative Radiotherapy and Oral Chemotherapy in head and neck cancer
Accelerated Hypofractionated Radiotherapy versus Stereotactic Body Radiotherapy for the Treatment of Stage I Non-Small Cell Lung Cancer — a Single Institution Experience with Long-Term Follow-up

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Purpose. When treating Stage I NSCLC, to decrease adverse events for serial organs, we have been treating central tumors with AHRT using a 75Gy/25fr/5wks regimen, and have compared the results with those of SBRT mainly using 48Gy/4fr/1wk.

Methods. Patients with central tumors and/or unfit for one-hour fixation were candidates for AHRT. Based on the proximity of biologically effective dose at 75Gy (BED10) of SBRT (48Gy/4fr), AHRT of 75Gy/25fr/5wks was adopted.

Results. From October 2003 to December 2010, 187 patients received either AHRT (103 cases) or SBRT (84 cases). In the AHRT group, 43 cases (41%) were central tumors, whereas in the SBRT group all cases were peripheral tumors. Median follow-up periods for surviving patients were 7.8 years and 8.1 years, respectively. Overall 5-year survival rates were 46.5% (95% CI 36.7-56.2%) for the AHRT group and 46.4% (95% CI 35.8-57.1%) for the SBRT group (not significant). Overall 5-year local control rates were 81.9% (95% CI 73.6-90.1%) for the AHRT group and 78.5% (95% CI 68.9-88.0%) for the SBRT group (not significant). Multivariate analysis revealed hazard ratios for AHRT v.s. SBRT were <1 for both local control and overall survival. Pulmonary toxicity was similar in both groups. No serial organ toxicity was observed in cases with central tumors.

Conclusions. AHRT with a 75Gy/25fr/5wks regimen is promising in that it can obtain similar local control and survival results to SBRT, and can control both central and peripheral tumors without any serial organ toxicities. Based on these results, prospective multi-center trials are worth conducting.

Keywords: Stage I NSCLC SBRT AHRT
First-line epidermal growth factor receptor (EGFR)–tyrosine kinase inhibitor alone or with whole-brain radiotherapy for brain metastases in patients with EGFR-mutated lung adenocarcinoma the relevant clinicopathological parameters on the therapeutic efficacy

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Objective: To compare the therapeutic effects of EGFR-TKI (epidermal growth factor receptor- tyrosine kinase inhibitor) and EGFR-TKI plus WBRT (whole brain radiotherapy) for the treatment of BM (brain metastases) in patients with EGFR-mutated lung adenocarcinoma, and the relevant clinicopathological parameters on the therapeutic efficacy.

Methods: 139 patients were enrolled in our study from September 2008 to December 2017 with EGFR-mutated lung adenocarcinoma accompany with BM, all of them were treated with EGFR-TKI, and the follow-up time was 2018/04/04. 79 patients were treated with EGFR-TKI alone, 60 with concomitant WBRT, local control of intracranial lesions and OS (overall survival) were the main objective. 76 cases were with 19 exon mutations and 1 with 19/21 double mutations, 101 patients with multiple brain metastases and 68 patients with asymptomatic brain metastasis. Ten patients were treated with supplementary WBRT, we also explore the relationship between clinical pathologic, genetic status and therapeutic effect.

Result: The median OS of EGFR-TKI alone group was 41.1 months; 48 months in the combined WBRT group, there was no significant differences of OS between them (P=0.912), no significant differences of OS between early radiotherapy and late radiotherapy (P=0.849). There were significant differences of intracranial TTP (time to progression) between EGFR-TKI alone and EGFR-TKI plus WBRT group (median 18.2 VS 30.0 months, P=0.001) no significant differences of OS between without and with intracranial symptoms (median OS 44 VS 31, P=0.189).

no significant differences of OS between oligonucleotides and multiple intracranial metastases (P=0.104); no significant differences of intracranial TTP between them (median intracranial TTP 24.7 VS 22.0, P=0.357).

no significant differences of OS between 19 compared with 21 exon mutations (median OS 37.4 vs. 44.0, P=0.418); no significant differences of intracranial TTP between them (median intracranial TTP 18.6 vs. 24.0, P=0.386).

Conclusion: Although there were no significant differences of OS between EGFR-TKI alone and combined with WBRT in patients with EGFR-mutated lung adenocarcinoma accompany with BM, also no significant effect on OS between early radiation contrast with late radiation, but joint brain radiotherapy can significantly extend the brain TTP, delay the progression of brain lesions. Whether there were no significant relationship between OS and such as intracranial symptoms, number of intracranial lesions, 19 or 21 exon mutations. no significant differences of brain TTP no matter the number of intracranial metastasis.
Toxicity and biochemical outcomes of dose intensified post-operative radiation therapy for prostate cancer: a randomized, controlled, phase 3 trial

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Purpose: High level evidence was very few about which radiation therapy (RT) regimen was more effective for prostate cancer after radical prostatectomy (RP). In 2011, we began the randomized, controlled, phase 3 trial to investigate the effect of dose intensified post-operative RT. Patients were randomly assigned to either 66Gy/33f or 72Gy/36f. The aim of current analysis was to compare toxicity, urinary continence recovery and biochemical outcomes.

Methods: This trial recruited patients who had received RP for a histologically confirmed adenocarcinoma of the prostate, and who had stage pT3-4, positive surgical margins, pN+ or who had rising PSA of 0.2ng/ml following RP. The primary endpoint was biochemical progression-free survival. The second endpoints were acute and late toxicity, and urinary continence recovery.

Results: Between Sep. 2011 and Nov. 2016, 144 patients were randomly assigned (66Gy: 71, 72Gy: 73). The median follow-up time was 42 months. 3-year bPFS was 73.8% vs. 76.6% in 66Gy vs. 72Gy group. No significant differences between both groups were seen for GI and GU toxicity. At baseline 48 (33.3%) of patients were incontinent (16.7% mild, 13.9% moderate, 2.8% severe). Of these, continence was recovery one year after RT by 33.3% vs. 28.6%, 63.0% vs. 66.7% of patients remained stable. Only 2 patients felt more seriously after RT.

Conclusion: Our study suggested that dose-intensified RT was associated with low rates of acute and late grade 2-3 GU/GI toxicity, and had no obviously impact on one-year urinary continence recovery. However, the long-term survival outcomes needed to be further explored.

Keywords: prostate cancer, post-operative radiation therapy, RCT
Carbon-ion Radiotherapy for bone and soft tissue tumors

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Purpose: To retrospectively evaluate the feasibility and efficacy of carbon-ion radiotherapy (C-ion RT) for unresectable bone and soft tissue tumors treated in Gunma University Heavy Ion Medical Center (GHMC).

Materials and Methods: A total 83 patients with bone or soft tissue tumors treated with C-ion RT between November 2011 and December 2017 in GHMC were retrospectively evaluated. In C-ion RT, 70.4 Gy(RBE) was administrated as the standard total dose for sarcomas; 67.2 Gy(RBE) for sacrococcygeal chordomas; 64.0 Gy(RBE) for spinal bone tumors, in 16 fractions over 4 weeks. Local control rate (LCR), survival outcomes, acute and late adverse events were analyzed.

Results: The median age at the C-ion RT was 68 years. Median follow-up time was 25 months (range, 1-86 months). Histologically, 29 patients had chordoma. The 3-year LCR and overall survival rates (OS) in all patients were 84% and 74%, respectively. The 3-year LCR and OS of 46 patients with bone tumor were 98% and 88%, and those of 37 patients with soft tissue tumors were 66% and 56%. The 3-year LCR and OS by volume of clinical target volume were 100%, 100% in under 100cc (n=5), 73%, 91% in between 100cc and 500cc (n=26), 68%, 70% in over 500cc (n=24), respectively. There were no patients with Grade 3 or above acute adverse events. The Grade 3 or above late adverse events were shown in 7 patients.

Conclusion: The results of this study showed that C-ion RT must be an alternative treatment option for unresectable bone and soft tissue tumors.

Keywords: Carbon Ion, Heavy Ion, Bone tumor, Soft tissue tumor
Molecular mechanism of PD-L1 upregulation in cancer cells after DNA double-strand break repair pathway following irradiation

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[Background] Immune checkpoint inhibitors have demonstrated marked clinical efficacy in cancer treatment. A recent report showed that blockade of PD-1/PD-L1 interaction after chemoradiotherapy prolonged progression-free-survival in lung cancer patients. It is also reported that PD-L1 is upregulated in cancer cells after irradiation. In addition, PD-L1 expression is one of the biomarkers of good response to PD-1/PD-L1 blockade. Therefore, understanding the mechanism of PD-L1 upregulation after irradiation is important; which however is not fully elucidated. In this study, we hypothesized that DNA damage signaling, particularly DNA double strand break (DSB) repair, is involved in PD-L1 upregulation.

[Methods] U2OS cells were irradiated to induce DSB, and PD-L1 expression was examined by immunoblotting, real-time PCR, and immunofluorescence assay. Specific inhibitors against Ataxia telangiectasia mutated (ATM), ataxia telangiectasia and Rad3 related protein (ATR), or Chk1 were examined for their involvement in PD-L1 upregulation. To identify the genes inducing PD-L1 upregulation after X-irradiation, immunoblotting was performed after siRNA screen targeting DSB repair.

[Results] PD-L1 upregulation after irradiation requires ATM/ATR/Chk1 kinase activities. The siRNA screen revealed that depletion of either BRCA2 or Ku80 enhanced PD-L1 upregulation after irradiation. This upregulation required Chk1 kinase activity in BRCA2-depleted cells and DNA end resection followed by Chk1 activation in Ku80-depleted cells. DSBs also activate STAT1/3 signaling, and IRF1 is required for DSB-dependent PD-L1 upregulation.

[Conclusions] DNA repair pathways affect PD-L1 upregulation in response to irradiation. These data suggest that the efficacy of anti-PD-1/PD-L1 therapy is likely to be enhanced in DSB-repair-defective cancer cells, particularly when radiotherapy is combined.

Keywords: PD-L1, radio-immunology, DNA double strand break, DSB repair, DNA damage signal
**OP035**

**Oncological & Functional Outcomes of Extracorporeal RT & Reimplantation for Bone Sarcoma**

Kinjal Jani

**BACKGROUND:**
We analysed oncological and functional outcomes of Extracorporeal radiotherapy (ECRT) and reimplantation done for bone sarcomas.

**PATIENTS AND METHODS:**
27 patients (14 osteosarcoma, 10 Ewing’s sarcoma, 3 others; mean age 13 years) were treated with ECRT between 2010 and 2016. Femur was commonest bone (18) followed by tibia (6) and humerus (3). 26 had a metadiaphyseal while 2 had osteoarticular resections. A single dose of 50 Gy was delivered to the resected bone segments. The irradiated bones were reimplanted immediately as a biological graft. Construct was stabilized with long locking plates. Osteoarticular ECRT was coupled with joint replacement. Patients were treated with chemotherapy as per standard protocol.

**RESULTS:**
All 27 patients were available at a mean follow-up of 34 months (24 to 74). The mean time to union for all osteotomy sites was 6 months (2 to 17): metaphyseal osteotomy sites united quicker than diaphyseal osteotomy sites. 3 nonunions needed bone grafting. 1 deep infection necessitated removal of the ECRT segment. There was 1 local recurrence in soft-tissue. At the time of final follow-up, 19 patients were free of disease, one was alive with disease and 7 had died of disease. The mean Musculoskeletal Tumor Society Score at the last follow-up was 26 (18 to 30).

**CONCLUSIONS:**
The radiated bone acts as a size matches allograft and has very good union rates. The complication rates are very low. Extracorporeal irradiation is an oncologically safe and biological reconstruction technique for limb salvage in sarcomas and has good functional results.

**Keywords:** Extracorporeal RT, Bone Sarcoma
Clinical results of Proton boost combined with pelvic IMRT for Node-Positive prostate cancer

Kento Nomura

Purpose/objective(s)

Previous studies demonstrated the efficacy of radiation therapy for clinically node-positive prostate cancer. However, there are few reports on treatment strategies incorporating proton therapy. The purpose of this study was to evaluate the clinical outcome and toxicity of pelvic IMRT combined with proton boost for node-positive prostate cancer.

Materials/Methods

From March 2013 to April 2018, 12 patients with node-positive prostate adenocarcinoma were treated by pelvic IMRT with 45 Gy/25 fr followed by proton boost with 34 GyE/17 fr to the prostate and seminal vesicles and 26 GyE/13 fr to positive lymph nodes. Biochemical failure was defined according to the Phoenix definition. Adverse effects were assessed using the National Cancer Institute Common Terminology Criteria for Adverse Events version 4.0.

Result

The median follow-up period was 39 months (range, 17-57 months). Patient median age was 66 years (range, 55-76 years). One patient had a T2b tumor, 3 had a T3a tumor, and 8 had a T3b tumor. Gleason score 7, 8, and 9 were observed in 1, 3, and 8 patients, respectively. The median PSA level before treatment was 38.8 ng/ml (range 11-230). All patients underwent androgen deprivation therapy for a median duration of 42 months. Two patients experienced extrapelvic recurrence. No other patients had biochemical failure. There was no grade 3 or worse acute or late GI and GU toxicity.

Conclusion

Proton boost combined with pelvic IMRT was feasible and safe in patients with node-positive prostate cancer. Further study is required for a larger population and a longer follow-up period.

Keywords: Prostate cancer, Pelvic lymph node, Proton therapy, Intensity modulated radiation therapy
Apurinic/Apyrimidinic (AP) Endonuclease 1 promotes the formation of clustered DNA double-strand breaks undergoing DNA end resection after carbon-ion particle irradiation

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DNA double-strand breaks (DSBs) induced by ionizing radiation are considered the major cause of deleterious mutations and cell death. X-rays or g-irradiations induce DSBs with a random distribution throughout the nucleus because of their low-density energy deposition. In contrast, the high linear energy transfer (LET) of heavy-ion particle irradiation deposits energy densely along the track of particle traversal, resulting in the non-random distribution of DSBs. Additionally, high LET particle irradiation induces multiple types of DNA damage including DSBs, single-strand breaks, and base damage within 1-2 helical DNA turns. Such damage is categorized as a complex DNA lesion. Here, we identified the formation of three dimensional (3D) widespread gH2AX foci after high LET carbon-ion irradiation by using a super resolution 3D-structured illumination microscopy. The large gH2AX foci in G2-phase cells encompassed multiple replication protein A (RPA) foci, a marker of DSBs undergoing resection during homologous recombination. Importantly, the average distance between two individual RPA foci within the gH2AX foci was approximately 700 nm. Closely localized DSBs are considered a risk factor for chromosomal rearrangement after heavy-ion irradiation. Next, to investigate the involvement of base excision repair proteins at clustered DSBs, we examined RPA foci in apurinic/apyrimidinic endonuclease 1 (APEX1)-depleted cells after high LET carbon-ion irradiation. Interestingly, the formation of large gH2AX foci and RPA foci within the gH2AX signal were suppressed in APEX1-depleted cells. These results suggest that APEX1 promotes the formation of clustered DSBs undergoing DNA end resection after high LET carbon-ion irradiation.

Keywords: Clustered DNA double-strand breaks, Particle radiation, Carbon-therapy, 5H2AX foci, DSB repair pathway
Next-generation sequencing analysis of radiotherapy-naïve versus -recurrent tumors

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Despite advances in cancer genomics, the mutation signatures that confer radioresistant nature on malignant tumors have not yet been fully elucidated. To tackle this issue, we analyzed a unique set of clinical specimens from a uterine cervical cancer that repeatedly locally recurred after multiple rounds of radiotherapy. Exon sequencing of 409 cancer-related genes in the treatment-naïve tumor and the tumors that recurred after initial and secondary radiotherapy identified (i) activating mutations in PIK3CA and KRAS, and putative inactivating mutations in SMAD4, as trunk mutation signatures that persisted over the clinical course; and (ii) mutations in KMT2A and TET1 as acquired mutation signatures observed only in recurrent tumors after radiotherapy. Comprehensive mining of published in vitro genomics data pertaining to radiosensitivity revealed that simultaneous mutations in KRAS and SMAD4, which have not been described previously in uterine cervical cancer, are associated with cancer cell radioresistance. The association of this mutation signature with radioresistance was validated by in vitro experiments that employed KRAS-knock-in and SMAD4-siRNA systems. The results of the present study indicate that next-generation sequencing analysis of clinical specimens is a promising strategy to explore the mutation signatures that contribute to tumor radioresistance, which is worth pursuing with larger cohorts in the future.
Carbon-ion radiotherapy for prostate cancer with bladder invasion

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[Purpose] Treatment for prostate cancer with bladder invasion is not established yet. Carbon-ion radiotherapy (CIRT) for localized prostate cancer has been performed at our institution since March 2010. Combined androgen deprivation therapy (ADT) is administrated for patients classified as intermediate or higher risk groups. We report the patients with bladder invasion treated by CIRT combined with ADT.

[Patients & Methods] Between March 2010 and September 2014, the 803 patients of localized prostate cancer were treated. Six out of 803 patients had bladder invasion. CIRT 57.6 Gy (RBE) 16 fractions/4 weeks was performed after 5–12 months ADT. CTV included whole prostate, proximal seminal vesicle, and residual invasion. ADT had continued after CIRT and total ADT duration was 24–46 months. Adverse events (AE) were evaluated according to CTCAE version 4.0.

[Results] Median age was 69 (range, 53–81). Median initial PSA was 34.7 ng/ml (range, 7.8–87.0). The Gleason score was 7 (4+3) in 2 patients, 9 (4+5) in one patient, and 9 (5+4) in 3 patients, respectively. Median observed period was 65 months (range, 41–78 months). One patient had local recurrence 45 months after CIRT and have been treated by ADT. The remain 5 patients are alive without any recurrence. Grade 2 or worse late AE was not observed.

[Conclusion] CIRT might be a safe and effective treatment option for prostate cancer with bladder invasion.

Keywords: Prostate cancer, bladder invasion, Carbon-ion radiotherapy
Radical re-irradiation in thoracic region

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Purpose: Explore the effect and toxicity in thoracic re-irradiation (re-RT) by X-ray.

Material/Methods: Between January 2008 and December 2016, 52 patients have been re-irradiated by X-ray in thoracic region with a complete overlap of the previous radiation therapy (RT). Six patients received three or more RTs in thoracic region. Patients were classified according to the number of lesions (localized or multiple lesions) and the interval with second RT (more or less than 12 months). Survival was defined as the time between the date of the second radiation therapy and the date of death or last follow-up. Toxicity was scored with the RTOG toxicity criteria and/or CTCAE ver 4.0.

Results: The median dose of first RT was 46.6 Gy and second RT was 65.0 Gy. And median interval period from 1st to 2nd RT was 21 months. Median follow-up period was 12 months. The 1-year, 2-years and 5-years overall survival was 49%, 34% and 26%, respectively. In patients with localized lesion and long interval until second RT, these were 74%, 61% and 42%, respectively. Two patients (2/52: 4%) experienced radiotherapy related grade 3-5 toxicity.

Conclusions: Long survival rates were achieved in patients with localized lesions and longer intervals up to the second RT, and there was few severe toxicity. The radical re-RT in thoracic region could be performed safely.

Keyword: Re-irradiation
Patterns of Practice on Palliation of Painful Bone Metastases Among Radiation Oncologists in the Philippines


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Introduction Bone metastasis is the most common cause of intractable pain among cancer patients that several need palliative radiotherapy. Numerous fractionations have been utilized and current reviews showed similar symptom relief among these, with more retreatments in single fraction radiotherapy (SFRT). Geographical variations on patterns of practice have been published worldwide but none from developing countries in Asia.

Objective The objective of this study is to report the perceived effectiveness and utilization of radiotherapy fractionations for painful bone metastases among radiation oncologists in the Philippines.

Materials and Methods A survey on perception and utilization of fractionations for bone metastasis was given to physicians registered under Philippine Radiation Oncology Society, during the 2017 Best of ASTRO meeting. Follow-up emails were made for non-response. Descriptive statistics, analyses and correlations were reported at 95% level of significance.

Results Seventy-six of 99 radiation oncologists completed the survey. Among long courses, 30/10 was deemed effective for 91% while 37.5/15 and 40/20 had 61% and 59% respectively. Among short courses, only half (53%) perceived 8GySFRT to be effective, while 20/5 and 36/6 had 47% and 26% respectively.

Almost all have utilized 30/10, while 65% have utilized 40/20 and 37.5/15. Less use shorter fractionations with 37%, 33% and 15% have utilized 8GySFRT, 20/5 and 36/6 respectively.

Conclusion Even with latest evidences, 30/10 is still the most utilized fractionation in the Philippines. More radiation oncologists perceive longer courses to be effective compared to shorter courses. There is a need to explore barriers against use of short course RT.
Estimation of dosimetric accuracy for VMAT plans using statistical learning

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Purpose: The purpose of this study was to estimate dosimetric accuracy for volumetric modulated arc therapy (VMAT) plans using statistical learning and to evaluate its accuracy.

Methods: This study included a total of 600 clinical VMAT plans (energy of 6MV, 10MV, 15MV, 6FFF and 10FFF). Each plan was characterized by 24 metrics that described different aspects of their complexity and were defined as predictor variables. Dosimetric measurements were performed using a cylindrical diode array (ArcCHECK), and passing rates of 5% dose difference and 3%/3mm global gamma were recorded. Their passing rates were estimated using three statistical learning methods, including regression tree (RT), multiple regression analysis (MRA) and neural networks (NNs). First, estimation models were calculated from 500 plans in 600 plans using three statistical learning methods. Second, dosimetric accuracy of passing rates were estimated using each model for other 100 plans. Finally, differences between estimated and measured passing rates were evaluated by means ± standard deviations (SDs).

Results: Measured passing rates were 92.3 ± 9.1% for 5% dose difference and 96.8 ± 3.1% for 3%/3mm global gamma, respectively. Estimation accuracies of 5% dose difference and 3%/3mm global gamma were 0.4 ± 6.2% for RT, -0.5 ± 2.7% for MRA and -0.8 ± 1.7% for NNs, respectively.

Conclusions: Dosimetric accuracy of VMAT plans was estimated using statistical learning methods. This study would be a new strategy of patient specific quality assurance.

Keywords: VMAT, statistical learning, dosimetric accuracy
Poster

Abstract
Head and Neck
Electroglottographic assessment of laryngeal toxicity post chemo-radiotherapy in non-laryngeal Head & Neck cancers

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Background: Acute laryngeal toxicity (LT) following concurrent chemo-radiotherapy (CCRT) for non-laryngeal head & neck cancers (NLHNC) has been inadequately studied. Electroglottography (EGG), a novel technique for objective quantification of LT, measures the change in electrical impedance generated by the glottic closure.

Aim: Objective and subjective assessment of acute LT post CCRT in NLHNC.

Methods: A prospective study on 30 biopsy proven NLHNC patients, treated with CCRT; 66-70Gy/33-35fractions with 5 cycles of weekly Cisplatin. Flexible laryngoscopic examination and EGG using model 6103 (Kay-Labs) were performed at baseline, 6weeks and 3months post CCRT; grades of LT and contact quotients (CQ) were documented. Patient reported outcomes of voice related quality of life (QoL) performed at same intervals, using 30-item Voice Symptom Scale (VoSS) questionnaire. Statistical analysis was done using ANOVA.

Results: 26/30 patients completed CCRT; 14 were available at 6weeks; 10 at 3months post CCRT for analysis. At 6 weeks, 3/14 (21.5%) patients had Grade II LT; 11/14 (78.57%) had grade III. At 3months, 2/10 (20%) had Grade I, 6/10 (60%) had grade II but 2/10 (20%) had worsened to grade IV. Mean CQ at baseline was 50.19 (SD ± 5.09); which decreased at 6weeks 48.42 (SD ± 5.23) and further at 3months 45.90 (SD ± 4.51) [P < 0.05] indicating the glottic hypo-adduction. VoSS responses showed significant impact on QoL in all 3 domains at 6weeks and 3months post CCRT, compared to baseline (P < 0.0001).

Conclusion: Electroglottography can be used to quantify acute post RT - LT. The study, however, requires larger sample size to draw further correlations.

Keywords: electroglottography, laryngeal toxicity, chemo-radiotherapy, head & neck cancers
PA002

Feasibility study on self-made fixing strip cooperating with tomotherapy automatic positioning function in head and neck cancer therapy

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Purpose/Objective(s): Using the self-made fixing strip (SMFS) to fix the neck and shoulder fixation device (NSFD) cooperating with tomotherapy automatic positioning function (TAPF), we tested on head and neck cancer (HNC) patients to analysis whether the application is feasible for treatment.

Materials/Methods: A total of forty patients with HNC were randomly selected and divided into four 10 patients groups: group A, B, C and D respectively. Positioning and computed tomography (CT) were completed with the SMFS to fix the NSFD on the CT bed in group A and group B, without the SMFS to fix the NSFD in group C and group D. At each radiotherapy, automatic positioning (AP) were completed with the SMFS to fix the NSFD on the treatment bed in group A and group C. Manual positioning (MP) completed without the SMFS to fix the NSFD in group B and group D. The positioning time was recorded in each group for analysis. Megavoltage computed tomography (MVCT) was utilized to match with reference CT data sets for adjustment, record the errors of lateral, longitudinal, vertical and spinning longitudinal direction of four groups. Groups were compared using the paired t test.

Results: In each positioning, the deviation between the marker on the immobile device and laser less than 1mm were deemed qualified. Four patients positioning procedure (PPP) were not qualified which belong to group C, and PPP were qualified and passed in group A. B and D. No significance was observed for the errors of lateral, longitudinal, vertical and spinning longitudinal direction of group A, B and D (A vs. B, \( P=0.105, 0.489, 0.780, 0.345 \); A vs. D, \( P=0.275, 0.800, 0.534, 0.802 \); B vs. D, \( P=0.653, 0.648, 0.296, 0.147 \) ). However, the positioning time for group A was significantly less than group B and D ( \( P=0.000, 0.000 \) ). There is no significant differences in the positioning time between group B and group D ( \( P=0.623 \) ).

Conclusion: It is feasible to complete positioning in CT and AP in treatment with the SMFS to fix the NSFD cooperating with TAPF in HNC therapy. It tends to be more efficient in timing saving due to the limiting collected information.

keyword: tomotherapy, head and neck cancer, self-made fixing strip, automatic positioning, setup error
**PA003**

**Dosimetric analysis of lower cranial nerves in radical radio(chemo)therapy for head and neck squamous**

Trinanjan Basu

Introduction: Radiation induced cranial nerve palsy (RICNP) involving the lower cranial nerves (CNs) is an under reported event. RTOG guideline exists to delineate lower CN’s. We followed the guideline to document dosimetric data in a cohort of HNSCC patients receiving radical RT(chemo).

Methodology: 15 HNC patients receiving radical radio(chemo)therapy by modulated RT techniques (IMRT/VMAT) were selected. All of them received RT dose of 70 Gy in 33 fractions (MSKCC protocol) with weekly concurrent cisplatin. The lower CN’s were delineated using RTOG guideline. The CN’s IX to XI were contoured as a single structure on either side of neck whereas CN XII was drawn as a separate structure. The dosimetric details like dose received by level II region on either side, dose maximum (Dmax), mean dose (Dmean), dose received by 0.03 cc, 0.5 cc and 1 cc of the volume were recorded.

Results: The median age was 63 years with 10 patients in stage IVB. All had baseline evaluation by neurologist and physiotherapist and no documented neurodeficit noted. The level II lymph nodal regions received median Dmax of 70 Gy. The median dose of CN’s IX-XI and XII with respect to Dmax, 0.03cc, 0.5cc,1cc, Dmean and D100 were 73.4, 72.25,70.67, 68.9,64.4, 38.8 respectively with variation on either side depending upon node positivity. Post treatment median follow up being 6 months and no documented CN palsy noted.

Conclusion: CN related events are less reported and so the neurodeficits. Future large sample size with longer follow up will highlight upon actual significance.

Keywords: HNSCC, lower cranial nerves, RTOG guideline, MSKCC protocol, Dosimetric data
Accelerated versus Conventional Fractionation of Chemo Radiotherapy in Locoregional Control of Locally advanced head and neck cancer

Hosne

Aims and Objectives: Head and Neck cancer is one of the most common cancers in Bangladesh. Most of them are squamous cell carcinoma and present as locally advanced disease. Standard treatment for this locally advanced inoperable disease is chemo-radiotherapy. The purpose of this study is to assess treatment outcome and toxicities and to reduce the overall treatment time in locally advanced head neck squamous cell carcinoma by treatment with accelerated fractionation of radiotherapy and comparison was made to those parameters of conventional chemo radiotherapy.

Material and methods: A quasi experimental study was carried out in the department of Oncology, Bangabandhu Sheikh Mujib Medical University and in department of Radiation Oncology in National Institute of Cancer Research and Hospital, Dhaka from April 2016 to March 2017. A total number of 88 patients with biopsy proven locally advanced squamous cell carcinoma of head neck region were included in this study. Radiotherapy was delivered with Co 60 teletherapy machine. In both the arms, patients received total 66 Gy, 2 Gy per fraction. In arm A, patients received radiotherapy, 6 days per week and in arm B conventional fractionation of radiotherapy 5 days in a week, were given concurrently with low dose weekly inj Cisplatin (30 mg/m2). Each patient was monitored weekly during treatment. Then follow up was given at 6th, 12th and 24th week after completion of treatment to see response and toxicities.

Result: Average age of patient at diagnosis was 58.45 years and male female ratio was 3:1. 68% patients were smoker but most of remaining population were exposed to other form of tobacco. Complete response was 68.2% in arm A and 61.36% in arm B. Common toxicities were mucositis, skin toxicities, loss of taste. Grade 2 and 3 mucositis were more common in arm B but skin toxicities were higher in accelerated group. Nephrotoxicities, hematological toxicities were more common in conventionally treated group. This study shows, accelerated fractionation radiotherapy arm gave the opportunity to treat more patients in same machine within a fixed time period. In this study, we get the benefit to treat extra 36% patients in one year.

Conclusion: So this study gives us the benefit to treat extra number of patients with existing facilities with similar result and manageable toxicities and thus helps to reduce machine load.
Weekly Cisplatin Vs. Three Weekly Cisplatin in Concurrent Chemoradiotherapy of Locally Advanced Head and Neck Cancer

Taohida Yaslim

Background: Head and Neck Cancer (HNC) is the 5th most common cancer in the world and one of the prevalent cancers in Bangladesh. Majority patients presents in locally advanced stages. Concurrent chemoradiotherapy (CCRT) with Cisplatin is the major modality of curative treatment in these cases.

Aim: This study was done to evaluate the therapeutic gain in weekly and three weekly cisplatin based CCRT for advanced HNC patients.

Methods: A quasi experimental study was done among 60 patients of locally advanced HNC at Radiation Oncology Dept. of National Institute of Cancer Research & Hospital, Dhaka from June’15 to July’16. Patients were accrued to arm A and arm B purposively to receive cisplatin based weekly and three-weekly chemoradiation respectively.

Results: Although there was a trend of increase in grade 3 oral mucositis and grade 3 skin toxicities in Arm A (weekly cisplatin) compared to Arm B (three weekly cisplatin), other toxicities including nausea, vomiting, hematological & renal toxicities were found slightly higher in arm B than arm A which was not statistically significant. In arm A complete response was 68% and partial response was 14%. In arm B complete response was 72.4% and partial response was 6.9%. No statistical significance was found between these two arms.

Conclusion: It could be said that weekly cisplatin based concurrent chemoradiotherapy can be a standard of care in locally advanced HNC patients in terms of superior radiobiological advantage & patient compliance.

Keywords: Chemoradiation, Cisplatin, Advanced, Toxicities, Response, Compliance
Oral cavity cancers: a retrospective audit from a tertiary care cancer centre in Northern India

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Objectives: To critically review the head and neck cancer patients and determine demography, intervention, toxicity and outcomes of oral cavity cancer (OCC) patients treated at Tertiary Cancer Care Centre.

Material and methods:
Service evaluation of oral cavity cancer patients treated between 2008 to 2013 was done. Demographic factors, diagnostic workup, subsite and stage were documented. Patients were taken up for either surgery followed by adjuvant RT or radical RT (with or without chemotherapy) or for palliative treatment. Statistical analysis done in September 2016.

Results:
714 OCC patients were registered at our institute out of which 597 (84%) patients were planned for definitive treatment; 117 (16%) for palliation. Median age of presentation was 49 years (range 18-90). Males (632/714) were predominant and median KPS was 80 (range 40-90). Tobacco habits were present in 540 (76%) cases. Commonest subsite was buccal mucosa-309/714 cases (43%), followed by oral tongue 267 cases (37%). Clinical stage-IV commonest i.e. 396/714 (55%). 459 patients underwent upfront surgery. 245/459 patients were pathologically stage-IV disease (53%). 72 patients had unresectable disease but received radical RT. In palliative subgroup, 44 (38%) received palliative RT and metronomic CT in a sequential manner. Overall 87% had grade III oral mucositis and 22% had grade II/III dysphagia. 35% relapsed loco-regionally-local (22%), LN (13%). Distal failures (10%). Average time to recurrence was 21 months. In the patient who received RT (adjuvant/radical RT) median follow up was 59 months. At the time of analysis, 130 patients (31%) were alive, 121 (29%) dead and 167 (40 %) patients lost to follow up with or without disease. The post-op RT group, 5 years LRFS and OS were 37% and 20% respectively. For radically RT treated group, 30% and 7% respectively (worst case scenario).

Conclusions: Oral cavity cancers often present late. Radical surgery followed by adjuvant radiotherapy gave the best result in this audit. Lost to follow up remains an issue. Multidisciplinary team (including Head Neck OncoSurgeon) for decision making Joint clinic is required for better management of oral cavity cancer patients.

Keywords: Oral cavity cancers, audit
Active Nutritional Improvement Before and During Radiotherapy in Head and Neck Cancer Patients

Nattapatch Janhom

PURPOSE: Malnutrition is the most common problem in head and neck cancer (HNC) patients, who had received the concurrent chemoradiotherapy. The radiation toxicities were the problem which decrease food intake., coming with the severe weight loss and malnutrition. The critical weight loss more than 10% is the major prognostic factor that decrease the disease-specific survival in HNC.

The objective of this study is to present that the active nutritional improvement before and during radiotherapy in HNC patients can improve rate of complete treatment without interruption related side effect.

METHODS: Quasi-experimental and prospective study of the effect of active nutritional improvement before and during radiotherapy (study, n=32) compared with the retrospective chart review in 2016 (control, n=80) in HNC patients who received definite or post-operative concurrent chemoradiotherapy. The primary end-point is the complete concurrent chemoradiotherapy. The secondary end-point are the declination of tube feeding insertion during treatment, RTOG toxicity, nutrition status and quality of life.

RESULTS: The rate of complete concurrent chemoradiotherapy is no statistical significance in both groups (p=0.121, 95%CI 0.226-1.188 in control and study group, respectively). The major cause of the delayed or discontinuation of chemotherapy is oral mucositis. No significant difference of the tube feeding insertion rate and RTOG toxicities in both groups. However, the data shows clinical significance of complete concurrent chemoradiotherapy in study group (56%) which is better than control group (40%).

CONCLUSION: Active nutritional counselling program is clinical benefit for HNC patients, that higher the incidence rate of complete treatment as schedule.

Keywords: active nutrition, radiotherapy, head and neck cancer, complete treatment
PA014

Can We Predict The Subset Of Head And Neck Cancer Patients With Laryngeal Obstruction Who Will Benefit From Elective Tracheostomy?

Kiran Kumar BR, Vijetha Jayakumar, Richa Tiwari, Geeta S Narayanan

Introduction: Head and neck cancers are among the 10 most common cancers globally and are the most common cancers in developing countries, especially in Southeast Asia. Airway obstruction is one of the major morbidities caused by these tumours. Prompt relief of the obstruction would not just save lives but also makes delivery of definitive treatment more effective. The severity of symptoms depends upon the site of obstruction, degree of obstruction and also other physiological factors. Here, we attempted to analyse the correlation between the degree of obstruction at the level of larynx with outcome of the patients in terms of tracheostomy rates and completion of definitive treatment without tracheostomy.

Materials and methods: All patients diagnosed to have primary cancers of head and neck who were treated with radiotherapy between the year January 2009 – June 2017 were included in the study. Area of the narrowest airway was measured on simulation CT. All the patients who had radiologically significant airway narrowing were analysed in terms of tracheostomy rates.

Results: 377 head and neck cancer patients which were treated, radiologically significant narrowing of laryngeal airway was observed in 179 patients. 53 patients of them required tracheostomy. Laryngeal airway narrowing could be classified into low, intermediate, high and highest risk for tracheostomy with corresponding tracheostomy rates of 5.8%, 23.5%, 41.6% and 80% respectively.

Conclusions: All highest risk patients will require elective tracheostomy where as high risk patients may benefit from tracheostomy. Intermediate risk patients can be considered depending upon other factors and co-morbidities.

Keywords: tracheostomy, elective, head and neck cancer, laryngeal narrowing
Outcomes with Reirradiation for Recurrent Nasopharyngeal Carcinomas: Experience

Ryan Anthony

Objective: The objective of this study is to report the outcomes with reirradiation (re-RT) recurrent nasopharyngeal carcinoma (rNPC) in our center.

Methods:
Records of 32 cases with rNPC treated with reirradiation were retrospectively reviewed (2006 – 2017). The median age of the cohort was 50 years old. Half (n=16) had primary radiotherapy done at our center and the other half were initially treated outside. Treatment modalities for re-RT were: IMRT (n=14), 3DCRT (n=9), SRS (n=6), fractionated SRT (n=2), and HDR brachytherapy (n=1). Median dose with conventionally fractionated radiotherapy was 60 Gy (16-64.96), median dose with SRS was 16.5 Gy (12-18), fractionated SRT was given in 18-24.4 Gy in 5 fractions, and brachytherapy was 21 Gy in 3 fractions. Twenty-seven had re-RT with curative intent, while 5 were for palliation.

Results:
The median follow-up was 13 months (1-123). Four died during the follow-up period. Thirteen patients had local progression after re-irradiation, while 1 had both locoregional and distant progression. A median locoregional failure-free survival (LRFFS) estimate of 18 months, and actuarial 1-year, 2-year, and 5-year LRFFS rates of 63.4%, 38%, and 38%, respectively were obtained. Univariate analysis identified improvement in 5-year LRFFS (53.8% vs 18.6%) in patients who had primary treatment at an outside institution. No significant differences in LRFFS were seen between different modalities. One patient developed symptomatic temporal lobe necrosis.

Conclusion:
Results of the study show that Re-RT may be a safe and effective treatment strategy in patients with rNPC following definitive treatment.

Keywords: Nasopharyngeal carcinoma
Dosimetric evaluation of Cochlea in radical radio-chemotherapy for non nasopharyngeal Head and neck squamous cell carcinoma (HNSCC)

Nithin Bhaskar

Background : Sensory-neural hearing loss is a known late effect of radical chemo-radiotherapy (CTRRT) in head and neck squamous cell carcinoma (HNSCC). The doses to cochlea which determines this late effect has been reported especially in nasopharyngeal carcinoma. However, non nasopharyngeal HNSCC also require doses to cochlea to be routinely documented.

Aim: Dosimetric evaluation of Cochlea in radical radio-chemotherapy for non nasopharyngeal HNSCC treated by Simultaneous Integrated Boost (SIB)

Methods and Materials

14 diagnosed cases of non nasopharyngeal HNSCC, treated radically with 70Gy in 33 fractions radiotherapy (SIB - MSKCC protocol) with or without concurrent weekly cisplatin were reviewed and doses to the cochlea were documented. All patients underwent baseline audiometry before the start of treatment.

Results

The cohort consisted of 13 males and one female; with a median age of 62.5 years. Six oropharyngeal cancers, six hypopharyngeal pharynx primaries, one oral cavity cancer and one neck nodes with unknown primary. The mean cochlear Dmean in the cohort was 27.25 Gy (range 55.7 Gy – 2.67 Gy), which was within the tolerance limits laid down by QUANTEC, although, three cases had a Dmean more than 45 Gy. 2/14 cases had V5% > 55Gy.

Conclusions

The doses to cochlea in non nasopharyngeal cancers are often overlooked. Our analysis revealed that in some cases, cochlea receives higher doses than recommended. These findings stress the importance of looking into the cochlear doses when evaluating HNSCC treatment plans.

Keywords: Dosimetric data, sensorineural hearing loss, cochlea
Psychological Assessment of Head & Neck Cancer Patients: A Review (Single centre Study)

Rajesh K. Agarwal, Zehra Fatima, Anu Tiwari

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Introduction- Head and neck cancer patients and their caregivers report high rates of psychological distress. High rates of physical symptom burden and the increased need for family members to provide caregiving during treatment may contribute to this distress. Prevalence of oral cancer in North India is around 80%. The Quality of Life can be affected as the treatment may alter body image, and daily activities such as drinking, eating, breathing and speaking. Thus, addressing the psychological need of such patient is crucial.

Method- Total of 153 patients were evaluated for quality of life with the help of EORTC QLQ-C30. The questionnaire has 5 sub-categories (physical, social, role, emotional and cognitive functioning) and 9 single items (pain, fatigue, financial effect, appetite loss, nausea/vomiting, diarrhoea, constipation, sleep pattern and Quality of Life).

Result- Most of the patients had good Quality of Life and the social adjustment was efficient, thus psychological distress, in this review was less. Patients who did not have good Quality of Life were 29%, patients with poor general condition were 19% and with poor social adjustment were 42%.

Conclusion- It was seen that Psychological intervention should be considered as a mandatory part of the multi-disciplinary approach towards the cancer treatment. However, head and neck cancer patients need specific attention and care.

Keywords : Head & Neck Cancer, Psychological Assessment Introduction- Head and neck cancer patients and their caregivers report high rates of psychological distress. High rates of physical symptom burden and the increased need for family members to provide caregiving during treatment may contribute to this distress. Prevalence of oral cancer in North India is around 80%. The Quality of Life can be affected as the treatment may alter body image, and daily activities such as drinking, eating, breathing and speaking. Thus, addressing the psychological need of such patient is crucial.

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Keywords : Head & Neck Cancer, Psychological Assessment
Effectiveness of Acupuncture Therapy in Preventing or Reducing Xerostomia on Head and Neck Cancer Patients from Radiotherapy: An Evidence-Based Case Report

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Background: Dry Mouth (Xerostomia) often occurs as result of damaged saliva glands due to radiation therapy dosage applied to treat head and neck cancer. Saliva tissue is sensitive to external radiation exposure, and xerostomia often develops when gland is included in the organ at risk therapy. Acupuncture may become an option for patients with secondary xerostomia due to radiotherapy for malign situation on head and neck. This therapy is expected to minimize symptoms on patients with advanced phase diagnostics.

Purpose: To compare the effectiveness of acupuncture therapy in preventing and and reducing dry mouth (xerostomia) on neck and cancer patients due to radiotherapy.

Method: Article research is conducted at Pubmed, Cochrane, Ebscohost and Springerlink in accordance with the clinical questions. After being filtered with inclusion and exclusion criteria, the author discovered 1 article with meta-analysis design and 3 articles with RCT design. Since the comparative component in meta-analysis conflicts with our clinical questions, the author decided to analysed 2 additional articles in such article, in accordance with the clinical questions. All five articles were then critically evaluated based on its validity, importance and applicability factor.

Results: A study compared real acupuncture therapy with sham acupuncture on head and neck cancer patients which underwent radiotherapy. Research results produced xerostomia questionnaires which >30 is considered as acute xerostomia. Scoring on the 6th week presented results of RR 0.29, CI 0.10 to 0.79 and NNT 1.6. On the 11th week, the result comprised of RR 0.17, CI 0.03 to 1.07 and NNT 1.6.

Conclusions: Acupuncture therapy has proven to prevent xerostomia occurrence on head and neck cancer patients undergoing radiotherapy; however the effectiveness of acupuncture after radiation (1 month post radiation) did not produce significant relationship. Therefore, further studies is required to observe the effectiveness of acupuncture therapy to prevent xerostomia especially in the follow up phase after radiation has been performed.

Keywords: radiotherapy, therapy, acupuncture, head and neck cancer, xerostomia,
Induction Chemotherapy Followed By Concurrent Chemoradiotherapy In A 14 Years Old Patient With Poorly Differentiated Nasopharyngeal Carcinoma: JRRMMC Experience of The ARAR0331 Protocol

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A major consideration of radiotherapy in children is toxicity. Adults with nasopharyngeal carcinoma (NPCA) usually receive concurrent chemoradiotherapy with or without adjuvant chemotherapy as standard treatment; however, the rarity of pediatric NPCA patients makes the sequence and dosages of both modalities less clear-cut. The ARAR0331 protocol published by the Children’s Oncology Group noted good overall and event-free survival.

This is a case report of a 14 year old Filipino male who presented with a right-sided neck mass without accompanying symptoms which increased in size to around 5x5 cm 5 months prior to consult. Punch biopsy revealed squamous cell carcinoma, poorly differentiated. CT scan showed lobulated right nasopharyngeal mass, extending to the right temporal lobe and an enlarged level II lymph node (T4N1M0, Stage IVA). ARAR0331 protocol was initiated with 4 cycles of induction chemotherapy (5-FU 1 g/m2/d CI x 5 days + Cisplatin 80 mg/m2). CT scan post-chemotherapy revealed absence of mass and lymphadenopathy. Patient was given concurrent chemoradiotherapy (tri-weekly cisplatin 100 mg/m2). Radiotherapy included opposed lateral faciocervical fields prescribed 61.2 Gy/1.8 Gy/34 fractions and low anterior neck anteroposterior field prescribed 50.4 Gy/18 Gy/28 fractions.

Patient tolerated treatment for 7 weeks without complications. RTOG grade 1 toxicities to the skin, saliva, and mucous membranes were noted. Follow-up imaging up to 1 year post treatment revealed absence of the mass and metastasis.

This is the first reported use of the ARAR0331 protocol for a case of pediatric NPCA in the country and illustrates its feasibility and short-term effectiveness in our setting.

Keywords: Pediatric, NPCA De-escalation, Adaptive Radiotherapy ARAR0331
University of Santo Tomas Hospital - Benavides Cancer Institute, Manila, Philippines Outcomes with Local Therapy for Metastatic Nasopharyngeal Carcinomas: Experience from a Tertiary Center in a Developing Country


Introduction: The role of local treatment is currently undefined in patients with metastatic nasopharyngeal carcinoma (NPC). We evaluated the oncologic outcomes after local radiotherapy in newly-diagnosed metastatic NPC patients at our center.

Materials/Methods: We retrospectively reviewed records of 17 patients with metastatic NPC at diagnosis from the period of 2006 to 2017. All patients were treated with primary local radiotherapy at our center. The median age of the cohort was 50 years old. Majority of the population had T3/T4 (65%) and/or N3 (64.7%) disease. Most of the patients were treated with conventional Modified Ho’s technique (70.6%) and received a total dose of 70Gy (76.5%). Twelve (70.6%) patients were given concurrent chemotherapy (triweekly cisplatin) and another 12 received induction chemotherapy (cisplatin + FU, 64.7%) Oncologic outcomes were calculated using the Kaplan Meier method. Clinical parameters and treatment modalities were compared using univariate analysis. Results: The median follow-up for the entire cohort was 11 months (range, 1-93 months). One-year and 2-year overall survival were 69% and 36%, respectively with a median survival estimate of 24 months. Univariate analysis showed significantly improved survival for patients with higher performance status (p=0.001) and those who had concurrent chemotherapy (p=0.46). No significant difference in overall survival was seen between RT modalities, T and N stage, site of metastasis, and induction chemotherapy. Five patients developed grade 3 mucositis. No grade 4 toxicities were noted.

Conclusion:

Local radiotherapy combined with systemic treatment may be associated with prolonged survival in newly diagnosed metastatic nasopharyngeal carcinoma patients.
Comparison of treatment responses between radiation and concurrent chemoradiation in locally advanced supraglottic laryngeal cancer.

Meher Zabin

Objective: The study was done to observe the outcome of radiation and concurrent chemoradiation in locally advanced supraglottic laryngeal cancer.

Materials and Methods: This Quasi-Experimental study was done from January 2010 to December 2010 in Dhaka Medical College Hospital and National Institute of Cancer Research & Hospital. Sixty diagnosed patients of locally advanced supraglottic laryngeal cancer were selected and divided into two arms, each containing 30 cases. Cases of Arm A were treated with concurrent chemoradiation and those of Arm B were treated with radiotherapy alone. The dose of radiation given to all cases of both arms was 66 Gy. Arm A cases received chemotherapy concomitantly with Inj Cisplatin (30mg/m2) weekly for 6 weeks. The cases were followed up for 6 months.

Result: Patients were aged between 35 to 67 years. The mean age was 53.56 years. Male, female ratio was 14:1. Ninety percent (90%) patients were smoker. The most common presenting features were cervical lymphadenopathy (100%), sore throat (70%), hoarseness of voice (52%) etc. Complete response of patients treated with concurrent chemoradiation was 73.33% in comparison to 30% complete response achieved in patients treated with radiotherapy alone. This difference was statistically significant (p=0.008). The toxicities in Arm A were more than that of Arm B, but were manageable.

Conclusion: Concurrent chemoradiation is more effective than radiotherapy alone in locally advanced supraglottic laryngeal cancer but toxicity is more.

Keywords: Radiotherapy, concurrent chemoradiation, locally advanced, Supraglottic laryngeal cancer, complete response, partial response.
PA022

External Beam Radiotherapy (EBRT) in the Management of Thyroid Carcinoma. Case Series of Its Utilization Based on Our Experience in Hospital Universiti Sains Malaysia

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Introduction

Thyroid carcinoma is a common endocrine malignancy with an incidence of 14.2 per 100,000 population. In Malaysia, thyroid carcinoma accounts for 2.9% of all malignancies and female and the 15-24 year old age group representing groups with higher incidence. The mainstay of treatment for thyroid carcinoma are surgery followed by remnant ablation with radioiodine therapy. However external beam radiotherapy (EBRT) in recent time becoming increasingly important and vital in optimizing treatment plan and providing better prognosis especially for patients with advance disease. Here we discuss case series of different role of EBRT in the management of thyroid carcinoma in our centre.

Case Series

A 53 year old, gentleman presented with sudden onset of airway obstruction requiring emergency tracheostomy. Biochemistry, imaging and cytology imaging showed locally advanced differentiated thyroid carcinoma with lung metastasis. Subtotal thyroidectomy was performed but with incompletely resection of the retrosternal extension of the tumour. EBRT of 66Gy/33# to the neck and mediastinum was prescribed for locoregional control followed by high dose radioiodine ablation therapy. The second case is a 54 year old lady initially presented with left groin swelling and reduce mobility associated with significant weight loss and was subsequently diagnosed with metastatic follicular thyroid carcinoma to the pelvis. Total thyroidectomy, high dose radioiodine ablation therapy and EBRT of 30Gy in 10# to the pelvis were done with significant improvement in her mobility as well as overall quality of life. Our last case is a 29 year old lady with known follicular thyroid carcinoma presented with progressively worsening numbness and weakness of the bilateral lower limb. A MRI of the spine showed mass arising from T10 vertebra compressing the spinal cord with associated perilesional edema. An emergency EBRT of 30Gy in 10# to the spine was ensued with the aim of salvaging the neurological function.

Conclusion

Our case series have shown EBRT as an important treatment tool in the management of thyroid carcinoma.
Adenoid Cystic Carcinoma of the Lacrimal Gland Treated with Eye Sparing Surgery and Adjuvant Radiation Therapy using Intensity-Modulated Radiation Therapy (IMRT).

Jose Miguel

University of the Philippines – Philippine General Hospital Department of Radiology

Malignant neoplasms arising from lacrimal gland epithelium are exceedingly rare tumors. The most common histologic diagnosis described in literature is adenoid cystic carcinoma (AdCC). Patients with lacrimal gland AdCC may initially present with non-specific symptoms such as blurring of vision and eye pain, which are easily attributable to more benign conditions. This often results to a delay in diagnosis and proper management. And although lacrimal gland AdCC is described as having a long natural history, it is also associated with a poor prognosis due to its propensity for local recurrence after initial treatment. Unfortunately, due to the rarity of this condition, the ideal management strategy for lacrimal gland AdCC still remains controversial. We report a case of lacrimal gland adenoid cystic carcinoma (AdCC) treated with eye sparing surgery and adjuvant external beam radiation therapy using intensity modulated radiation therapy.

Keywords: Lacrimal Gland Tumors, Adenoid Cystic Carcinoma, Eye-sparing Surgery, Intensity-Modulated Radiation Therapy
Mammary Analogue Secretory Carcinoma of the Parotid; a Case Report from the Phillipines

Jose Mario M. Luna, MS

Introduction Mammary Analogue Secretory Carcinoma (MASC) is a rare histologic subtype of salivary gland neoplasm that was first described in 2010. It has the same histologic and immunostaining profiles with certain types of breast cancer, attributed to a chromosomal translocation in salivary gland tumors which is identical in the fusion gene mutation in the secretory subtype of invasive mammary ductal carcinoma (12;15)(p13;q25). The treatment is usually a combination of complete excision, post-operative radiation therapy (PORT) and chemotherapy.

Case Presentation A 68/F presented with a 2 years’ history of an approximately 1 cm right pre-auricular mass which was subsequently excised and biopsied. The mass was proven to be MASC of the right parotid. A radiation dose of 60Gy in 30 fractions was delivered to the post-operative bed, high right level II cervical lymph nodes, and parapharyngeal space. 50Gy in 30 fractions was delivered to the ipsilateral right cervical lymph nodes level IB-III). The patient tolerated the radiation therapy well with no greater than RTOG grade III acute adverse reactions. Six months after radiation therapy, there were no more acute adverse reactions and greater than RTOG grade I late adverse reactions reported. There were no palpable nodule and mass on the right neck.

Conclusion Not much evidence is available on the use of PORT for MASC. Recent data and this clinical case suggests that PORT may have a role in delaying the recurrence of the tumor while keeping severe acute adverse reactions to a minimum, pending a longer follow-up.
Clinical effect of radiotherapy on supraglottic laryngeal or hypopharyngeal carcinoma: A single-center study

Min Zhang

Objective Our objective was to analyze the outcome of patients with laryngeal cancer or hypopharyngeal cancer treated with curative radiotherapy or the combination of surgery with postoperative radiotherapy.

Methods A total of 37 patients treated from January 2012 to August 2016 were reviewed. In 19 cases treated with the combination of surgery with postoperative radiotherapy (group A), 6 cases were treated with postoperative concurrent chemoradiotherapy. 1 case was treated with postoperative radiotherapy plus Sodium Glycididazole. Of the other 18 cases treated with radical radiotherapy (group B), 14 cases were treated with concurrent radiochemotherapy, 1 case was treated with radiotherapy plus Sodium Glycididazole and 3 cases were treated with radiotherapy alone.

Results The patients of the two groups were similar with respect to mean ages, original sites, stages, T stages, and N stages. The 3-years local control rates were 60.8%, and no statistical difference were observed between the two groups(47.1% vs.59.5%, P= 0.364). The 3-year overall survival rate was 54.4%, and no statistical difference were observed between the two groups(51.69% vs.70.67%, P=0.277). The 3-year disease free survival rates were 42.1%, and no statistical difference were observed between the two groups(34.6% vs.49.6%, P=0.277).

Conclusions Radical radiotherapy is an effective treatment for supraglottic laryngeal carcinoma and hypopharyngeal carcinoma.

Keywords: head and neck, curative radiotherapy, postoperative radiotherapy, overall survival
Validation of the 8th AJCC Staging System of Nasopharyngeal Carcinoma in the Era of Intensity-Modulated Radiotherapy

Shiran Sun

Purpose: To evaluate the 8th edition of the International Union against Cancer/American Joint Committee on Cancer (UICC/AJCC) staging system for nasopharyngeal carcinoma (NPC) in patients treated with intensity-modulated radiotherapy (IMRT).

Methods and materials: A total of 812 patients with biopsy-proven, non-metastatic NPC treated with IMRT in our institution between August 2003 and January 2012, were retrospectively re-staged with the 8th edition staging system. The distribution and the impact of T stage, N stage and clinical stage on overall survival (OS), disease-free survival (DFS), local relapse-free survival (LRFS) and distant metastasis-free survival (DMFS) were analyzed.

Results: The proportion of patients in Stage I, II, III and IVA were 3.1%, 18.3%, 41.7%, and 36.8%, respectively. The 5-year OS, DFS, LRFS, RRFS and DMFS were 80.0%, 81.2%, 91.6%, 95.0% and 82.2%, respectively. The 5-year LRFS rates for T1-4 patients were 94.8%, 94.9%, 94.1% and 81.1%, respectively. The differences between T1 and T2, T1 and T3, T2 and T3 were lack of significant statistically. The 5-year DMFS rates for N0-3 patients were 96.9%, 87.0%, 82.2% and 63.6%, respectively. The differences between N1 and N2 were lack of significant statistically. The 5-year disease-specific survival (DSS) rates for stage I-IV patients were 100%, 93.7%, 86.7% and 66.6%, respectively. The differences between I and II, I and III, II and III were lack of significant statistically.

Conclusions: The 8th edition of the staging system is acceptable with regard to the distribution of clinical stage and prediction of treatment outcomes.

Keywords: nasopharyngeal carcinoma; staging system; intensity-modulated radiotherapy
CNS
Radiation effects on neurons and its consequences: investigation by in vitro, in vivo and in silico studies

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Irradiating healthy neurons during a course of radiation therapy for brain tumors is unavoidable. Several clinical studies have reported that irradiation of the brain has detrimental effects on cognitive endpoints. However, how radiation induces cognitive damage is still poorly understood. Here, we studied radiation effects from X-rays and Carbon ions and the underlying mechanisms in the brain. We performed in vitro analysis using cultured primary hippocampal neurons and investigated the changes of essential proteins for the function of synapses. Subsequently, we analyzed the acute memory formation by in vivo analysis. We are also developing a simulation platform, TOPAS-nBio, to determine the distribution of energy deposition events within the neuron. We observed that radiation affects immature and mature neurons differently. Our results showed that less than 1 Gy of X-rays cause delayed cell death in some immature neurons while other neurons survived but with decreases in postsynaptic proteins such as PSD-95 and drebrin at three weeks. On the other hand, 10 Gy of X-rays does not cause cell death in mature neurons but may induce a temporary decrease of the postsynaptic protein drebrin which is thought to be correlated with the change in memory formation. Interestingly, X-rays and Carbon ions show different results related to neuronal cell death and function. Additionally, we are modeling the radiation energy deposition in cell body or neurites in silico. In conclusion, we have shown that even moderate doses of radiation could affect the neuronal function which has significant implications for radiation therapy treatment planning.

Keywords: radiation, brain, neurons, cell death, cognitive function, synaptic function
Clinical outcome of single isocenter, dynamic conformal arc stereotactic radiotherapy using Multiple Brain Mets SRS

Haruo Inokuchi

Purpose:
Several treatment planning systems are available for linac based stereotactic radiotherapy for multiple brain metastases. Here, we present our initial practical experience with a new technology which enables simultaneous irradiation of multiple brain metastasis with mono-isocenter and multiple dynamic conformal non-coplanar arcs (DCA).

Methods: Patients positioning is based upon non-stereotactic real-time skeletal digital reconstructed radiographs obtained with the Novalis ExacTrac system and robotic table. Multiple Brain Mets (MBM) module from BrainLab delivered with up to 5 DCA. V5 and V12 as well as the mean brain dose were used to evaluate the dose to the normal brain. The total MUs, beam on time and in room time were also recorded.

Results: we have treated 14 patients with MBM with a minimum of 2 and a maximum of 10 metastases (median 5). Primary cancer sites were lung (12), cervix(1), kidney (1). Cumulative tumor volumes were 1.4-28.6cc (median 8.9cc). The prescribed dose was 28-35 Gy normalized to the 95% volume of the target volume in 4-5 fractions. The percentage of normal brain tissue exposed to >12 Gy was 0-7% (median 0.7%). Beam on time and in room time were 8-17min (median 12min) and 11-25min (median 18min), respectively. Early response tumor regression time was consistent with our previous data for conventional radiosurgical techniques.

Conclusion: Single-isocenter simultaneous radiotherapy using MBM was well tolerated and addressed potential benefits of optimizing patient throughput. This technique is a promising treatment management for patients with multiple brain metastases.

Keywords: multiple brain metastases, single isocenter, stereotactic radiotherapy
Stereotactic Radiosurgery For Single or Oligometastatic Brain Lesions – A Single Institutional Experience


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Aim: Intracranial metastases are the most common neurologic complications of systemic cancer. Stereotactic radio surgery (SRS) is a proven modality for treating single or oligometastatic brain lesions. In this retrospective study we have analyzed patients data treated in our hospital with SRS.

Materials/Methods: The analysis included 52 patients data treated between August 2010 to January 2018. These include the patients in complete remission of the primary disease and have recurred in the brain with one to four metastases after a significant disease free interval. Patients case sheets and treatment planning system data were analyzed to collect the data for this study.

Results: Median follow up was 10 months (range, 1 to 37 months). There were 20 cases of Ca Lung, 13 cases of Ca Breast, 5 cases of Ca Rectum, 4 cases of Ca Endometrium, 2 case of Ca Esophagus and 1 case each of Alveolar Rhabdomyosarcoma of right parotid, Ca Ovary, Ca Vaginal vault, Ca Lacrimal gland, Ca Colon, Ca Urinary Bladder and Ca Prostate. These patients who had recurrent disease in the brain were treated with doses ranging from 15Gy to 20Gy in single fraction, 24Gy in 3 fractions, 27Gy in 3 fractions or 30Gy in 5 fractions. Median progression free survival was 9 months and median overall survival was 12 months in these patients.

Conclusion: Frameless Stereotactic Radiosurgery is a valid option of delivering high dose radiation to patients who develop one to four brain metastasis with comparable median progression free and overall survival to the previously reported data.
A Correlation study of Histological and Molecular Diagnosis in Adult Glioblastoma Multiformes patients treated with adjuvant chemoradiation

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Aim: To evaluate frequency of 1p/19q Codeletion. IDH 1 mutation, ATRX deletion, MGMT gene methylation in adult patients with glioblastoma multiformes (GBM) and correlate with response to chemoradiation.

Methods and materials: Between January 2017 and July 2018, 30 cases diagnosed as glioblastoma multiformes in histopathology as per the WHO classification 2007 modified 2016 underwent four molecular studies ie; Chromosome 1p and 19q deletion status done by in Flourescence situ hybridisation studies, IDH 1 mutation by IHC using mutation specific antibody, ATRX deletion by IHC, MGMT gene hypermethylation by methylation specific PCR at a tertiary care centre underwent maximum safe resection followed by adjuvant radiotherapy to 60 Gy with concurrent Temozolamide and adjuvant Temozolamide for six months. The dose of Temozolamide was 75 mg/ m2 concurrent with RT followed by 6 cycles of adjuvant TMZ at 150 -200 mg/ m2 given 5 days of every 28 days. The median age (range) was 46.5 years (18-67years); 21(70%) were male; All were referred from Department of Neurosurgery after undergoing maximum safe resection. Presenting features included headache (95%), vomiting (65%) and seizures (48%). The median (mean, SD, range) of symptoms were 9 months (31, 19.8, 1-72). Median (mean, SD, range) diameter of residual disease was 5.0 cm (3.1, 3.2, 3.4-5.8) and in 29(73%) patients both CT scan and MRI were used for initial imaging. Time (mean, SD, range) from the most recent surgery to start of radiotherapy being 2.6 months (2.8, 7.8, 5-6). Following immobilization patients were treated on a 6 /10MV linear accelerator. Median dose (range) was 60Gy (59.4-60 Gy) given in 1.8-2.0 Gy fractions, 5 fractions/week. Progression free survival was computed with the Kaplan-Meier method and correlation was done with molecular markers.

Results: Following RT, patients were assessed clinically as well as a using radiological imaging. Thirteen (43%) patients had a reduction in tumor size post RT. With median (range) follow up of 22.3 months (1.4-146.6), disease was stable in 18(45%), progressive in 12 (36%). Of the 30 patients IDH 1 mutation was seen in 15, Chromosome 1p and 19q deletion status codeleted in 7 patients, ATRX deletion seen in 7, MGMT gene methylation in 5 patients.No patient had any documented second malignancy or cerebro-vascular events. Neuro-cognition was not assessed.

Conclusion: Concurrent temozolamide and RT as described in patients following a conservative surgery in patients of GBM is safe and effective for tumor control. The current study was designed to investigate the frequency of 1p/19q Codeletion, IDH 1 mutation, ATRX deletion and MGMT gene methylation in high grade gliomas in Indian patients and its correlation with response to chemoradiation and overall survival. Challenges for management include reliable follow up and financial limitations that preclude periodic imaging.
Hippocampal avoidance in Whole Brain Radiotherapy for Metastases – Comparative Neurocognitive and Dosimetric Assessment

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Purpose/Objective(s): Hippocampus is associated with formation and storage of new memory and irradiation of the same during whole brain radiotherapy in brain metastases leads to decline in the neurocognitive function. Recent advancements in radiation delivery in form of IMRT, Hippocampal avoidance has been made possible. We analyze feasibility of hippocampal sparing and associated neurocognitive and dosimetric assessment.

Materials/Methods:
75 patients diagnosed radiologically and clinically with brain metastases were included in the study. Mini Mental State Examination (MMSE) and quality of life assessment with EORTC BN20 questionnaire were assessed along with dosimetry. Patients were assessed at baseline and followed by at 1, 3 and 6 months respectively. Wilcoxon test for multiple comparisons was calculated to detect significant differences in global QoL scores.

Results:
Median age was 49 years. Median D100% and Dmax to contralateral hippocampus was 7.1Gy and 16.7Gy. With IMRT, doses to other critical structures were reduced. Patients treated with IMRT were found to have achieved desired dose constraints to hippocampus. Assessment of neurocognitive function between two groups, there was no difference at 1 month after treatment, however, difference was seen at 3 and 6 months. No difference noted in other aspects of quality of life between two groups. No severe toxicities (Grade 3 and 4) were noted in either group. Median survival in the HA-WBRT arm was found to be 9.8 months.

Conclusion:
Conformal avoidance of hippocampus during WBRT is associated with improved neurocognitive function and quality of life. IMRT has found to provide better dosimetric outcomes in HA-WBRT.

Keywords: Glioma, Neurocognition, Hippocampal avoidance
Favourable Outcome of AIDS-Related Multicentric Central Nervous System EBV-Associated Smooth Muscle Tumour with Surgery and Adjuvant Radiation Therapy: a Case Study and Literature Review

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Epstein-Barr virus associated smooth muscle tumour (EBV-SMT) is a unique condition which affects immunocompromised patients. We describe the favourable outcome of a patient with acquired immune deficiency syndrome (AIDS)-related multicentric EBV-SMT involving the posterior fossa and spine treated with surgery and adjuvant volumetric modulated arc therapy (VMAT) comprising 50 Gy in 25 fractions to four sites initially to the brain and lumbosacral spine followed by 6th to 9th thoracic vertebrae (T6-9) and sacrum a year later. All the four sites remained stable with follow up at 2 years (for first two sites) and 9 months (for the latter two sites) respectively. Reported literature suggests that AIDS-related EBV-SMT are more sensitive to radiotherapy, however compliance to the highly active anti-retroviral therapy (HAART) is paramount in preventing future recurrence. This case also emphasizes the importance of ensuring the best possible outcome for uncommon tumour through multidisciplinary management.

Keywords: AIDS, EBV, smooth muscle tumour, radiotherapy
Lung
Quantitative Accuracy of Radiomic Features of Low-Dose 18F-FDG PET Imaging

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Introduction:

Radiomic features (RF) are quantitative image measures extracted from medical images which allow further characterization of lesions. We aimed to explore accuracy of RF, such as texture features and first-order statistics, in low-dose 18F-FDG PET imaging.

Methods: Twenty patients with lung malignancy were enrolled. They underwent a whole-body 18F-FDG PET/CT scan, and low-dose situations (true counts: 20x106, 15x106, 10x106, 7.5x106, 5x106, 2x106, 1x106, 0.5x106, 0.25x106) were simulated by randomly discarding counts from acquired list-mode data. Texture-based RF included features calculated from gray-level co-occurrence matrix (GLCM), gray level run length matrix (GLRLM), gray-level size zone matrix (GLSZM), neighboring gray-level dependence matrix (NGLDM) and neighbor gray-tone difference matrix (NGTDM). All RFs for each lesion, mean and maximum standardized uptake value (SUV) in normal lung and liver, and bias percentage at different count levels for each RF were calculated.

Results: 65 lesions with a volume >1 cm3 were found (mean volume, 8.6 cm3, volume range, 1.0-184.0 cm3). Bias percentage for all RFs increased with reducing count data. SUVmean in lesions, normal lung & liver, entropy and sum entropy from GLCM, busyness from NGTDM and run-length non-uniformity from GLRLM were the most robust features. RF including cluster shade from GLCM, long-run low grey-level emphasis high grey-level run emphasis and short-run low grey-level emphasis from GLRM exhibited the worst performance with 50% of bias with 20x106 counts.

Conclusions: SUVmean, entropy and sum entropy from GLCM, busyness from NGTDM and run-length non-uniformity from GLRLM were the least sensitive features to lowering count.

Keywords: Radiomics, low dose, 18F-FDG PET/CT
Significance of 18F-FDG PET parameters according to histologic subtype in the treatment outcome of stage III non-small cell lung cancer undergoing definitive concurrent chemoradiotherapy

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Purpose: We analysed pre-treatment PET-CT parameters in patients with stage III NSCLC undergoing concurrent chemoradiotherapy (CRT) to examine the prognostic value of PET-CT parameters according to histologic subtypes (squamous cell carcinoma [SqCC] and adenocarcinoma [ADC]).

Methods: We retrospectively reviewed data from 130 NSCLC patients who underwent definitive CRT. Radiotherapy was delivered with a median dose of 66 Gy. We obtained PET-CT parameters such as SUVmax, SUVmean, TLG, MTV, and CV. Each parameter was bifurcated based on the optimal cut-off, and propensity score matching was performed between the SqCC and ADC groups.

Results: The median follow-up was 51.3 months (range: 19.2–109.3) for surviving patients, and the median overall survival (OS) was 35.5 months. There were 108 patients diagnosed with SqCC or ADC and 44 patients each were allocated to SqCC and ADC groups via propensity score matching. SUVmax, SUVmean, TLG, and MTV values were significantly higher in SqCC than in ADC. In the SqCC group, PET-CT parameters were not associated with survival outcomes. However, in the ADC group, SUVmax and SUVmean were related to LRPFS and TLG and MTV were related to OS. In addition, patients with ADC showed more frequent distant metastasis and worse DMFS compared with SqCC patients.

Conclusions: PET-CT provided different prognostic implications between SqCC and ADC in locally advanced NSCLC patients receiving radical CRT. This suggests that it is necessary to consider the histologic subtype and PET-CT parameters concurrently when predicting survival outcomes.

Key Words: Non-small cell lung cancer, chemoradiotherapy, PET-CT, prognostic factor, histology
Stereotactic Body Radiation Therapy for Medically Inoperable Early-Staged Non-Small Cell Lung Cancer, Preliminary Data of A Single Institution Experience

Jose Mario M. Luna, Angela D. Gaerlan-Tagle,

Introduction & Objectives

Although Stereotactic Body Radiotherapy (SBRT) has been well established and is the preferred treatment for early-staged non-small cell lung cancer (NSCLC) over conventionally fractionated radiotherapy, this technology is not yet widely available in the Philippines. No data have been reported on its use for lung cancer in our country. We report our institution’s preliminary results on the use of SBRT for early staged, medically inoperable NSCLC. The primary objective is to look into local control rate, with overall survival as a secondary endpoint.

Design, Setting & Patients

This is a single institution review of patients with biopsy proven stage I (T1-T2a, N0, M0), medically inoperable NSCLC. The prescription dose was 50 Gy in 4-5 fractions (BED 100-112.5 Gy) to the isodose covering the PTV. The study period was from 2011-2016.

Results

A total of 10 patients were accrued, of which all had minimum follow up of 18 months at the time of the study period.

Results showed that local control rate was 88,9% at 12 months, and 83,3% at 18 months with an overall survival rate of 90% at 12 months, and 60% at 18 months. There were no reported grade 3-5 toxicities.

Conclusion

This preliminary results suggest improved local control rate compared to historical controls of conventionally fractionated radiotherapy with an average of 60-70% local control rate at 1-2 years.

Perhaps a bigger BED can be used to improve the local control rate of future patients that will be treated with SBRT in our institution.

Keyword: lung, SBRT, stereotactic, Philippines, NSCLC, lung cancer
Single Lung Stereotactic Body Radiotherapy (SLABR)- a Case Report and Overview of Literature

JP Agarwal

Introduction: Management of a second primary lung cancer (SPLC) after prior pneumonectomy (PP) poses a significant clinical challenge. Treatment options include sub-lobar surgical resection, conventional RT and stereotactic body radiotherapy (SBRT). Low cardiopulmonary reserve limits the use of surgery in the majority. SBRT has been shown to be a safe and effective treatment option for medically inoperable early stage lung cancer. However, there is limited data on the use of SBRT in patients with a single lung. Herein we discuss the challenges in management and case summary of one such patient.

Methodology: We treated a patient with metachronous SPLC with SBRT after a disease free interval of 5 years. He had previously undergone preoperative chemo-radiotherapy and a pneumonectomy. The SBRT dose delivered was of 60Gy in 8 alternate day fractions using 4DCT planning and VMAT technique with isocentre based prescription. Volumetric imaging was used at every fraction for image guidance.

Results: The dose received by 100% of PTV was 95%. Mean single lung dose was 4.6 Gy, volume of lung receiving dose of 5Gy (V5), 10Gy (V10) and 20Gy (V20) was 21%, 10% and 16%, respectively. These dose constraints met the criteria proposed in literature for SBRT of patients with primary NSCLC. There was no acute pulmonary and oesophageal toxicity.

Conclusion: SBRT is a safe and technically feasible option for patients with single lung.

Keywords: Pneumonectomy; SBRT; Second primary; Single lung
Clinical Experience and predictive factors of response to Whole Brain radiotherapy in metastatic lung cancer – A Single Institute experience

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Aim/ Objective:
Metastases in lung cancer especially to the brain is associated with poor outcomes and warrants palliative care in form of whole brain radiation therapy or best supportive care. Prognostic factors for overall survival are seen in many studies. Aim of this study was to identify clinical outcomes and assess predictive factors associated with treatment outcomes with WBRT in lung metastases.

Material and Methods:
From 2009 to 2016, from the medical records of Jupiter Hospital, 95 patients were evaluated retrospectively for demographic and treatment and clinical outcome parameters. Univariate and multivariate analysis were assessed for the various impact of the parameters in the treatment outcomes. Various parameters assessed were age, Charlson comorbidity score, gender, marital status, use of chemotherapy, other metastatic sites, weight loss, BMI and edema and extent of edema/tumor ration (E/T).

Results:
In the univariate analysis, poor outcomes were related to small cell lung cancer (p = 0.0006), E/T ratio > 1.5 (p <0.001), median tumor diameter <2 cm was associated with better prognosis. On Multivariate analysis, low Charlson comorbidity score, male gender, presence of extra-cranial metastases, weight loss >10% and higher BMI were associated with poorer outcomes. On subset analysis as per the risk factors, the median survival was 5.6 months’ vs 9.2 months in poor risk factors vs the better factors.

Conclusion:
In view of end of life WBRT, in cases where outcomes are poor, they can be considered for best supportive care and these require quality of life assessments to predict the outcome comparison.

Keywords:
Lung Metastases, Predictive factors, WBRT
Gynecology
Nomograms predicting overall survival and disease-free survival in patients with cervical cancer treated with concurrent chemoradiotherapy: a special focus on lymph nodes metastases

Weiping Wang

Objective: To construct nomograms predicting the overall survival (OS) and disease-free survival (DFS) in patients with cervical cancer treated with concurrent chemoradiotherapy (CCRT).

Methods: A total of 833 patients with cervical cancer treated with definitive radiotherapy or CCRT in our institute from January 2011 to December 2014 were included. Cox proportional hazard regression models were used in univariate and multivariate analysis. The following variables were included in the univariate analysis: histology, FIGO stage, lymph node metastases (para-aortic, pelvic, common iliac, bilateral pelvic, and bilateral common iliac LNMs), the number of pelvic metastatic lymph nodes (MLNs), and the diameter of pelvic MLNs. Nomograms predicting the 3- and 5-year OS and DFS were constructed. The nomograms were internally validated with respect to discrimination and calibration.

Results: The median follow-up period was 36.4 months (range, 1.0 to 76.2 months). After univariate and multivariate analysis, histology, FIGO stage, para-aortic LNM, pelvic LNM, and the number of MLNs significantly predicted both OS and DFS. Nomograms predicting the 3- and 5-year OS and DFS were constructed incorporating these significant variables. The two nomograms showed good discrimination and calibration, with a concordance index of 0.73 for predicting OS and 0.71 for DFS. The concordance index values of the nomograms proved to be superior to those of the FIGO staging system in predicting both OS (p<0.001) and DFS (p<0.001).

Conclusion: We constructed nomograms predicting OS and DFS with a special focus on regional LNM in patients with cervical cancer treated with concurrent chemoradiotherapy.

Key word: nomograms, uterine cervical cancer, chemoradiotherapy, lymph node metastases
Comparison of treatment outcomes between squamous cell carcinoma and adenocarcinoma of cervix after definitive radiotherapy or concurrent chemoradiotherapy

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Background: Concurrent chemoradiotherapy (CCRT) is efficacy in the treatment of locally advanced cervical squamous cell carcinoma (SCC). However, it was conflicting issue whether treatment outcomes of cervical adenocarcinoma were equivalent to SCC after CCRT.

Methods: Cervical cancer patients treated with definitive radiotherapy or CCRT in our institute from January 2011 to December 2014 were reviewed. Patients were treated with intensity modulated radiation therapy and intracavitary, combined with concurrent chemotherapy. The treatment outcomes of patients with SCC and adenocarcinoma were compared with multivariate cox regression model, and propensity score matching (1:1).

Results: A total of 815 patients with cervical cancer were included, with 744 patients in SCC group and 71 patients in adenocarcinoma group. The median follow-up period was 36.2 months (range, 1.0-76.2 months). The 3-year overall survival (OS), disease-free survival (DFS), pelvic control and distant control rates of patients in SCC group and adenocarcinoma group were 85.2% and 75.4% (p=0.005), 77.5% and 57.3% (p<0.001), 89.0% and 74.0% (p=0.001), 86.0% and 74.4% (p=0.011), respectively. After multivariate analysis, histology was an independent factor of OS, DFS, pelvic control and distant control. With propensity score matching, 71 pairs of patients were selected. After matching, the OS, DFS, pelvic control and distant control of patients with adenocarcinoma were poor than those of patients with SCC.

Conclusion: The present study demonstrated that patients with adenocarcinoma of cervix had poorer OS and DFS than patients with SCC, no matter treated with radiotherapy alone or CCRT. New treatment approach should be considered for cervical adenocarcinoma.

Keywords: adenocarcinoma, squamous cell carcinoma, cervical cancer, radiotherapy, concurrent chemoradiotherapy
Clinical outcomes of radiotherapy combined with image guided brachytherapy for cervical cancer

Hiroki Ushijima

Background

Image guided Brachytherapy (IGBT), using CT/MRI image to planning of brachytherapy, is gradually spreading out in Japan and expected to gain effect of treatment and decrease adverse effects (AEs). This study was designed to evaluate the efficacy of radiotherapy combined with IGBT for uterine cervical cancer.

Method

From January 2014 to March 2017, 114 patients with cervical cancer were treated with definitive radiotherapy including the intracavitary brachytherapy. Median patient age was 63 (27 -81) years old. Number of patients classified with FIGO stage IB1 / IB2 / IIA1 / IIA2 / IIB / IIIA / IIIB / IVA were 11 / 11 / 12 / 5 / 44 / 2 / 26 / 3, respectively. The histologic subtype was classified as squamous cell carcinoma in 108, adenocarcinoma or adenosquamous carcinoma in 6. Pelvic nodal involvement was found in 57 patients. In IGBT, delivering 6 Gy or more to D90 of High Risk CTV was aimed. Systemic chemotherapy (weekly CDDP) was administered to 96 patients. Survival rate was estimated with the Kaplan-Meier method, acute and late AEs were analyzed based on CTCAE ver 4.0.

Results

Median follow-up period was 29 months. The 2-years overall survival, progression free survival and local control were 92%, 89%, 94%, respectively. There were 3 cases in acute AEs of small intestine. Grade 3 late AEs were observed in 2 to small intestine, 4 to rectum, 1 to bladder, respectively. Grade 5 late AEs to rectum and bladder was observed in 1 patients (same case).

Conclusion

Our results demonstrated that clinical outcomes of the patients of cervical cancer treated with definitive radiotherapy combined with IGBT were favorable.

Keywords: Image guided brachytherapy, Cervical cancer
Analysis of planning parameters for cervical cancer in helical tomotherapy

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Purpose: Different combination of optimize parameters including field width (FW), pitch factor (PF) and modulation factor (MF) are effect to quality of Helical TomoTherapy (HT) plans and treatment time. For long target such as cervical cancer with extended-field to the para-aortic lymph nodes, the FW is always set to 5cm to keep the treatment time acceptable. The aim of this study was to find the optimized combination of MF and PF parameters which compromise between plan quality and treatment times for cervical cancer. Materials and Methods: Ten cervical cancer patients with extended-field to the para-aortic lymph nodes were included. 12 treatment plans consisted of different optimize parameters combination (PF=0.43, 0.287, 0.215; MF=2.0, 2.5, 3.0, 3.5) for each patient were created, with the same other optimization parameters for all plans, alternative dose distributions were calculated to achieve the same coverage for PTV, the doses to 95% of PTV was >50.4Gy. Target coverage, conformity index, the DVH parameter D50 of small bowel, bladder and rectum, as well as D33 of liver and kidneys, gantry period and treatment times per fraction were compared for all plans. Results: The study show all plan has the same target coverage (P>0.05), treatment plan with MF=3.5 and PF=0.215 showed the largest CI and lowest dose for all OAR parameters, the D50 of small bowel, bladder and rectum is 18.8±2.35Gy, 48.5±5.23Gy and 52.37±3.24Gy, respectively. The D33 of liver and kidneys is 11.36±1.84Gy, 15.84±2.78Gy and 16.13±1.98Gy, respectively, the treatment time was longest among all plans up to 745.3±47.6s. Otherwise, plan with combination of MF=3 and PF=0.43 showed comparable dosimetry result, shorter treatment time (485.7±38.7s) (p < 0.001) and suitable gantry period of about 20s. When PF was chosen, the treatment time got shorter with smaller MF. Gantry period was depended on PF very much, PF was little influence on the dose distribution and total treatment time. Conclusions: For routine cervical cancer patients with extended-field to the para-aortic lymph nodes, we suggest the planning optimization parameters consist of FW=5.0 cm, PF=0.43 and MF=3.

Keyword: tomotherapy; optimize parameters; cervical cancer
Vaginal Dose-Vaginal Stricture in Locally Advanced Cervical Cancer Patient Treated with External Beam Radiotherapy (EBRT) and Three-Dimensional High-Dose-Rate Brachytherapy (3D-HDR BT)

Harn-utairasmee; Dankulchai.

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OBJECTIVE: To investigate the dose-late complication relationship between vaginal dose and vaginal stricture, consequently evaluate dose constraint for vagina.

METHODS: Locally advanced cervical cancer patients who had complete treatment at least 12 months were included. Vaginal stricture grading (CTCAE version4.03) was assessed. Dosimetric analysis was obtained in the definition of vaginal volume and point doses. The correlation between vaginal doses and vaginal stricture grade3 was tested by univariate and multivariate logistic regression. Vaginal dose-effect relationship was established by logistic post-estimation probability.

RESULTS: 97 patients were included with median follow-up time 20months. The crude incidence of vaginal stricture grade3 was 22.7%. We found significant correlation between vaginal stricture grade3 and Posterior-Inferior Border of Symphysis (PIBS), PIBS plus 2 cm in cranial, caudal (PIBS+2, PIBS-2), right side (R), right plus 0.5 cm laterally(R+5), left side (L) and dorsal side plus 0.5 cm posteriorly (D+5) point doses in univariate analysis. Moreover, PIBS+2 and PIBS point doses were the significant factors associated with an increased risk of vaginal stricture grade3 in multivariate analysis (p-value = 0.035 and 0.011, respectively). Based on logistic post-estimation probability, the 15% and 20% probability of vaginal stricture grade3 were associated with 68.2Gy and 104.5Gy at PIBS+2 point dose and 53.0Gy and 55.7Gy at PIBS point dose.

CONCLUSION: Both PIBS+2 and PIBS point doses were the significant factors associated with increased risk of vaginal stricture grade3 in univariate and multivariate analyses. We established the vaginal dose-effect relationship between these PIBS+2, PIBS point dose and vaginal stricture grade3 by logistic post-estimation probability.

Keywords: vaginal stricture, cervical cancer, vagina, dose-effect relationship
Treatment outcomes of involved-site intensity modulated radiotherapy for locally advanced gynecologic cancer in aged patients

Noriko Li

[Objective] We herein report the treatment outcomes of involved-site intensity modulated radiotherapy (IS-IMRT) for locally advanced gynecologic cancer in three aged patients.

[Materials and Methods] Between December 2017 and February 2018, 3 patients ≥ 79 years of age (range, 79-86 years) with gynecologic cancer (uterine cancer [T3aN1M0] poorly differentiated carcinoma, cervical cancer [T3bN0M0] clear cell carcinoma and vaginal cancer [T2N1M0] squamous cell carcinoma) underwent IS-IMRT. They had some comorbidities that did not seriously affect their functional status. The Barthel index (BI) was used to evaluate their activities of daily living (ADL).

[Results] All three patients completed IS-IMRT. The patient with uterine cancer started with 30 Gy of conformal radiotherapy, and a continuous boost of 30 Gy of IS-IMRT was performed. The other 2 patients were treated with 60 (n=1) and 70 Gy (n=1) of IS-IMRT. The patient with vaginal cancer had 6 Gy of brachytherapy added for a boost. Although the follow-up time was short, a complete response was achieved in 2 and a partial response in 1 patient. The toxicities were as follows: vaginitis in one as a Grade 2 acute adverse event, and diarrhea in one as Grade 1 acute adverse event. The mean pre-radiotherapy baseline BI of the 3 patients was 83.3, and the mean post-radiotherapy BI was 80.

[Conclusion] Despite the older age of these patients, IS-IMRT was able to be performed with curative radiation doses without serious toxicity. IS-IMRT may play an important therapeutic role in aged patients with locally advanced gynecologic cancer.

Keywords: Locally advanced gynecologic cancer, aged patients, involved-site intensity modulated radiotherapy
Comparison of clinical outcomes of patients with uterine cervical cancer between two-dimensional planning and computed tomography-based image-guided brachytherapy

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Purpose
Since April 2014, three-dimensional image guided brachytherapy (IGBT) based on computed tomography (CT) for uterine cervical cancer has been conducted in our institution. This study aims to investigate the improvement in clinical outcome with CT-based IGBT from conventional two-dimensional (2D) planning.

Materials and Methods
Consecutive patients with cervical cancer treated by primary radiation therapy from August 2007 to May 2017 were retrospectively analyzed.

Results
Two hundred and thirty-five (131 in 2D group and 104 in IGBT group) were enrolled in this study. In FIGO stages, I, II, III and IV, was present 34, 72, 20, and 5 patients in 2D group, 23, 50, 22, and 9 patients in IGBT group, respectively. Average age and tumor size at diagnosis in 2D and IGBT group were 61 and 4.6 cm, 58 and 5.0 cm, respectively. The median duration of follow-up for was 59.1 months in 2D group, 25.4 months in IGBT group. The 2-year overall survival (OS) rates in patients with FIGO stages, I, II, III and IV were 100%, 88.4%, 51.7%, and 60.0% in 2D group, 93.8%, 91.8%, 85.9%, and 47.6%, in IGBT group respectively. In patients with tumors smaller than 4 cm at diagnosis, no local recurrence was observed in both groups. In patients with tumors greater than 4 cm at diagnosis, the 2-year local control (LC) rates 79.3% in 2D group and 88.4% in IGBT group.

Conclusion
IGBT has a potential to improve local control in cervical cancer patients with larger tumors.

Keywords: uterine cervical cancer, computed tomography, image-guided brachytherapy
A Retrospective Observational Study Comparing Response, Toxicities and Survival in Cervical Cancer Treated with Sequential Brachytherapy versus Interdigitated Brachytherapy

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Background: Cancer cervix is the fourth most common malignancy worldwide in women and the leading cause of cancer related deaths in developing countries. Risk factors include smoking, early age of first intercourse, multiple sexual partners, HPV infection etc. Radiotherapy is the standard treatment of choice in all stages of cancer of uterine cervix, with combination of external beam radiotherapy (EBRT) and intracavitary radiotherapy (ICRT). This combination of treatment is used for patients with stages IB2 to IVA with curative intent. Stages IA-IB1 may be considered for EBRT if they are deemed inoperable. Stage IVB disease may receive radiation but with palliative intent. The initiation of EBRT on typically precedes brachytherapy. Although brachytherapy maybe interdigitated with EBRT in order to minimize the overall treatment time and achieve better local control. Our study is a prospective observational study comparing two groups of treatment- EBRT interdigitated with ICRT and EBRT followed by ICRT. This study will help us to see the effects of implementing ABS guidelines in Indian society in a rural setup.

Aim and Objectives:

To assess local control and disease free survival in patients of cervical cancer treated with two regimes- External beam radiotherapy with sequential Intracavitary radiotherapy and External beam radiotherapy interdigitated with Intracavitary radiotherapy.

To determine the overall treatment time (OTT) in the above two regimes and describe its relation with outcome.

To assess the acute and late side effects using RTOG criteria in the two modalities of treatment and to implement a standard protocol for the management of cervical cancer as per American Brachytherapy Society (ABS) guidelines.

To evaluate various dosimetric parameters and their relation with late toxicities

Materials and Methods: Patients of cervical carcinoma who satisfied the inclusion criteria were enrolled in this study from 2014 to 2016 till a sample size of 100 was attained. Patients were evaluated by detailed history, general and systemic examination and by hematological and relevant radiological investigations. Study Group A had 40 cases and Control Group B had 60 cases.

Patients in Group A (Study) were given EBRT (50 Gy in 25 # with MLB after 40 Gy) interdigitated with ICRT (4 # of 7 Gy each) interdigitated with EBRT and concurrent weekly chemotherapy with Injection Cisplatin 40 mg/m2.

Patients in Group B (Control) were given EBRT (50 Gy in 25 #) with concurrent weekly chemotherapy with Injection Cisplatin 40 mg/m2 followed by ICRT (3# ICRT of 7 Gy each).

Response evaluation was done clinically and radiologically and documented as per RECIST criteria on each follow up; first being after 6 weeks of treatment completion and then every 3 months (for a period of 1 year).

Results: Response was assessed in terms of local pelvic control and disease free survival at one year. We found that 75.00% cases from Group A (Study) had Complete Response at the time of 1st Follow up compared to 66.66% in Group B (Control). Disease free survival at one year was 78.26% and 64.70% for stages IIB and IIB in Group A (Study). For Group B (Control), disease free survival was 71.42%, 100% and 59.45% for stages IIB, IIIA and IIB respectively. 15.00% cases from Group A and 16.66% cases from Group B had Progressive Disease at one year. 10.00% cases from Group A and 11.66% cases from Group B had disease recurrence at one year follow up. There was 1 death in Group A and 5 deaths in Group B at the one year follow up due to progressive and metastatic disease. (Dosimetric and statistical data for two years follow up is being compiled and will be mentioned in the final presentation).

Conclusion: EBRT Interdigitated with HDR (once weekly) ICRT has higher tumor control with higher but manageable complications and lesser overall treatment time (OTT); and is a safe and effective treatment for patients with carcinoma cervix. However, a longer follow up is needed to assess 5-year DFS and late toxicities.

Keywords: Cervical carcinoma, Human Papilloma virus (HPV), interdigitated HDR brachytherapy, ABS guidelines, Overall treatment time.
Transitioning from 2-D to 3-D Image-Guided Brachytherapy (IGBT) in Gynecologic Malignancies in the Philippines: Looking Back and Moving Forward

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OBJECTIVES:
Brachytherapy is the standard treatment to achieve adequate tumor dose leading to better clinical results. This paper aims to present the development, current status, clinical outcomes, as well as obstacles in the development of 2-D to 3-D IGBT in gynecologic malignancies in the Philippines.

METHODS:
A survey was done regarding the status of IGBT in the Philippines.

RESULTS:
In the Philippines, the 1st LDR manual-loading brachytherapy was started at the Philippine General Hospital in 1962. Technological advancements included the 1st LDR remote afterloader at JRRMMC (1985) and 1st HDR remote afterloader brachytherapy at SLMC (1990’s).

The concept of IGBT was introduced by Prof. Richard Potter through the 1st ESTRO-SEAROG-PROS teaching course (2009). Two years after, the first IGBT was performed at JRRMMC. The Philippines participated in the RAS 6062 project (2012-2015) on “Strengthening IGBT capabilities in the RCA region” of the IAEA in cooperation with PNRI. A National Training Course by JRRMMC-IAEA was conducted by international experts.

International collaborations and training in IGBT were made possible through the Forum for Nuclear Cooperation in Asia (FNCA) and Department of Radiation Oncology, Gunma University Hospital, Japan.

Out of 18 centers with HDR brachytherapy, 11 are IGBT capable and 8 have ongoing procedures. The adaptation of IGBT in the country is still in progress as to outcomes on local control, survival and treatment-related toxicities.

CONCLUSION:
IGBT continues to evolve and many centers across the country have adapted it. Clinical outcomes in the use of IGBT in the Philippines are expected to be reported soon.

Keywords: IGBT-Philippines
Quality of life during concurrent chemo-radiotherapy for locally advanced cervical cancer

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Introduction: Cervical cancer is the 2nd most frequently diagnosed cancer among Thai women. Understanding quality of life (QoL) will help healthcare providers introduce interventions for better care and outcomes in these women. This study investigated ‘during treatment’ QoL of locally advanced cervical cancer patients treated with chemo-radiotherapy.

Methods: From 2016 to 2017, stage IIB and IIIB cervical cancer patients were treated with concurrent chemoradiation. Structured questionnaire(EORTC QLQ-C30) was used to assess QoL at the first consultation, every week during treatment and at the 6th week, 3rd month and 6th month after treatment completion.

Results: Twenty-nine patients were enrolled. The mean age was 53.66±9.66 years. The majority of them was in stage IIB (96.55%) and had squamous cell carcinoma histology(89.66%). Fatigue, nausea and vomiting, dyspnea, insomnia, appetite loss and diarrhea scores during treatment were significantly higher than pre-treatment scores whereas pain, constipation and financial difficulties scores were not significantly different from pre-treatment scores. Physical and role functioning during treatment were worse than that of pre-treatment. Emotional and social functioning were not significantly different from baseline and improved after treatment completion while no difference was observed in terms of cognitive functioning.

Conclusion: In locally advanced cervical cancer patients receiving concurrent chemo-radiotherapy, QoL declined during the course of treatment and returned to the same level as treatment initiation. Knowledge of the changing of QoL will enable us to adapt medical care and encourage appropriate interventions properly in order to maximize QoL of the patients.
Can prophylactic para-aortic irradiation improve survival of small cell cervical cancer?

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Purpose: Small cell carcinoma of the cervix (SCCC) is a rare cancer comprising about 1-5% of all cervical neoplasms. The purpose of this study is to evaluate the treatment outcome of SCCC.

Materials and methods: Patients with pathologically proven SCCC treated in our institution from 2007 to 2016 were retrospectively analyzed through medical records. Over all survival (OS), treatment strategy, FIGO and UICC staging were evaluated. Survival was determined with the Kaplan-Meier methods. Univariate analyses were conducted using log-rank tests and univariate predictors of OS were considered using a Cox multivariate proportional-hazards model.

Results: Twenty-four patients were evaluated. Eighteen patients had chemo with VP16 and of those 18 patients, 11 of them had radiotherapy concurrently with VP16 and CDDP. Twelve patients have died from SCCC at the time of evaluation, and the median survival was 23m (7-101m). Significant association with worse OS was seen in patients with metastatic disease before starting any treatment (p=0.03, HR 4.96, 1.16-21.2) and chemo without VP16 (p=0.02, HR 4.23, 1.2-14.9). Patients with nodal metastasis did not associate with worse OS than without after excluding patients with distant metastasis (p=0.73). Interestingly, if we exclude four patients with lymph node metastasis who underwent prophylactic para-aortic irradiation, the median survival was worse with lymph node metastasis (18.5m and 39m, respectively), but did not reach statistical significant probably due to small number of patients (p=0.25).

Conclusion: Application of chemo including VP16 is very important, and strong local treatment including prophylactic para-aortic irradiation may improve survival of this disease.

Keyword : Small cell cervical cancer
Vulva Cancer in Ghana – Review of Hospital Based Data

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Background: The current management of localized vulva cancer emphasizes on conservative surgery. In Ghana, majority present with advanced disease not amenable to surgery and this review describes the available management options and challenges in managing vulva cancer.

Methodology: A retrospective study of vulva cancer cases managed at National Centre for Radiotherapy, Ghana over a 14-year period (2000-2014). Records were extracted from the hospital database. Descriptive statistics were generated using rates, ratio and proportions.

Results: Vulva cancer accounted for 2% (70) of 2479 gynecological malignancies. Mean age was 56.3 years (24-79 years). Median follow-up was 42.4 months. The commonest presenting symptom was vulva swelling (38%). The labia minora was the commonest primary site (44%). Squamous cell carcinoma was the predominant histological type (84%). 13% presented with stage 1, 15% with stage 3 and 60% with stage IV disease. Upfront surgery was recommended in five patients. Average interval between presentation and diagnosis was 52.8 days (1-347). Seven received palliative radiotherapy and 23 had definitive radiotherapy or chemoradiation using Cobalt 60 Teletherapy. Mean time to commencement of radiotherapy was 38 days (5-98). There was a 32.7% treatment default rate. Radiotherapy treatment breaks were required in 52% for grade three toxicities and planned in another 26% (mean = 36 days). 2 and 5 year overall survival was 56.7% and 36.7% respectively for 30 subjects who received radiotherapy.

Conclusion: Majority of vulva cancer patients in Ghana presents with unresectable disease, which require radiotherapy or chemoradiation. Late presentation and poor compliance to treatment are factors affecting outcomes.

Keywords: vulva cancer, chemotherapy, radiotherapy, palliation, vulvectomy
Serum CEA as Tumor Marker in predicting paraaortic lymph node metastasis in Squamous Cell Carcinoma of uterine cervix

Kiran, Swathi Reddy, Bhaskar Vishwanathan

Background: Cancer of the uterine cervix is the major cause of death from gynecologic cancer worldwide. Isolated paraaortic lymph node metastasis and distant metastasis detected at the initial diagnosis of cervical cancer could be addressed by extended field paraaortic lymph node irradiation. Serum carinoembryonic antigen (CEA) could be done for detecting early Para aortic lymph node involvement and scrutinizing relapse or recurrence. The objective of the study is to assess pelvic and paraaortic lymph node status by Magnetic resonance Imaging scan and also correlate with the pretreatment serum carcinoembryonic antigen levels.

Materials and Methods : Study design include hospital based randomized, prospective and comparative study. Twenty patients of histologically proven squamous cell carcinoma of cervix of any age group were recruited into the study. Sample size is randomized into 2 arms,CONTROL ARM- Carcinoma Cervix stage I to IIIB.High risk arm i.e. Carcinoma Cervix stage IVA and IVB. Informed written consent will be taken from the patient/ guardian. We assessed the status of pelvic, paraaortic lymph node and distant metastasis by Magnetic Resonance Imaging study. Pretreatment serum CEA levels were evaluated in all patients.

Results & Conclusions:We observed that there was an elevation of carcinoembryonic antigen in those patients having paraaortic lymph node and distant metastasis. Based on the results, we could opine that serum carcinoembryonic antigen levels could help to prognosticate the cervical cancer patient, predict the presence of paraaortic and pelvic lymph nodes. To explore the potential of for PALN detection and treatment response assessment.
Dose coverage of the common iliac nodes in cervical cancers with the traditional 2D-based landmark radiotherapy plan

Mora Mel

Introduction

The traditional bony landmark radiotherapy plans based on Digitally reconstructed Radiographs have been used to treat cervical cancer patients in our department. Setting the superior border at L4-L5 interspace might not guarantee the sufficient dose to the common iliac nodes, which begin at the bifurcation of aorta. This study aims to assess the radiotherapy doses to the common iliac nodes of the cervical cancer patients with these plans.

Method

34 radiotherapy plans for cervical cancer patients FIGO stage IIB-IIIB were reviewed. We do vessel-based delineation to define the common iliac nodes. CTV volume is 7mm expansion around the course of the common iliac vessels excluding bone, small bowel and muscles and 7mm expansion from CTV is PTV. The CTV, PTV volumes and doses to 95% of these volumes were extracted from Dose Volume Histogram of the plans.

Results

The mean CTV and PTV volumes are 60cc (40-97) and 169cc (124-250) respectively. The mean dose to 95% of the CTV volume is 1650cGy (330-4700) and the mean dose the 95% of the PTV volume is 1000 cGy (290-3700). Only one out of 34 patients has 95% of the CTV volume covered by more than 4500 cGy.

Conclusion

To set L4-L5 interspace as the superior border of the radiotherapy plans for cervical cancers does not give sufficient dose to the common iliac nodes defined on CT scan. CTV and PTV of the nodes at risk should be defined to personalize the plans.

Keyword: 2D landmark radiotherapy plan, cervical cancer, common iliac nodes
Early Stage Vulva Melanoma Maligna Treated with Intensity Modulated Radiotherapy (IMRT) Rapid Arc as Primary Therapy

Defrizal, Kartika Brohet

Malignant melanoma of the vulva is the second most common type of vulvar cancer, representing 10% of all vulvar neoplasms. It is a rare but extremely aggressive tumor. The rarity of this malignancy has led to confusion over the practical management of patients presenting at any stage of disease. However, increasing literature suggests that the vulvar subtype of melanoma mimics the behavior of cutaneous melanoma and should be staged and managed in accordance with the same guidelines. Radiotherapy is rarely used as a primary treatment modality instead of surgery which is the curative treatment of choice for all types of primary melanoma lesions. Poor performance status of the patient with severe comorbidities or refusal of proposed surgery are potential but less plausible motives in clinic for replacing surgery with radiotherapy. Currently, there is no specific guideline for radiotherapy in malignant melanoma of the vulva. In this study, we present a rare case of early stage vulvar melanoma patient who were treated with IMRT Rapid Arc Technique as primary treatment. In this case, primary radiotherapy is safe alternative to surgery. IMRT Rapid Arc technique provides advantages minimum side effect with shorter treatment time for each radiotherapy session.

Keywords: melanoma, vulva, IMRT, Rapid Arc, Radiotherapy
Overall Treatment Time of Locally Advanced Cervical Cancers

Mora Mel

Introduction
The prolonged overall treatment time of cervical cancers was shown to negatively impact on the local control. The American Brachytherapy Society and the European Society of Medical Oncology recommended the treatment duration should not exceed 8 weeks. The study aims to assess the rate of compliance to this in our department.

Method
The charts of cervical cancer patients who started radiotherapy from January 2014 to December 2016 were reviewed. The overall treatment time, based on the first day and the last day of radiotherapy with either external beam radiotherapy or brachytherapy were recorded. The overall treatment time was calculated accordingly.

Result
145 patients with cervical cancers 2009 FIGO stage IB2-IVA were reviewed. The median age of the patient is 50 (26-83). All patients received concurrent chemoradiation. 37 patients (26%) finished their treatment within the prescribed time while 108 patients (74%) exceeded 56 days. The mean overall treatment time is 77 days.

Conclusion
Two third of the patients do not comply with the recommended overall treatment time. The cause of extended treatment duration and possible solutions are worth studying to improve the patient’s outcomes.

Keywords: cervical cancers, overall treatment time, radiotherapy
Effect of Long-term Polycarbofil Moisturizing Gel in Cervical Cancer Patients Who Have Received Radiotherapy and Have Complaints of Vaginal Dryness: Preliminary Results of an Ongoing Experimental Study

Emailsa Denta, Henry Kodrat, Soehartati Gondhowiardjo

Background: there has been no previous experimental study of the use of polycarbofil gel in cervical cancer patients who have received radiotherapy.

Purpose: to evaluate the efficacy of long-term use of polycarbofil gel on vaginal dryness based on Vaginal Index Health Score (VHIS) in subjects with cervical cancer who have received radiotherapy.

Methods: this preliminary report obtained from an ongoing, randomized, open-label, prospective, single centre study which when completed, will encompass 44 eligible subjects that randomly assigned to treatment or control group with a 3:1 ratio. VHIS assessment is conducted 5 times over a 12 months period of therapy, at baseline, 3rd, 6th, 9th, and 12th month. Repeated measure Anova analysis using SPSS 21 was performed to evaluate the efficacy of polycarbofil gel based on VHIS between both arm.

Result: this current report deals with 18 subjects who already pass through 6 months period of therapy and have done 3 times VHIS assessment, but 6 of them dropped out, 1 subject dropped out because of residual disease found from imaging evaluated 3 months after radiotherapy, 3 were withdrawn from study, and the remaining 2 subjects died. The results from statistical analysis showed that VHIS at baseline, 3rd, and 6th month between both arm was not significantly different (P = 0.738) and the mean VHIS from both arm tends to decrease by time. In the treatment group, VHIS decreased from a mean of 12.8 to a mean of 8.7 after 6 months period of therapy, while in the control group was also decreased (12.3 to 5.8).

Conclusion: preliminary report suggest that the efficacy of polycarbofil gel based on VHIS during 6 months period of therapy between both arm hasn’t been proven yet.

Keywords: efficacy, polycarbofil gel, cervical cancer, Vaginal Index Health Score
Gastrointestinal
A Reliable Nomogram is identified to predict the overall survival for patients with esophageal squamous cell cancer after radiation therapy combined with chemotherapy followed by surgery

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The purpose of this study is to develop nomogram for patients with esophageal squamous cell cancer (ESCC) after radiation therapy combined with chemotherapy followed by surgery through the correlation of clinical features. We searched through SEER database. Search Criteria: patients diagnosed with pathologically proved ESCC in 2010-2014 with T1-4N0-3M0 disease (AJCC 2010 7th version); patients underwent chemoradiation therapy followed by surgery. Age, ethnicity, sex, Primary Site of the tumor, T stage, N stage were recorded as clinical predictors. These predictors were used in multivariable logistic regression analysis-based nomograms to estimate the probabilities of OS. The predictive accuracy and discriminative ability of the nomogram were determined by C-index and calibration curve. Analyses were performed with software R (version 3.2.1). 326 patients were identified. 3 and 4-year OS for the entire cohort of the patients were 53%, 47% with the median survival time of 45 months. Median survival of male and female patients were 38 vs. 54 months (p=0.024); 3-year survival of patients with white race and other race were 56% vs. 45%, p=0.050; For patients with N0, N1, N2, N3 stage, 3-year OS were 87.3%, 54.3%, 37.1%, 0%, p<0.001. Nomograms were developed for the OS with age, sex, ethnicity, T stage, N stage. The calibration curve showed relatively good agreement. The risk of having one of the indications of adjuvant radiation therapy increased with increases in predictor. Using clinical information, we produced nomogram which may relatively accurately predict the probabilities of OS for patients with ESCC after radiation therapy combined with chemotherapy followed by surgery.

Keywords: Esophageal squamous cell cancer; nomogram; OS;
Success and failures of Adjuvant chemoradiation after D2 gastrectomy in carcinoma stomach: A retrospective review from a tertiary care cancer research institute

Ruparna Khurana

INTRODUCTION & BACKGROUND: Gastric cancer is the fourth most common malignancy and the second leading cause of cancer related death worldwide. Surgery remains the mainstay of curative treatment albeit only twenty percent of all patients are amenable for a curative resection, with overall survival ranging 20 – 30 %. Thus adjuvant chemoradiaiation after a D2 gastrectomy is evolving as a preferred regimen with a modest survival advantage. This study was conceived with the aim of reviewing gastric cancer data from our institute, in terms of clinical outcomes survival analysis and failure patterns.

MATERIALS AND METHODS:
This was a single institute retrospective study of all gastric cancer patients who underwent D2 gastrectomy followed by adjuvant chemoradiation between January 2010 and December 2017. Clinical outcomes in terms of overall and disease free survival and failure patterns including time and site of recurrence were analysed.

RESULTS: A total of 122 patients met the inclusion criteria. The median age at diagnosis was 55.6 yrs with a definite male preponderance accounting for 65% males. Poorly differentiated adenocarcinoma was the commonest histology seen in 54% cases. More than half of the patients had pathological stage III tumours with 95% having node positive status. All patients received adjuvant chemoradiation. On serial follow up 20% (24/122) patients had a recurrence, 10% (12/122) failing distally, lung being the most common site. and 6% (7/122) had isolated local recurrence

CONCLUSION: Adjuvant chemoradiation after D2 gastrectomy has become an integral part of management of locally advanced carcinoma stomach with modest survival benefit and a favourable toxicity profile. Results from our institute are encouraging and comparable to world standards.

Keywords: D2 gastrectomy, Ca stomach, adjuvant chemoradiation
QOL changes with preoperative treatment in cancer esophagus patients: neoadjuvant chemotherapy versus neoadjuvant chemoradiotherapy

Srivastava A, Tekta K, Singh K, Saluja S

Purpose: To evaluate the impact of preoperative therapies (NACT or NACTRT) on quality-of-life scores in cancer esophagus patients.

Methods: EORTC QLQ-C30 and dysphagia(OESDYS) and reflux from EORTC-QLQ-OES24 questionnaires completed pre and post-treatment were compared in 40 patients randomly allocated to either NACT (2 cycles of Paclitaxel + Carboplatin q 21 day) or NACTRT (41.4Gy/23fr concurrent2 cycles of Paclitaxel + Carboplatin q 21 day) arms.

Results: Baseline scores in both arms were similar. Post-treatment, QL, functional, dysphagia and reflux scores improved in both arms. Compared to NACT, NACTRT significantly worsened symptom nausea-vomitting.

Conclusions: Preoperative therapies positively impact quality of life, however there is negative impact on nausea-vomitting with NACTRT despite optimal use of premedication.

Keywords: quality of life, esophageal cancer, neoadjuvant
Efficacy and outcome of combined SBRT by Cyberknife and Hyperthermia in Hepatocellular carcinoma


Objective

SBRT has emerged as a potent advanced conformal radiation technique therapy for primary and secondary liver tumours and has been used in the management of liver tumors mostly as primary therapy and in some circumstances as a bridging therapy to transplant. Hyperthermia, the procedure of raising the temperature of tumour-loaded tissue to 40-43oc, is applied as an adjuvant therapy with various established cancer treatments such as radiotherapy and chemotherapy to improve local control. The present study attempted to evaluate the efficacy of combined hyperthermia and sbrt in HCC patients.

Materials

A retrospective analysis of 7 patients between 2013 and 2017, who underwent combined modality

Treatment with sbrt and hyperthermia. sbrt was given by cyberknife to gtv liver to a dose of 30-40gy in 5 fractions and hyperthermia was given by celcius tcs machine for 20 minutes before, 40 mins after sbrt in 3 sessions on alternate days as a sandwich technique. pet ct response and biochemical response were assessed. the lesion sizes treated ranged from 2.8cm to 14cm with 4 and 3 patients in the child pugh a and b category respectively.

Results

Median age of the samples was 60 years and all patients tolerated both hyperthermia and sbrt well. more than fifty percent reduction of afp was found in all patients. median percentage reduction in tumour size in follow up pet scans was 22%. all patients had a partial reduction of tumour size except one patient who had increase in size from 7 to 8.7cm. there was partial reduction of pet suv also.

Conclusion

Combined hyperthermia and sbrt is safe and effective in reducing the tumour size in hcc patients. longer follow up to assess local control is underway and controlled studies need to be undertaken to generate stronger evidence.

Keywords: SBRT STEREOTACTIC BODY RADIATION THERAPY, AFP ALPHA FETO PROTEIN, HCC - hepatocellular carcinoma
Neoadjuvant Short-Course Radiotherapy followed by Chemotherapy and Delayed Surgery for Locally Advanced Rectal Adenocarcinoma: A Retrospective Analysis

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INTRODUCTION: Neoadjuvant concurrent chemoradiotherapy is an established treatment for locally advanced rectal adenocarcinoma. With the emerging adaptation of short-course radiotherapy as neoadjuvant regimen, the Polish Colorectal Study Group has provided a protocol with comparable outcomes.

OBJECTIVES: To compare short-term outcomes of patients with locally advanced rectal adenocarcinoma that underwent neoadjuvant adapted Polish II protocol versus standard long-course chemoradiotherapy, both followed by definitive surgery.

METHODS: A chart review and analysis of patients with rectal adenocarcinoma managed from January 2016 to December 2017 with short-course radiotherapy followed by chemotherapy (adapted Polish II Protocol) were compared to patients that underwent long-course concurrent chemoradiotherapy. Acute toxicities were graded based on NCI/CTCAE and RTOG acute radiation scoring. Pathologic complete response (pCR) and resection margin were used to assess pathologic outcomes. Overall survival and disease-free survival were assessed for short-term oncologic outcomes.

RESULTS: Sixteen patients were reviewed, 7 underwent adapted Polish II protocol and the rest underwent long-course protocol. Acute toxicities were comparable between groups, however, patients that underwent long-course treatment had higher grades of acute skin toxicity (p-value =0.004). Pathologic findings were comparable: 1 (14.3%) documented pCR in short-course group while none (0%) in long-course group; 100% had adequate resection margin in both groups. Long-course protocol group showed better short-term overall survival (34 months versus 26 months) and disease-free survival (p-value =0.509).

CONCLUSION: Although only a small number of patients were analyzed in the study, it showed the potential use of Polish II protocol as an alternative neoadjuvant treatment for locally advanced rectal adenocarcinoma.

Keywords: -
Expression of serum miR-21, miR-145 as predictor of chemoradiation response in rectal cancer

Nawangsih CH; Riwanto I; Soehartati G; Mubarika S.

Introduction
Chemoradiation and chemotherapy are the standard therapy for inoperable locally advance rectal cancer. However, there is still limited tool to measure the effect of the therapy. MicroRNA (miR) particularly miR-21 and miR-145 is known to be expressed during carcinogenesis. miR-21 is mainly upregulated in malignant solid tumor including rectal cancer. Interestingly, recent study showed that the expression of miR-21 is downregulated after chemoradiation. Instead, miR-145, known as tumor suppressor gene, is downregulated before the chemoradiation treatment. The aim of our study is to determine the application of serum miR-21 and miR-145 as biomarker for predicting the prognosis of rectal tumor patients treated with chemoradiation.

Method
The serum level of miR-21 and miR-145 before and after the chemoradiation will be quantified in 44 patients diagnosed with locally advance rectal cancer with stadium II and III based on MRI and histopathology examination. MRI examinations were done before and after the chemoradiation to evaluate shrinkage.

Results
Total of 26 patients age ranging from 33-70 years old (mean 48 years old) completed the treatment and follow up MRI examination. There is significant tumor shrinkage in 24 patients and tumor progression in 2 patients

However, the examination of the serum miR-21 and miR-145 is still ongoing.

Conclusion
There is tumor shrinkage in 24 rectal patients treated with chemoradiation while ongoing study remains for serum miR-21 and miR-145.

Keywords: Rectal cancer, miR-21 serum, miR-145 serum, tumor response
Carbon ion radiotherapy for elderly Japanese patients with hepatocellular carcinoma

Takuya Kumazawa

Background. Hepatocellular carcinoma (HCC) is the second common cause of cancer death in Asia. Although surgery and radiofrequency ablation are curative therapy in the early stage, elderly patients cannot often receive such treatments due to their comorbidities and poor-performance status. So minimally invasive treatment for HCC is required.

We examined the feasibility and efficacy of carbon ion radiotherapy (C-ion RT) for elderly patients with HCC.

Methods. Eligibility criteria of this retrospective analysis were: 1) HCC confirmed by histology or diagnostic imaging; 2) no intrahepatic or distant metastasis; 3) no findings suggesting direct infiltration of the gastro-intestinal tract; 4) performance status ≤ 2 by ECOG classification; 5) Child-Pugh grade A or B; and 6) age ≥ 80 years old. Total dose was 52.8 or 60.0 Gy (RBE). Toxicities were recorded using CTCAE Version 4.0.

Results. Between March 2011 and November 2016, 35 patients were treated. The median follow-up period of all patients was 33 months (range: 8-73 months). Median age at the time of the registration was 83 years old (range: 80-95 years old). Child-Pugh grade A and B were 33 patients and 2 patients, respectively. Hepatitis B and C virus were positive in 2 and 20 patients.

The 3-year estimated overall survival, local control, and progression-free survival rates were 79.6%, 81.3%, and 44.6%, respectively. No patients had Grade 2 or higher acute toxicities. As for late toxicities, Grade 3 encephalopathy was observed in 2 patients.

Conclusion. C-ion RT was effective with minimal toxicities for elderly patients with HCC.
Breast
A Japanese prospective multi-institutional feasibility study on multi-catheter brachytherapy accelerated partial breast irradiation: analysis of reproducibility and quality

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Background and Purpose: Asian females have smaller breast than Western females, and accelerated partial breast irradiation (APBI) is considered difficult. A prospective multicenter study was performed in Japan to verify the reproducibility and quality of APBI using high-dose-rate interstitial brachytherapy (ISBT) designed for Japanese female patients (UMIN 000001677). We are aiming for a P2 study in Asia.

Methods and materials: Study patients (n=46) were recruited at 6 institutions. Half of the patients (54%) had a small bra size (A/B cup). Compliance of the ISBT-APBI plans was evaluated using three indices: (1) minimum clinical target volume dose with a clip dose ≥ 600 cGy/fraction, (2) irradiated volume (Vref) constraint of 40-150 cm3, in principle, and (3) uniformity of dose distribution, expressed as the dose non-uniformity ratio (DNR, V150/V100) < 0.35. Each ISBT-APBI plan was considered compliant when all 3 indices were compliant with the constraints. The relationship between bra size and dose indices was also analyzed.

Results: The median values of the 3 indices were as follows: Vref, 117 cm3 (range, 40-282), DNR, 0.30 (range, 0.22-0.51), and clip dose, 784 cGy (range, 469-3146). The ISBT-APBI plans were compliant for 43/46 patients, meaning ISBT-APBI is reproducible by definition. Depending on the bra size, the value of CTV volume, Vref and maximum skin dose were significantly different while there was no significant difference in DNR, clip dose and CTV mean dose.

Conclusions: This study showed that multi-institutional ISBT-APBI is reproducible in Japan. A high-quality and reproducible treatment plan was created even for small breasts. Dose constraints should be modified according to breast size to conduct a new trial in Asia.

Keywords: APBI, brachytherapy, breast
Comparison of External Beam Radiotherapy versus Brachytherapy in Patients of Early Stage Breast Carcinoma Treated with Accelerated Partial Breast Irradiation


INTRODUCTION: Breast conservation therapy has been evolving as standard of care for most of patients with breast carcinoma. Whole breast irradiation(WBI) is being replaced by accelerated partial breast irradiation(APBI) in early stages. Though similar guidelines are followed for APBI universally, the best technique is still under study.

Aim: To compare the efficacy of external beam radiotherapy(EBRT) and Multicatheter Interstitial Brachytherapy(MIB) in patients of breast carcinoma treated with APBI.

Material and methods: 30 patients of early stage breast carcinoma(T1-2, N0) are treated with either EBRT(n=15, median age-62 years) or MIB(n=15, median age – 67 years ) from 2008 to 2018. Brachytherapy is done either per or postoperatively. EBRT is given by either Intensity modulated or Image guided Radiotherapy.

RESULTS: After a median followup of 71 months, none of the patient developed Ipsilateral Breast tumour recurrence(100% local control in both the arms). One patient in EBRT arm developed distant metastasis.

CONCLUSION: EBRT can be considered a good alternative for APBI due to its non invasiveness and better compliance by patient and produces comparable cosmetic outcomes. Using higher techniques like IGRT , better conformity can be achieved along with surrounding normal tissue sparing like brachytherapy.

Keywords: APBI - Accelerated Partial Breast Irradiation, EBRT - External Beam Radiotherapy, MIB - Multicatheter
Assessment of Predictive Factors and Prognostic outcomes with Neoadjuvant Chemotherapy, Radiation and Surgery in Triple Negative Breast Cancer: A Single Institute Experience


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Purpose/Objective(s): Triple negative breast cancer (TNBC), defined as HER2, estrogen and progesterone receptors negative, is associated with aggressive pathological features, early relapse and poor overall survival (OS). This study aimed to identify predictors of disease-free survival (DFS) and patterns of LRR following NAC, surgery and adjuvant RT in TNBC.

Materials/Methods: Retrospective study was conducted on 200 patients diagnosed with TNBC treated with NAC, surgery and adjuvant RT between 2009-2016. DFS was calculated using Kaplan-Meier method. LRR rate was estimated by cumulative incidence function by treating death as competing risk. Predictors of DFS were identified using Cox regression analyses.

Results: The median follow-up was 36 months. Most patients had clinical T2-T3 disease 60% were converted from node positive to negative disease following NAC. All patients completed adjuvant RT, most receiving 50 Gy/25 fractions. 34 patients relapsed: 6 local, 8 nodal and 20 distantly. The 3-year cumulative incidence of LRR was 8%. All local relapses were within the RT field. Of the 5 patients who relapsed regionally, all received nodal RT, and all relapsed within the RT field. The 3-year DFS and OS were 76% and 88% for the entire cohort, respectively. Patients with a pCR had significantly higher 3-year DFS (98% vs 65%, p<0.001). Those with clinical stage II disease had significantly higher 3-year DFS than stage III (88% vs 62%, p<0.001).

Conclusion: Non-pCR and advanced clinical stage were independently associated with worse DFS. All LRR were within RT field, and of these patients all except one also relapsed distantly.

Keywords: Breast Cancer, Triple Negative, Radiation therapy, NACT
Optical Surface Monitoring System (OSMS, Vision RT) for Deep Inspiration breath-hold (DIBH)

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Background

This study is aimed at educating Radiation Therapist on the benefit of using new equipment called OSMS with DIBH technique for left-sided breast cancer patients undergoing radiation with Varian Truebeam machine. Due to the anatomy of the heart lies on the left side of patient, it will receive dose depends on factors such as shape of the lungs, position of the heart and the location of the primary tumour. This study also includes exploring the issues and the evidence of the relationship between OSMS with DIBH technique for patient and staff. Highlighted will be the importance of the OSMS for DIBH technique for the left-sided breast patients in avoiding frequent repositioning and unnecessary skin marks on patient.

Summary of key points

Treating early staged, left-sided breast cancer patients with DIBH has proven benefits in reducing and or avoiding lung and heart issues long term. However, the issues arising from using OSMS for DIBH technique are the inability of the patient to perform breath-hold of the same amount from CT-simulation, exposing patient body without cover, language barrier, patient compliance, and trained staff. Furthermore, this study will explore if the benefits of using OSMS for DIBH helps in reducing heart and lung dose outweigh the potential cons of the issues stated above.

Conclusion

This poster will explore the importance of the OSMS for the DIBH technique in reducing the radiation dose to the lung and heart for left-sided breast cancer patients. It will explore the issues arising in utilising this technique not only with patients, but also with staff and various department protocols. Evidence will be analysed and presented regarding the benefits of using this OSMS with DIBH technique.

Keywords: OSMS, DIBH
Short Term Results of Study on the Safety and Efficacy of Hypofractionated Radiotherapy in Postmastectomy Irradiation for Breast Cancer Patients in Mongolia

Erdenetuya

Objective: To prove that hypofractionated post mastectomy regional radiotherapy (HF-PMRT) is as safe and as effective as conventionally fractionated radiotherapy and superior in terms of convenience.

Background: Breast cancer is one of the five leading cancers in females and the average breast cancer incidence is 8 per 100,000 women and the standardized rate is 8.9 in Mongolia.

In 2008-2012, cancer mortality in female followed by 42.7% of liver cancer, 12.2% of stomach cancer, 9.2% of esophageal cancer, 8.5% cervix uteri, 4.6% of lung cancer, 3.1% breast cancer. The average breast cancer mortality is 3 per 100,000 women and the standardized rate is 3.4.

Breast cancer treatment is a multidisciplinary treatment with surgery, radiotherapy and systemic drug therapy. In post mastectomy status, post mastectomy radiation therapy (PMRT) has been found to improve the survival rate in patients who had lymph node metastasis, especially four or more, and PMRT is highly recommended in those patients.

Methods: The dose-fractionation of 50  ~  50.4 Gy /1.8 ~ 2.0 Gy per time /25 ~ 28 times /4.5 ~5.5 weeks has been thought as the standard.

The hypofractionated radiotherapy consists of total doses of 43.2 Gy /2.7Gy per fraction /16 times /3 ~ 4 weeks has been compared with the conventional fractionation. As for irradiation site of PMRT, chest wall, supraclavicular region are commonly recommended.

Results: 25 patients were enrolled in the study. Patients were tolerable to the hypofractionated RT and hematological and nonhematological acute toxicities low e.q skin.

21 patients are alive without local recurrence and distant metastasis at the present time.

3 patients are alive, who have local recurrence and distant (lung and liver) metastasis. They are undergoing for chemotherapy.

2 patients died due to liver and lung metastasis and life time were 4 and 18 months after RT respectively.

In comparison of these two fractionation schedules, 5 years local recurrence rate, overall survival rate, cosmetic outcome are not significant difference, but there have been less adverse effects in hypofractionated radiotherapy.

Keywords: Breast cancer, hypofractionated radiotherapy
Relaps and Metastatic Rate of Breast Cancer profile in Radiotherapy Department Cipto Mangunkusumo Hospital, January 2016 to January 2018 and Its Association with Complying to the Guideline

I Made Haryoga, Narisa Darwis, Soehartati Gondhowiardjo

Introduction: Clinical guidelines are believed to assist physician to provide beneficial outcome and prevent harm in delivering medical service to patient. Aims: This research aimed to find the benefit of following the practical guideline as well as to find out the breast cancer profile in our daily practice. Methods: a total of 124 breast cancer cases were collected consecutively from January 2016 to January 2018. Based on our national breast cancer guideline (PNPK), we confirmed the definition of cases which following the guideline or not. Chi square analysis by using SPSS 21 was performed to explore the association between risk factors and dependent variables, which was relapse and metastatic rate. Result: The most frequent cases came to our department were stage III (53%), followed by IV (42%), II (20%), and I (2.4%), respectively. We figured out that the relapse-metastatic rate was 47.6% versus 52.4% of non relapse-metastatic patients. There was 56.5% of the total cases were not complying to the guideline. Several factors which influenced the relapse-metastatic rate were prognostic staging (p <0.001), time to radiation after surgery and chemotherapy (p <0.001), time to radiation from surgery without chemotherapy (p= 0.003), adherence to guideline (p< 0.001), and category for not complying to the guideline (p<0.001) including time to radiation, patient came in later stage, surgery refusal, drop out to treatment, and returning patient to undergo chemotherapy. Conclusion: this report showed that poor compliance to the guideline was associated with the high rate of relapse and metastatic cases in our department, where time to radiation played the biggest contribution to the result.

Keywords: adherence to guideline, breast cancer, metastasis, profile, relapse
Dosimetric Analysis of Three Dimensional Conformal Radiotherapy (3DCRT)-Field-in-Field, Volumetric Modulated Arc Therapy and Helical tomotherapy in Left Breast Cancer Radiotherapy

Fatmasari, Angela Giselvania, Soehartati A.G.

Background: Radiotherapy as a single therapy and as a combination therapy, plays an important role in the management of left breast cancer. A study was conducted to analyze the dosimetry parameters between 3DCRT-FIF, VMAT and HT in breast cancer in the Radiotherapy Department of RSUPN-CM. Method: Exploratory experimental study with intervention on 10 CT plans of left breast cancer patients who have been irradiated. A dose of 50 Gy (in 25 fraction) is administered to PTV. Evaluated by conformity index (CI) and homogeneity index (HI), D98%, D2%, D50%, D95% and OAR. Results: All three techniques provide minimal varying dose coverage on the target volume, the HT technique is capable of delivering a superior D95% average. At D50% there was a significant difference in 3 groups between 3DCRT-FIF and VMAT (p = 0.000), 3DCRT-FIF with HT (p = 0.000), and VMAT with HT (p = 0.005). D2% of the results of statistical analysis found significant differences in the 3 groups that existed between 3DCRT-FIF with VMAT (p = 0.005), 3DCRT-FIF with HT (p = 0.005), and VMAT with HT (p = 0.005). Conclusion: The use of VMAT and HT in the management of left breast cancer still needs attention, especially for radiation doses in OAR. While for 3DCRT-FIF usage of this research is still quite safe for OAR although in coverage of D98%, D2%, D50% and D95% not as good as 2 other technique that is VMAT and HT.

Keywords: Radiotherapy, left breast cancer, dose escalation, three dimensional conformal radiotherapy
A Clinical Study On Psychosocial Aspect And Quality Of Life In Breast Cancer Patients

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Background:
Worldwide, breast cancer is the most common malignancy diagnosed in women. While early detection and advancement of treatment improved survival, treatment related problems can have a major impact on the quality of life in breast cancer patients. Also, it affects women’s identities and therefore studying quality of life in women who loses their breasts are vital. Thus the issue of “survivorship” now has become an important topic in breast cancer care that demands the investigation of long term effects of breast cancer diagnosis and its treatments.

Objectives:
To determine the psychosocial aspect and quality of life in breast cancer patients after completing chemotherapy or radiotherapy or any combination therapy.

Methods:
This hospital based, descriptive and cross sectional study was conducted at Radiotherapy department, Dhaka Medical College Hospital, Dhaka included 100 breast cancer patients. Patients with breast cancer received prior definitive treatment were enrolled in this study.

Results:
In this study the mean age of patients were 46 years. The result showed that there were significant improvements in patients physical, emotional and social functioning at 12 months follow up (p - <0.001). It also showed that there were deterioration in patients arm symptoms, body image, sexual functioning, future perspective and anxiety symptoms but significant improvement of breast symptoms and systemic therapy side effects.

Conclusion:
The findings of this study suggest that overall breast cancer patients perceived benefits from their treatment. However, patients reported problems with pain, fatigue, arm symptoms, body image and sexual functioning after 12 months following their treatment.

Keywords : Psychosocial aspect ,Quality of life , Breast cancer
Radiation recall dermatitis with docetaxel and cyclophosphamide in a case of early stage breast cancer considered high risk by molecular profiling

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Breast cancer treatment is in constant evolution. The traditional clinical and pathologic criteria used to determine risk factors for recurrence and other outcomes are increasingly being complemented by the use of gene expression profiling. As a result, the use of additional treatments in breast cancer may rise, based on the predicted risk for developing adverse outcomes. This case report documents radiation recall dermatitis (RRD) in a woman found to be at high risk for recurrence based on molecular profiling (MammaPrint® 70-gene breast cancer recurrence assay; Agendia, Inc.). Factors predisposing to the patient's developing RRD are explored in relation to published data. In addition, this case highlights the need for vigilance and a system for reporting this adverse event.

Keywords: breast cancer, case report, radiation recall
**Adenoid Cystic Carcinoma of the Female Breast: A Case Report**

Aveline Marie Du Ylanan

**Introduction:** Adenoid cystic carcinoma (ACC) is a rare subtype of invasive breast cancer, occurring in <0.1% of all malignant breast tumors. Though majority are triple-negative, ACC of the breast has good prognosis with a low incidence of regional and distant metastases.

Case: A 45-year-old premenopausal female presented with a 5-month history of a gradually enlarging mass on her left breast. After core needle biopsy and subsequent metastatic work-up, she underwent total mastectomy with sentinel lymph node biopsy. Final histopathology showed adenoid cystic carcinoma, 2.1 cm in size and no lymph nodes positive for tumor. She is about to complete adjuvant radiotherapy of 50Gy to the chestwall, after which regular follow-up is planned.

**Discussion:** Surgery with either lumpectomy or mastectomy has been established as the mainstay of treatment of ACC of the breast, but the use of adjuvant radiotherapy (RT) and chemotherapy has not been established. Adjuvant RT has been seen to improve cause-specific and overall survival following lumpectomy or breast conserving surgery (Coates et al., 2010). However, its indications post-mastectomy has not been established (Sun et al., 2017). The decision to administer adjuvant RT was based on the current evidence indicating the advantages of adjuvant treatment for breast carcinomas in general, indications for postmastectomy RT in a retrospective Rare Cancer Network study (Khanfir et al. 2010), and reported incidences of local recurrences following mastectomy alone: 21.4% (Arpino et al., 2002) and 22.2% (Millar et al., 2004).

**Keywords:** adenoid cystic carcinoma, breast, adjuvant radiotherapy
PF014

Change of Immunohistochemical evaluation in estrogen and progesterone receptors of pre and post-neoadjuvant Hormonal therapy for breast cancer: A Rare Case

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In one study assessing the effect of short-term preoperative hormonal therapy on treatment outcomes and found that levels of Ki67 levels in the Immunohistochemical (IHC) examination may change compared to Ki67 before hormonal therapy tends to decrease. As for changes in ER, PR and HER2 after hormonal therapy can occur but still in research. In this case report will present the changes of ER, PR and HER2 changes in locally advanced stage breast cancer patients after hormonal therapy, and then continued with MRM surgery and irradiation.

Keywords : Immunohistochemical, ER, PR, Breast cancer
Palliative
Palliative Radiotherapy for Advanced Cancer: Are we giving it to the Right Patient at the Right Time?

Syadwa Abdul Shukor

Introduction: Palliative radiotherapy is widely used to treat patients with symptomatic advanced cancer. Symptomatic relief following treatment may take a few weeks up to a few months to occur. Accurate prognostication to aid patient selection and is important in order to avoid harm to this group of patients with limited lifespan. The literature on this subject, especially in the developing world, is rather scarce. The aim of this study is to determine the median survival and 30-day mortality (30-DM) of patients who had palliative radiotherapy in our centre and factors associated with these parameters in order to identify the group of patients likely to have significant benefit from this treatment modality while at the same time reduce the burden on healthcare resources.

Methods: We conducted a retrospective cohort study in our centre. Data from 585 eligible patients who received palliative radiotherapy between January 2012 and December 2014 were analysed. Median overall survival was calculated from the commencement of first fraction of the last course of radiotherapy to date of death or when censored. 30-DM was calculated as the proportion of patients who died within 30 days from treatment start date. Kaplan-Meier survival analysis was used to estimate survival. Cox regression and logistic regression analysis was used to assess the impact of potential prognostic factors on median survival and 30-DM.

Results: Six hundred and thirty episodes of palliative radiotherapy in 585 patients were analysed. The most common diagnoses were lung and breast cancers and most common irradiated sites were bone and brain. Median survival and 30-DM were 97 days and 22.7% respectively. ECOG performance status, systemic treatment post radiotherapy, hospital status during treatment and intended radiotherapy treatment completed had a significant impact on median survival and 30-days mortality.

Conclusion: Median survival and factors affecting both survival and 30-DM in our study are comparable to others. However a 30-DM rate of 22.7% is significantly higher compared to the literature. We need to better select patients who will benefit from palliative radiotherapy in our centre.

Keywords: palliative radiotherapy, 30-days mortality
Quality of life in the patients with brain metastasis, comparison of whole brain radiation therapy 20gy/5f and 30gy/10f
Phongpan

PURPOSE: To compare quality of life, toxicities, overall survival, cognitive function and imaging response in metastatic brain patients treated with whole brain radiation therapy (WBRT) dose 20 Gy/5 F and 30 Gy/10 F.

METHODS: In this prospective non-inferiority randomized controlled trial. Eligible patients were > 18 years of age, diagnosed with CT or MRI scan with good response to prior steroid treatment. Exclude the patients with previous cranial irradiation, brain stem lesion and posterior fossa lesions without prior surgery. Patients were randomly assigned (1:1) to 20 Gy/5 F and 30 Gy/10 F with allocation concealment. RESULTS: Between Jan 1st, 2017 and Oct 31st, 2017, 23 patients were randomly assigned to the 20 Gy/5 F group (n=12) or 30 Gy/10 F group (n=11) with 21 patients available for primary end point analysis; 2 patients were excluded after randomization (one patients from each group). Median follow-up time = 135 days. Multilevel regression with adjusted unbalance baseline showed non-inferiority of FACTBr (-0.92, 95% CI -5.31 to 3.47, non-inferiority margin = -9) and ADAS score (0.28, 95%CI -1.26 to 1.82, non-inferiority margin = +3) difference at 1-month follow-up. There is no significant difference of grade 3-4 toxicity, including intracranial symptom (9% vs 10%) and duration of steroid use in both arms. There is no CNS progression (0%) in both arms. The median survival in 20 Gy/5 F group and 30 Gy/10 F group were 187 and 210 days respectively (p=0.868)

CONCLUSION: In the patients with short life expectancy, WBRT with dose 20 Gy/5 F can be used instead of dose 30 Gy/10 F with non-inferiority of quality of life and cognitive function.
Objective: We retrospectively analyzed our experience with 3 staged gamma knife stereotactic radiosurgery (GKS) in treating large brain metastasis of more than 3 cm.

Methods: 8 patients with single or multiple large brain metastasis which were treated with outpatient 3-staged frameless gamma knife radiosurgery were retrospectively selected for this study. The median age was 51 years (range 26–76 years), 3 patients had non–small cell lung cancer, 3 patients had breast cancer, 1 patient had cervical cancer and 1 patient had radioresistant tumor (sarcoma). The prescription dose per fraction ranged from 10 Gy to 12 Gy to the 50%-64% isodose line. Each patient returned 3 weeks later for Gamma Knife radiosurgery to the residual tumor. Patients were followed through outpatient visits and MR imaging after 3 months.

Results: Significant decreases in tumor volume were observed between each treatment stages for non-small cell lung cancer and breast cancer patients with brain metastasis. At 3-month follow-up, non small cell lung and breast cancer patients presented with excellent control rates and improved symptoms. Sarcoma patient was diagnosed with tumor progression at the last follow-up.

Conclusions: Gamma Knife radiosurgery for breast and non-small cell lung brain metastases leads to excellent control rates of treated lesions; however the outcome remained poor for patient with radioresistant brain metastasis.

Keywords : gamma knife, brain metastasis
Palliative Radiotherapy as a Pain Management in Radioactive Iodine Refractory Differentiated Thyroid Cancer

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Objective: To present complicated case of Radioactive Iodine (RAI) Refractory Differentiated Thyroid Cancer (DTC) with multiple bone metastases, extradural spinal mass, uncontrolled intermittent pain with opioid and its response to palliative radiotherapy

Methods: We reviewed all clinical data includes pathological samples, Magnetic Resonance Imaging (MRI), Computed Tomography (CT) scan, imaging obtained from CT simulator and palliative radiation effect on patient’s Quality of Life.

Results: A 36-year-old woman with a history of DTC-follicular type, a total thyroidectomy, who had multiple bone metastases, extradural spinal mass (12.07 cm x 11.29 cm x 10.82 cm) from T12 to S1, paraplegia and intermittent pain. She was treated with chemotherapy (Doxorubicine), Bisphosphonate, RAI as well as combination of DexKetoprofen 75mg/day and fentanyl patch 12.5µg/day. Even so, the mass is getting bigger and cannot be treated with RAI. We gave her a palliative dose; 36 Gy delivered in 15 fractions and 10 Gy boost dose delivered in 5 fractions. After completing her treatment; the mass has shrunk, she was pain free and could live without any painkillers.

Conclusion: Palliative Radiotherapy gives a good response on reducing mass and pain in RAI refractory DTC case. Therefore, we should consider it as a treatment option to improve the Quality of Life.

Keywords: radioactive iodine refractory differentiated thyroid cancer, palliative radiotherapy, pain, palliative, radiotherapy
Acupuncture as Complementary Treatment in Radiation Therapy Related Fatigue

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Fatigue is one of the most common symptoms experienced by cancer patients that negatively impacts quality of life. Radiation Therapy (RT) related fatigue is defined as ‘a persistent, subjective sense of tiredness related to RT that interferes with usual functioning, and its specific etiology remains unclear. Acupuncture has the potential to prevent RT-related fatigue, along with exercise programs, TENS (Transcutaneous Nerve Stimulation) and Relaxation Therapy. Eventhough the side effects of acupuncture is minimal (i.e: small bruises or minimal bleeding), there is a need to raise awareness of the potential benefits to patients and the evidence base supporting the use of acupuncture in palliative care. Expansion of palliative care services to a larger number of patients and illnesses throughout the country, considering home-based palliative care service is also urgently and badly needed, strengthening health care systems; focusing on patient centred care, education and training to all levels of health care professionals.

Keywords: Radiation Therapy Related fatigue, acupuncture, Palliative care
Death education for children – based on clinical oncology and ethics

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Radiation therapy has an important role in palliative treatment for cancer patients. Medical staffs are usually faced with death of cancer patients. Patients and their family often avert their eyes from death and much medical efforts are paid, but unfortunately death is something inevitable. On such situations many of medical staffs develop a sense of defeat-feeling like “This is our failure”, or “We are losers.” Although science have already told us that no creature lives forever and immortality is rather harmful, why we cannot stop such feeling? One reason may be the social environment in Japan today. The more family become “Nuclear family”, which is a family of parents and children without grandparents, and children have less chance to be present at the moment of death of their family. In addition, most of patients die in the hospital, rather at home. Death draws a line with our daily life. However, the death should be accepted without a sense of defeat, because it is natural goal. Death should be something natural for us-both medical staffs and patients. From such background we reached the following conclusion that we should give opportunities to younger generation for thinking about death. It should not be considered to talk about death as a taboo. To give such opportunities to children, our research group which includes researchers of other area (philosophy, ethics and social science) and medical doctors, makes educational programs of thanatology for children and students. In this occasion, we are introducing our educational try.

Keywords: death education, thanatology
Palliative Radiation Therapy: impressive 3 cases of bone metastases

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Background: The role of palliative radiation therapy (PRT) is to control symptoms caused by cancer and so giving the patient a better QOL. Here we present impressive cases of PRT for bone metastases during 30 years of experience. Case Presentation: 1) A 44-year-old woman with endometrial cancer previously treated with surgery developed gait disturbance and sensory loss of bilateral lower extremities occurring 2 days ago. Just a night before admission, she could not even stand up. Thoracic MRI revealed bulky bone metastases at Th1-3 heavily compressing her spinal cord. Emergency PRT was started from the day and continued up to 38Gy. After 6 months of bedridden, she gradually recovered her sensory and could stand up again at 9 months. She is still alive without progression at 10 years. 2) A 38-year-old woman with cervical cancer treated with chemoradiation developed painful Th2-3 oligometastasis at 40 months. Cyberknife stereotactic RT of 20 Gy followed the conventional RT. Complete response was obtained and she is still NED at 6 years. 3) A 44-year-old medical doctor with disseminated breast cancer was approaching her end-of-life. She had severe hip joint pain due to bone destruction by metastatic tumor not responding to opioid medication. She was moved by bed and treatment port was set directly at Linac treatment room. A single fraction of 8 Gy was delivered. Next day, she said “Hip pain is completely gone. Thank you, doctor.” She died a week later.

Conclusions: PRT can provide further benefits beyond symptomatic relief for cancer patients.

Keywords: Palliative radiation therapy, bone metastasis
Brachytherapy
Difference of dose distribution on organs at risk between prescription methods according to bladder distension in MRI-based intracavitary brachytherapy for cervical cancer

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Purpose: To investigate whether there is a difference in the distribution of doses on organs at risk (OARs) between prescription methods (2D vs. 3D image-based planning) according to bladder distension in intracavitary brachytherapy for cervical cancer.

Materials and Methods: From May 2015 to December 2016, 50 cervical cancer patients who underwent external beam radiotherapy and brachytherapy were retrospectively reviewed. We reviewed the actual MRI-based treatment planning and established a point A prescription treatment planning. We compared dose parameters of OARs, such as Rectum D2cc (the minimum dose value in a 2cc volume receiving the highest dose), Sigmoid D2cc, Bladder D2cc and Bowel D2cc.

Results: The stage ranged from IB1 to IVB and IIB was the predominant stage. Median 45 Gy of external radiation and 30 Gy of brachytherapy were performed. Clinical target volume (CTV) dose coverage did not show a significant difference between prescription methods. For 25 patients without a bladder distension, there is significantly decreased mean bowel D2cc values in 3D image-based planning (p=0.010). There were no substantial differences in rectal, sigmoid and bladder D2cc values. For patients with a bladder distension, the mean D2cc values of rectum, sigmoid, bladder and bowel significantly decreased with 3D planning. However, the bladder volume did not show a significant correlation with any OAR.

Conclusions: In our analysis, 3D-image based planning can reduce the D2cc value of OARs more effectively in bladder distension more than 200cc. However, there is no need to fill in the amount as much as possible.

Key words: Brachytherapy, Organ at risk, Dose distribution, Cervical cancer
HDR Interstitial brachytherapy in Recurrent head and neck cancer: An effective treatment modality - A Single institute experience

Vibhay Pareek, Rajendra Bhalavat, Manish Chandra, Lalitha Nellore, Karishma George, Dipalee Borade, Ketan Kalariya, Zaiba Moosa, Navaneeth Reddy, Amrita Srivastava, Ankita Kapoor

Objectives:
High Dose Rate (HDR) Interstitial Brachytherapy has role in head and neck malignancies and offers good survival rates, however, there are scant data on improved local control (LC) and treatment-related complications in patients with recurrent head and neck (H&N) cancers. We report our results in patients with recurrent H&N cancers treated with interstitial HDRBT.

Methods and materials
Twenty-Five patients with recurrent H&N cancers were treated with HDR interstitial brachytherapy between January 2010 and December 2016. The treatment sites were oral cavity (15/25) and oropharynx (10/25). The median dose was 4.5 Gy twice per day with median total dose with brachytherapy of 40.5Gy in radical and 27Gy for EBRT cases. The EBRT median total was 46Gy. Patients were followed up as per the institutional protocol and were assessed for survival outcomes and toxicities.

Results
With a median follow-up of 18 months, 4 local recurrences were observed within first year of follow up after the procedure. The 2-year local control and overall survival outcomes for the entire group were 58.3% and 83.3%, respectively. The 4-year disease free survival was 50% and distant metastases seen in 33.3% at 5 years. There were 3 patients with Grade II and 4 with Grade III complications. A median BED of 88Gy showed improved survival outcomes in these patients.

Conclusion
The results of HDR Interstitial brachytherapy have shown an acceptable local control and overall survival rates along with tolerable toxicities and morbidity in recurrent H&N cancers.

Keywords: HDR brachytherapy, Head and neck cancer, Recurrent tumor

Back to Link
Can Brachytherapy help reduce the dose to Dysphagia/ Aspiration related structures in head and neck cancer treated post external beam therapy? – A Clinical experience

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Introduction/ Objective:
Dysphagia/ Aspiration related structures (DARS) receiving the brachytherapy dose has been gaining importance. However, role of brachytherapy to spare these structures has not been explored yet. In this study, we evaluate role of brachytherapy in sparing DARS

Material and Methods:
From January 2009 to Dec 2016, 35 patients with oropharyngeal cancers were evaluated, DARS structures were delineated including superior, middle and inferior constrictors and larynx. The parameters noted were structure volume, maximum dose to structure at a given point (Dmax) and total volume as a whole (MDTV) along with dose to 30%, 50% and 95% of the volume (D30, D50, D80 and D95). Toxicities assessed as per the swallowing performance status scale.

Results:
Brachytherapy dose per fraction was 4Gy (Range 3.5 – 4.5Gy). Volume of the DARS was 23.5 cc of superior constrictor (SC), 5.6 cc of middle constrictor (MC), 3.9 cc of inferior constrictor (IC) and 29.8 cc for larynx (L). The MDTV, Dmax, D30 and D80 for SC was 65%, 118%, 78% and 66%; for MC was 61%, 70%, 63%, 60%; for IC was 55%, 59%, 57%, 55%; for L was 58%, 99%, 66%, 62%. After a median follow up of 20 months, 15% patients had Grade III status and 25% had Grade II status.

Conclusion:
Brachytherapy has important impact, both clinically and dosimetrically to preserve DARS. In our country, application of brachytherapy as a boost or radical approach can be a better substitute for IMRT boost which is not easily available across all centers.

Keywords: DARS, Head and Neck Cancer, Brachytherapy, IMRT
Quality Assurance
Modulation index to evaluate VMAT plan delivery accuracy

Jong Min Park, Hong-Gyun Wu, and Jung-in Kim

We evaluated the performance of various modulation indices (MI) for volumetric modulated arc therapy (VMAT). The specific indices evaluated were MI quantifying the mechanical and dose calculation uncertainties (Mic), MI for station parameter optimized radiation therapy (MISPORT), modulation complexity score for VMAT (MCSv), leaf travel modulation complexity score (LTMCS), plan averaged beam area (PA), plan averaged beam irregularity (PI), plan averaged beam modulation (PM), and plan normalized monitor unit (PMU) to predict VMAT delivery accuracy. By utilizing 240 VMAT plans generated with the Trilogy and TrueBeam STx, Spearman’s rank correlation coefficients (r) were calculated between the MIs and 1) the local gamma passing rates (GPRs) acquired with the MapCHECK2 and ArcCHECK dosimeter arrays and 2) the mechanical parameter differences between VMAT plans and the log files. For the Trilogy system, Mic showed the highest r values with GPRs (r = -0.624 with p<0.001 for MapCHECK2 and r = -0.655 with p<0.001 for ArcCHECK). For TrueBeam STx, Mic also showed the highest r values with GPRs (r = -0.625 with p<0.001 for the MapCHECK2 and r = -0.561 with p<0.001 for the ArcCHECK). The Mic showed the highest r values to the MLC position errors for the Trilogy and TrueBeam STx systems (r = 0.770 with p<0.001 and r = 0.712 with p<0.001, respectively). To comprehensively review the results, the Mic showed the best performance to predict the VMAT delivery accuracy.

Keywords: volumetric modulated arc therapy, modulation index, gamma evaluation
OBJECTIVES: SAFRON is a database of error reporting and incident learning system (ILS) on radiotherapy developed by International Atomic Energy Agency (IAEA) in December 2012. Identifying and analyzing safety-related events is a proven way to enhance the quality of cancer care and radiation delivery. Adapting SAFRON will help to assist our institution in promoting safety culture and to improve patient safety through analysis of incidents and formulate action plans to minimize errors in the future. This study will present a descriptive analysis about the radiotherapy events and near misses in our institution utilizing the SAFRON database.

METHODS: This study utilized SAFRON database of incidents (July 2017 - February 2018) reported by the Department of Radiotherapy, Jose R. Reyes Memorial Medical Center, Manila, Philippines. Data were analyzed based on the following: 1.) who discovered the incidents; 2.) how the incident was discovered; 3.) reachability to patients; 4.) process phase; 5.) clinical severity, 6.) failure of safety barriers. The results were analyzed using descriptive methods.

RESULTS: There were 99 reported incidents to the SAFRON database by our institution, majority of which were reported by radiation therapist (74%). Most of the incidents were discovered during chart checks (77%). More than two-thirds of the incidents occurred during the treatment phase while based on clinical incident severity, 80% were minor incidents and only 2% were major incidents, while the remaining 17% were classified as near miss with potential serious consequences.

We further investigated into what safety barriers were breached which includes: failure to do time-outs, failure to review treatment plan and inability to do independent confirmation of dose, and absence of record verifying system.

CONCLUSION: SAFRON demonstrated that ILS will promote and reinforce the safety and quality of radiotherapy. Our institution’s participation to SAFRON have led to increase awareness of safety culture and reporting of treatment errors through regular chart checks and clinical review of treatment plans; strengthening the identification of errors and near misses especially during the treatment phase, detection of it’s clinical severity and reachability to our patients; and furthermore identifying our safety barriers that need improvement and modifications.
Calibration of 192Ir high dose rate brachytherapy source using water phantom

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Purpose: Source calibration is an essential part in the dosimetric quality assurance programme of brachytherapy radiation. An indigenously designed jig is needed for in-air measurement. The purpose of this work is to use water phantom with a Farmer chamber for calibrating Ir-192 high dose rate (HDR) brachytherapy source and to determine the accuracy and suitability of this method for routine calibrations. Methods: The Ir-192 HDR brachytherapy source from Nucletron MicroSelecton HDR machine (Elekta AB, Sweden) was calibrated using two different procedures, one using the well-type ionization chamber (Standard Imaging Inc, Middleton WI), the result of which were set as a reference. The other procedure was in-air calibration method using a 0.65 cc ionization chamber (FC-65G, Scanditronix/Wellhofer, with a build-up cap of thickness 0.55 gm/cm2) with an empty water phantom (Blue Phantom2, IBA Dosimetry, USA). Firstly, a needle were fixed 5 cm up to the chamber on one side of the water phantom. Secondly, the radiation source was sent to the tip of the needle, then the cross-line and in-line profiles were scanned using the scan function of water phantom software. Thirdly, the chamber origin position were reset on the maximum signal position of each profile curve, rescan profiles until the two curves overlap together and centered on the source. Lastly, the reference air kerma rate (RAKR) of the source was determined using the 7-distance technique, the ionization chamber was moved downward to various distances (10, 15, 20, 25, 30, 35 and 40 cm) from the origin position, along the Z direction of water phantom. Measurements were repeated ten times over two half-life of the source. Results: The RAKR determined using the two calibration methods both show good agreement with the manufacturer stated value. The average differences in percentage between the two procedures mentioned above for the Nucletron HDR source are 1.53 ± 0.19 % and 1.11 ± 0.30%, respectively. The result has no statistical differences with different nominal source activity. The combined total measurement uncertainty in the water phantom and the total Farmer chamber calibration uncertainty for this method was 2.25 %( k=2). Conclusion: Using water phantom with a Farmer chamber for source calibration is relatively simple to perform, which provides an accurate positioning of the source and chamber without additional indigenously designed calibration jig for in-air measurements. Methods of calibration discussed in this study are effective to be used for routine calibration purposes.

Keywords: Ir-192 calibration, In-air calibration, water phantom, High dose rate (HDR)
Breast board combined with a thermoplastic head mask immobilization can improve the reproducibility of the treatment setup for breast cancer patients receiving whole breast and supraclavicular nodal region irradiation

Mingwei Ma

Objective: To quantify the setup errors measured with kV cone-beam CT (CBCT) using breast board with or without a thermoplastic head mask in breast cancer patients who received whole breast and supraclavicular nodal region irradiation. CTV to PTV in 3 directions were also calculated. Methods: The study included thirty patients receiving both whole breast and supraclavicular nodal region irradiation on Elekta Versa HD linear accelerators. All the patients were immobilized in the supine position on a breast board system with both arms raised. Twenty of the patients added an extra thermoplastic head mask to immobilize the neck. Van Herk's setup margin defined as MPTV= 2.5Σ + 0.76. Results: 56 and 109 images were acquired in breast board only group and head mask group, respectively. Shifts of the breast board only group and the head mask group in X, Y, Z were 0.212±0.174 cm vs. 0.272±0.242 cm, p=0.07; 0.364±0.246 cm vs. 0.242±0.171 cm. p=0.001;0.423±0.302 cm vs. 0.364±0.269 cm, p=0.204. Proportion of the shift less than 5mm were 91.07% vs. 85.32%. p=0.294; 67.86% vs. 89.91%, p=0.001; 67.86% vs. 74.31%, p=0.381. The MPTV in X, Y, Z were 0.645cm, 0.981 cm, 1.317 cm and 0.873 cm,0.709 cm,0.961cm, respectively. Setup error in the X direction was significantly correlated with BMI (p =0.001). Conclusions: Using a breast board in combination of a thermoplastic head mask may significantly help to reduce the shift variance in superior-inferior direction. Other immobilization device are needed to be further explored to improve anterior-posterior error.

Keywords: Breast cancer; Setup error; CBCT; IMRT
The Experience of Family Caregivers Living with Cancer Patients Receiving Chemotherapy in Sarawak: A Preliminary Study

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BACKGROUND: Cancer is a disease which affects not only patients but also their family caregivers by physically and emotionally. The purpose of this study is to identify and explicate the experiences of family caregivers living with cancer patients receiving chemotherapy in Sarawak.

STUDY DESIGNS AND METHODS: This was a qualitative descriptive study of family caregivers living with cancers patients receiving chemotherapy. Data were collected through open ended individual interviews. The study sample comprised 8 family caregivers. The interviews were audiotaped and transcribed verbatim with the participant’s permission. Data was analyzed by using Colaizzi’s data analysis method.

RESULTS: The study findings are grouped under six main themes: alternative treatment beside chemotherapy, knowledge and perception about cancer, difficulties, challenging and coping styles, relationship with healthcare personnel (doctors and staff nurses), improving the facilities and knowledge to be the best caregivers. Some caregivers claim to use alternative treatment other than chemotherapy. During the caregiving process, the caregivers not only affected emotionally but also physically and socially. Financial and transportation problem was determined in some caregivers. In addition the caregivers hope that the hospital can improve the facilities for both patients and caregivers. The caregivers also expect that the healthcare professional should be more sensitive to the presence of caregivers.

CONCLUSIONS: The caregivers faced many difficulties during the caregiving process and they have different ways of coping behaviors. The presence of caregivers while accompanying patient during the visiting including the improvement of the facilities should take into account by the healthcare professionals.

Keywords: cancer; chemotherapy; caregivers experience; qualitative study
Dosimetry
Dosimetric analysis of 3D conformal, Intensity Modulated Radio Therapy, and Helical Tomotherapy in Craniospinal Radiation Technique

Anak Agung Sagung Ari Lestari, H. M. Djakaria, Soehartati A. G.

Background: Craniospinal radiation is a method of radiation that is often used in cases of malignancy of the central nervous system that spread to cerebrospinal fluid. Due to the large area of radiation, the radiation area must be divided into several fields that produce difficulty in overcoming the inter-field junction. In addition, the number of critical organs involved and the age of patients with the majority of children result in separate considerations in the choice of craniospinal radiation techniques. Currently there is no research data that analyzes craniospinal radiation with 3D-CRT, IMRT, and Helical Tomotherapy (HT) in Indonesia. Method: exploratory experimental study by planning intervention on 10 CT plan data of craniospinal patients radiated in Radiotherapy Department of Cipto Mangunkusumo General Hospital. Dose 36 Gy is given in 20 fractions. Cranial and spinal PTV coverage was evaluated using the conformity index (CI) and homogeneity index (HI). Performed recording of critical organ parameters, the number of MU and the duration of the beam. Results: The Helical Tomotherapy technique is the best technique for achieving HI and CI figures and protection of critical organs, but has the highest body-wide radiation exposure compared to CRT and IMRT 3D techniques in addition to the highest MU values and longest exposure duration so should be considered in children high risk of secondary malignancy. 3D CRT has the worst HI and CI values with limited ability to protect critical organs but has the lowest total body radiation, MU exposure and the shortest duration of irradiation. Keywords: Dosimetric comparison, craniospinal, 3D conformal technique, Intensity Modulated Radiotherapy (IMRT), Helical Tomotherapy (HT), secondary malignancy.
Analysis of Newer Treatment Techniques in Clinical Outcomes of High Grade Glioma: Volumetric Arc Therapy Versus Intensity Modulated Radiation Therapy Versus 3D Conformal Radiation Therapy


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**Purpose/Objective(s):** In high grade gliomas, clinical outcomes depend on the tumor dose coverage and toxicities depends on the dose to surrounding organs at risk. With advent of newer modalities in the form of Intensity Modulated Radiation Therapy (IMRT) and VMAT, there is a need to look in to the dosimetric and clinical outcomes compared to the standard 3D conformal radiation therapy (3DCRT). This study, aims to evaluate the dosimetric and survival outcomes with respect to tumor doses and normal organs at risk and form a consensus on better treatment modality.

**Materials/Methods:** Between 2011 and 2016, total 140 patients were evaluated of which 110 were WHO Grade IV and 30 patients were Grade III. Of these, 45 patients each underwent radiation therapy with VMAT and IMRT and 50 patients underwent 3DCRT treatment. The patients received 50.4Gy followed by boost of 9Gy with 1.8Gy per fraction dose. Planning was done with the aim of 98% of PTV covered by 95% isodose. Mean OAR dose were maximally decreased without reducing PTV coverage or violating hotspot constraint. The treatment plans were evaluated using standard dose volume histogram. The median follow-up of the patients was 13 months. The local control, overall survival and progression free survival were evaluated. Response was recorded using the Response Assessment in Neuro-Oncology criteria and toxicities graded according to CTCAE version 4.0. The dosimetric parameters were assessed using unpaired t test and the Wilcoxon matched-pair signed-rank test for non-parametrically distributed data used to compare the means. Maximum and mean OAR doses were directly used as part of the optimization process and, along with MU and timing, were considered as primary endpoints.

**Results:** All three techniques achieved an adequate dose conformity to the target volume. The conformity and Homogeneity index were found to be better with IMRT and VMAT (p < 0.005). The monitor units (MU) and treatment times were better with VMAT (p < 0.01). The doses to brainstem, optic nerve, retina, lens and normal brain parenchyma were found to be significantly better with VMAT. The median overall survival with VMAT, IMRT and 3DCRT were 16, 13 and 10 months respectively. The 1 year and 2 year PFS were 72 and 27%, 55 and 21%, 46 and 13% respectively in the three treatment techniques (p < 0.001). The toxicities assessed were similar in both IMRT and VMAT. The prognostic factors found to be influencing the treatment outcomes included age, gender, grade of tumor and Karnofsky performance status (KPS) of the patient.

**Conclusion:** The treatment outcomes in the form of overall survival and toxicities are found to be better with VMAT and also to spare the normal brain parenchyma and structures at risk. With modern treatment techniques available to permit better tumor dose conformity and spare normal tissue, outcomes of the disease can be achieved in desirable manners. VMAT is an excellent technique for treatment of high grade gliomas and needs to be looked in to in future large prospective trials.

**Keywords:** IMRT, VMAT, 3DCRT, High grade glioma
Comparison of ICRU 38 Rectal Reference Point Dose Estimates with Measured Dose In-vivo in Cobalt-60 HDR Brachytherapy for Cervical Cancer

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The objective of this study was to compare the ICRU 38 calculated rectal dose with in-vivo dosimetry measured doses in Cobalt-60 HDR brachytherapy for cervical cancer. A total of 48 brachytherapy insertions done on 15 patients treated from January to March 2017 at our institution were included in this prospective cross sectional study. The results demonstrated no significant difference between the computed ICRU rectal point dose and in-vivo maximum measured rectal dose (r) 0.6208, p <0.0001 [S]; t-test p=0.1578 [NS] 95%CI -0.78 to 0.46), but a significant difference between ICRU rectal point and in-vivo mean measured rectal dose (r) 0.6033, p <0.0001[S]; t-test p<0.0001[S] 95%CI -0.81 to 0.35). These findings were seen even when sub-analyzed for the two used fraction sizes of 7Gy and 8Gy. The results also showed no significant differences in the maximum (r) 0.9029, p <0.0001[S]; t-test p=0.2576[NS], 95%CI -0.21 to 0.06) and mean (r) 0.9766, p<0.0001[S]; t-test p=0.2786[NS], 95%CI -0.93 to 0.03) doses taken from treatment planning system assigned dose points coinciding with the imaged probes of the in-vivo dosimeter. Over-all, this study was able to provide additional evidence that in-vivo dosimetry can be validly used in the clinical setting to estimate the dose to the rectum during Co60 HDR brachytherapy. Use of this technique allows for an additional quality assurance method that can contribute to reductions of errors in dose delivery.

Keywords: “Cobalt-60”, “Brachytherapy”, “In-vivo”, “Dosimetry”, “Rectal Dose”, “Cervical Cancer”.
Dosimetric Analysis of Intensity Modulated Radiosurgery Step-and-Shoot (IMRS-SS) and Volumetric-Modulated Arc Radiosurgery (VMAT) in Vestibular Schwannoma

Aurika S, Arie Munandar, Soehartati A. G.

Purpose: This dosimetric analysis compare the conformity index (CI), the gradient index (GI), monitor unit (MU), and the dose to organ-at-risk i.e. brainstem and ipsilateral cochlea between Intensity Modulated Radiosurgery Step-and-Shoot (IMRS-SS) and Volumetric-Modulated Arc Radiosurgery (VMAT) treatment plans. Methods: Ten CT data plans of vestibular schwannoma patients were selected with mean tumor size 8.50 + 5.26 cm3. IMRS-SS treatment plant was generated with 14-17 fields, while VMAT with 2-3 arc (planar or non-coplanar). Results: Respectively for IMRS-SS and VMAT, Mean CI values were 0.99 + 0.02 and 1.01 + 0.02 (p = 0.149), mean GI values were 4.28 + 0.34 and 4.37 + 0.47 (p = 0.179), mean doses to brainstem were 1173.16 + 168.02 and 1175.07 + 156.12 (0.860), mean doses to ipsilateral cochlea were 769.80 + 332.25 and 770.77 + 311.52 (p = 0.977), mean MU were 4622.10 + 593.24 and 3849.20 + 269.05 (p = 0.004). Conclusion: There was no significant difference between conformity index, gradient index, and dose to brainstem and ipsilateral cochlea, but VMAT decreases MU, which was associated with decreased beam-on time.

Keyword: vestibular schwannoma, IMRS-SS, VMAT
The Impact of Monte Carlo Simulation on Radiotherapy

Freddy Haryanto

More than one decade Monte Carlo (MC) simulation is implemented to increase the accuracy of dose calculation on Radiotherapy. Due to its method based on the nature process of transport particle, MC simulation became a golden model for dose calculation, especially on the IMRT. Therefore, the aims of this work is to explore the advantage of MC simulation for dose calculation.

To achieve our aims, MC simulation is used to model the LINAC’s head and to calculate dose in phantom or patient. For the first step, the information of material and geometries of each component on LINAC’s head from manufacture is needed. Then the detailed model of LINAC’s head based on MC simulation is build and also is commissioned with the LINAC’s machine. After the commissioning’s step, two aspects of dosimetry is investigated, namely the small field and the tongue and groove effects. Some of measurement are done for justification the results of our simulations.

Models of LINAC’s head from two manufacture ELEKTA and VARIAN are made. The results of their commissioning are also will be discussed on our presentation. From the study of the small field effect, the simulation could answer the problem that appears in small field dosimetry. The results from the tongue and groove simulation shows that the MC simulation gave the same outcomes as measurement.

As conclusion, Monte Carlo simulation make some important role to increase the accuracy of dosimetry on the radiotherapy, but it still need some computing technology to boost its computing time.

Keywords : Monte Carlo, Small field, Tongue and Groove effect
Dosimetric Analysis of 3D-Conformal Radiotherapy, Intensity Modulated Radiotherapy (IMRT)-Step and Shoot, Helical Tomotherapy and Volumetric Modulated Arc Therapy in Prostate Cancer Radiotherapy

Fenny Gozal, Arie Munandar, Soehartati A. G.

Background: There is limited study comparing dosimetry parameters between four different techniques; Three Dimentional Conformal Radiotherapy (3D-CRT), Intensity Modulated Radiotherapy - Step and Shoot (IMRT-SS), IMRT-Helical Tomotherapy (HT) and Volumetric Modulated Arc Therapy (VMAT) in relation to prostate cancer in Radiotherapy Department RSUPN Cipto Mangunkusumo. Method: Experimental study with intervention on 10 prostate cancer patients’ CT planning data. All the subjects underwent radiation in radiotherapy department RSUPN-CM. 78 Gy dose in 39 fractions was given for PTV. Results: The mean V75Gy rectum and bladder between 3D-CRT and the other three above mentioned techniques all showed significant results (p <0.05). V5Gy RVR between 3D-CRT vs VMAT and HT, IMRT-SS vs HT and VMAT vs HT is statistically significant (p <0.0001). The longest radiation time was done with HT (mean 4.70±0.84 minutes). Conclusion: V75Gy rectum and bladder between 3D-CRT is statistically significant compared with the other three techniques. Even though, it is not superior compared to HT and VMAT, IMRT-SS using 5 co-planar beams are able to provide good dose distribution for PTV and critical organs. HT have inferior conformity compared to VMAT. Shortest radiation time was done using VMAT (statistically significant compared to three other techniques). Keywords: prostate cancer, 3D-CRT, IMRT- Step and Shoot, helical tomotherapy, VMAT
Dosimetric Analysis of Intensity Modulated Radiotherapy (IMRT), Volumetric Modulated Arc Therapy (VMAT) and Helical Tomotherapy (HT) in Hippocampal Sparing Whole Brain Radiotherapy

Hadi Nurhadi, Arie Munandar, Soehartati A. G.

Background: Radiation therapy is still a standard treatment in brain metastases cases. Whole brain radiation therapy is widely used to reduce debilitating symptoms, on the other hand this treatment could decrease neurocognitive function due to radiation-induced inflammation of the hippocampus. This is the ground reason to apply Hippocampal Sparing Whole Brain Radiotherapy (HS-WBRT), in order to reduce hippocampus related side effects. The focus in this study is to analyze dosimetric parameter between Intensity Modulated Radiotherapy (IMRT), Volumetric Modulated Arc Therapy (VMAT), and Helical Tomotherapy (HT) in Hippocampal Sparing Whole Brain Radiotherapy (HS-WBRT) to assess any differences in dosimetric values.

Method: This study is an experimental study on CT and delivered treatment planing data, recalculated in silico as a hippocampal sparing treatment planning to be compared. The dosimetric parameter that were used in this study are Conformity Index, Homogenity Index, Treatment Time, D98% PTV, D2% PTV, D50% PTV, D100% Hippocampus, dan Dmax Hippocampus.

Result: The dosimetric comparisons between the three modalities resulted in statistically significant differences in Homogeneity Index, D98% PTV, D2% PTV, D50% PTV, D100% where Helical Tomotherapy (HT) has a better mean value among the rest of the group. In other dosimetric comparisons, Intensity Modulated Radiotherapy (IMRT) and Volumetric Modulated Arc Therapy (VMAT) does not have any significant differences, as such both modalities allows for sparing of the hippocampus with acceptable means value in many dosimetric parameters. Further research is needed, particularly with larger sample to assess superiority in HS-WBRT modalities, as such to increase efficacy in its treatment planning. Keywords: Dosimetric comparison, craniospinal, 3D conformal technique, Intensity Modulated Radiotherapy (IMRT), Helical Tomotherapy (HT), secondary malignancy.
Whole Brain Irradiation with Hippocampal Sparing: Tomo vs Conventional Radiation

Handoko, Gregorius Ben Prajogi, Arie Munandar

Background:
In some cases of brain metastasis in which tumors in other part of the body can be controlled well, patients might have relatively good survival if those brain lesions can also be controlled. Management of brain metastasis lesions is primarily carried out with radiation. Conventional WBRT provided a good control for a period of time for many patients, but cognitive decline is very common and it impacts quality of life of those patients. Recent technology with Tomo Linac using Tomo Plan can reduce significantly the dose to hippocampus as shown by the result presented here.

Aim:
To compare dosimetric data of conventional WBRT vs hippocampal avoidance radiation with Tomo Plan

Method:
In Tomo plan, gross tumors were boosted to a higher dose while at the same time reducing dose to hippocampus. Two planning were compared (conventional WBRT and hippocampal avoidance WBRT plan) in a patient with 3 brain metastasis. Prescription dose in conventional WBRT was 15x2.5 Gy. Prescription dose in hippocampal avoidance WBRT plan for PTV gross tumor > 40.5 Gy (90% of prescribed dose), for PTV hippocampal max dose < 6 Gy, for hippocampal avoidance zone 20% of volume less than 20 Gy.

Result:
Average dose to gross tumor in 3 brain lesions were 43.77 Gy, 43.68 Gy, and 39.19 Gy with Tomo plan. While average dose in those 3 different lesions were 39 Gy, 38.74 Gy, and 38.75 Gy with 2D conventional plan. Dose to 96% volume of whole brain PTV was 7.08 Gy from Tomo Plan and 31.29 Gy from conventional WBRT.

Max dose in hippocampus with Tomo plan and conventional WBRT plan were 6.78 and 37.3 Gy respectively.

Dose for 20% of hippocampal avoidance zone volume was 6.42 Gy and 38.89 Gy in Tomo Plan and WBRT conventional plan respectively.

Discussion:
In our dosimetric study, we showed that with Tomo hippocampal avoidance plan, we can limit the dose to hippocampus significantly while booasting the gross tumor to a higher dose. Low dose in hippocampus may translate into better cognitive function after WBRT and probably a better quality of life. But avoiding hippocampus resulted in low dose regions around hippocampus and there is a possibility that new lesions may more likely to occur in the future in those low dose regions. Though the dosimetric data seems to be very promising in hippocampal avoidance radiation plan, but some clinical questions remain to be elucidated. Will it actually result in better cognitive preservation and will it result in more frequent recurrence of brain lesions in the future are questions yet to be validated clinically in future prospective trials with patient oriented outcomes such as survival, brain metastasis disease free progression, subjective and objective memory function of the patients.

Keywords : WBRT, Hippocampal Sparing, Tomotherapy
Pediatric
Paediatric Primary Extracranial Meningioma In Anterolateral Abdomen : A Scarce Case Report

Lucky Taufika Yuheid, Soehartati A.G.

Primary Ectopic Meningioma occurring in Anterolateral region of the Abdomen are scarce. The clinicohistopathological feature at initial founding is confusing. We make a consultation, asking for an expert opinion from abroad. He found the fact that it’s a challenging case and have also shared this to his several colleagues with differential diagnosis such as Epitheloid sarcoma, meningioma, glomus tumor, PEComa, synovial sarcoma and sarcoma not otherwise specified. But finally concluded it is a High Grade Malignant epitheloid neoplasm most consistent with extracranial meningioma.

Patient underwent surgical excision 3 times, a definitive diagnosis made a month after 2nd surgery and after the 3rd surgical resection the patient treated with radiation therapy to the right abdominal wall (Photon, 3D CRT, Total dose 60 Gy, in 2Gy daily fraction), lumbospinal (Photon, 2D PA, 30 Gy in 3 Gy daily fraction), and right inguinal (Electron, 60 Gy in 2 Gy daily fraction). Chemotherapy using regimen Hydroxiurea was proposed but his mother refused because of uncertain outcome and worried of the side effect.

A follow up 7 month after completion of the first radiotherapy session with FDG PET Scan revealed partial response at the abdomen residual mass, shrinkage right inguinal lymph node and progressive disease intra bilateral pulmonary.

A second radiotherapy session to the 10th-12th thoracospinal was performed using 3D CRT total dose 37.5 Gy in 2.5 daily fraction.

Systemic therapy definitive treatment is urgent following surgical resection and radiotherapy to achieved local control and resolve metastases.

Keyword : Primary Ectopic Meningioma, Extracranial meningioma
PK002

Pediatrics papiloma ethmoid sinuses irradiation

Nawangsih, CH; Rhamatsian S

OBJECTIVE:

We report a rare case of 6 year-old boy with papilloma in ethmoid sinuses with complication of visual loss whom improved after irradiation.

METHOD:

Complete physical, radiological and histopathological examination involving multidisciplinary team in management and radiation planning.

RESULTS:

A 6 year-old boy with headache, rhinorhoea and visual loss was referred to ophthalmologist, ENT and neurologist. Physical examination revealed the paresis of left nerve III, IV and VI while nasal polyp was suspected from nasal endoscopy. Fundoscopy to examine the visual loss indicated increasing intracerebral pressure and papyl edema while pre-operative radiological images demonstrated opacification of the left nasal cavity and anterior ethmoid with a bone-density lesion with tenicium uptake during nuclear scintigraphy with SPECT (single photon emission computed tomography). The mass diagnosed as papilloma from histopathology examination with bony lesion was not completely removed followed by progressive symptom led to total blindness. Irradiation with total dose of 54 Gy in 30 fractions using IMRT was done resulted in improvement of the patient vision and quality of life.

CONCLUSION:

This case highlights the importance of early recognition and management from multidisciplinary team may prevent tumour-induced blindness.
Miscellaneous
68Ga-PSMA PET/CT-guided hypofractionated salvage radiation therapy and simultaneous integrated boost for PSMA-avid sites after radical prostatectomy: safety and high PSA response

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Purpose: 68Ga-labeled PSMA PET/CT (PSMA) has shown a novel promising diagnostic tool to locate early biochemical failure after radical prostatectomy (RP) in prostate cancer patients, and would influence the decision for salvage radiation therapy (SRT). In this study, we evaluated the PSMA-guided hypofractionated SRT and simultaneous integrated boost for PSMA-avid sites.

Materials/Methods: From June 2016 to December 2017, 31 patients with BF after RP who underwent PSMA were evaluated. The median time between RP and PSMA was 10 months. Prostate bed was treated with IG-VMAT to 62.5Gy/25f with PSMA-guided SIB of 66-67.5Gy for prostate fossa disease, 60-64Gy for LN and bone metastasis. Treatment response was defined as >50% reduction in PSA.

Results: Median follow-up was 7 months. PSMA was positive in 22 patients (71.0%). Median PSA in positive patients was 1.15 ng/ml. Pelvis nodes, non-pelvis nodes, bone and within the prostate suspected recurrence disease were detected in 10 (45.5%), 3 (13.6%), 7 (31.8%), and 8 (36.4%) patients, respectively. Median (range) dosimetric parameters included small bowel Dmax 4976.5cGy (0-5885.4), V45 29.0cc (0-126.8). Acute grade 1 and 2 GI toxicity was 63.6% and 9.1%. Acute grade 1 and 2 GU toxicity was 59.1% and 18.2%. In patients who had finished SRT more than 3 months, 71% of patients had treatment response following SRT.

Conclusion: Our study suggests that hypofractionated SRT with SIB PSMA-avid sites was well tolerated and results in good PSA response in patient with biochemical failure after radical prostatectomy. However, the long-term survival outcomes need to be further explored.

Keywords: prostate cancer, PSMA PET/CT, salvage radiation therapy
Clinical Outcomes of External Beam Radiation Therapy With or Without Androgen Deprivation Therapy in Localized Prostate Cancer: A Single-Institution Experience

Jeremy Tey

Background

External beam radiation therapy (EBRT) is one of the curative treatment options for localized prostate cancer. We reviewed the outcomes of prostate cancer treated with EBRT over a 14-year period.

Methods

Patients with histologically-confirmed non-metastatic node-negative localized prostate cancer who received curative-intent EBRT with or without androgen deprivation therapy (ADT) at our institution from January 2002 and December 2015 were reviewed. Clinical data were obtained via the institutional electronic medical records and radiotherapy databases. The primary endpoint was 5-year overall survival (OS). The secondary endpoints were 5-year biochemical progression-free survival (bPFS) as per Phoenix definition and treatment toxicities graded using Common Terminology Criteria for Adverse Events version 4.03. Univariate and multivariate cox proportional hazard regression models were performed to identify independent factors with significant impacts on patients’ survivals. Statistical analyses were performed using STATA version 14.

Results

200 eligible patients were identified with a median follow-up period of 48 months. Median age was 72 years (minimum, 54; maximum, 87). 27 (13.5%), 72 (36.0%) and 101 (50.5%) patients had low-, intermediate- and high-risk disease respectively according to the D’Amico risk classification. Median prescribed radiation dose was 79.2Gy (minimum, 66.6; maximum, 79.2Gy). 157 (78.5%) patients were treated with intensity-modulated radiation therapy technique, 122 (61.0%) had dose escalation to more than 74Gy and 166 (83.0%) received ADT. The 5-year OS and bPFS for all patients were 82.6% and 89.9% respectively. The 5-year OS were 90.0%, 86.7% and 77.6% and bPFS were 94.0%, 100.0% and 81.0% for low-, intermediate- and high-risk patients, respectively. Univariate analysis showed that older age (hazard ratio (HR), 1.08; 95% confidence interval (CI), 1.02-1.15; P= 0.009) and Eastern Cooperate Oncology Group (ECOG) performance status 2 (HR, 2.74; 95% CI, 1.46-5.13; P= 0.002) were significantly associated with increased hazard for death. D’ Amico risk category, radiation technique and dose escalation were not significantly associated with OS on both univariate and multivariate analyses. The incidence of grade 3 or more proctitis was 13.0% and grade 3 or more cystitis was 1.5%. There was no grade 5 toxicities.

Conclusion

Men with localized prostate cancer treated with EBRT in our population had good survival and biochemical outcomes which were comparable to internationally-published data.

Keywords: Prostate cancer, Radiotherapy, Androgen deprivation
Nomograms to Predict Indications for Adjuvant Radiation Therapy for Patients with Resectable Prostate Cancer

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Background: No reliable nomogram currently exits for the prediction of patients having indications for adjuvant prostate radiation therapy (RT) among prostate cancer (PCa) patients receiving radical prostatectomy (RP). Our purpose was to develop a nomogram using pretreatment prostate-specific antigen (PSA), clinical T stage, and Gleason score (GS), with adverse features that are commonly indicated for adjuvant radiotherapy. Patients and Methods: We analyzed patients receiving RP between 2007 and 2016 at our hospital. Patients with a history of neoadjuvant hormonal therapy, transurethral resection of the prostate(TURP), RT, or lymph node metastasis were excluded. Six-hundred and sixteen patients were eligible. Age, surgical method, preoperative serum PSA levels, clinical T stage diagnosed by magnetic resonance imaging, and GS were preoperative predictors. Predictors were used in nomograms developed from multivariable logistic regression analysis to estimate the probability of extra-prostatic extension, positive margins, and GS 8–10 after RP. The nomogram’s predictive accuracy and discriminative ability were determined by the concordance index (C-index) with calibration and receiver operating characteristic (ROC) curves. Results: Post-surgery, 33.8% of patients had positive margins; 10% that had biopsy GS <8 had pathologic GS 8–10; 46.3% who were diagnosed with organ confined disease were found with extra-prostatic extension. Calibration curves showed good agreement between nomogram predictions and patient observation (C-index = 0.679, 0.755, and 0.885 for extra-prostatic extension, positive margins, and GS 8–10, respectively). Conclusions: Using clinicopathological information, we produced a nomogram that may accurately predict indications for adjuvant RT after RP, which may help individualize treatment decision-making.

Keywords: Prostate cancer; adjuvant radiotherapy; radical prostatectomy; nomogram
Objective

We report the PSA transition of patients who underwent carbon ion radiotherapy (CIRT) combined with short course hormone therapy.

Method

Ninety-two intermediate risk group prostate cancer patients who underwent CIRT (57.6 Gy (RBE) in 16 fractions over 4 weeks) at Gunma University from July 2010 to July 2013 were analyzed. LH-RH agonist were given 6 to 8 months as neoadjuvant and concurrent hormone therapy and terminated after CIRT in all cases. Average age is 67 years. The median PSA before treatment is 8.22 ng/ml (2.939 - 19.91).

Results

PSA values (mean ± standard deviation) at the end of treatment, 2 months, 3 months, 6 months, 9 months, 1 year, 2 years, 3 years, 4 years, 5 years after treatment start were 0.35 ± 1.39 ng / mL, 0.13 ± 0.71 ng / mL, 0.11 ± 0.55 ng / mL, 0.26 ± 0.55 ng / mL, 0.38 ± 0.50 ng / mL, 0.42 ± 0.42 ng / mL, 0.38 ± 0.68 ng / mL, 0.38 ± 0.41 ng / mL, 0.37 ± 0.57 ng / mL, 0.35 ± 0.43 ng / mL. In 9 out of 92 cases (9.7%) experienced PSA recurrence according to Phoenix ’s definition and mean of PSA recurrence time was 23 months. In 3 cases, PSA decreased without any treatment. In particular, PSA values of all 2 patients judged as PSA recurrence with in 1 year are decreased without any treatment.

Conclusion

PSA rise within 1 year is necessary to carefully distinguish from PSA recurrence.

Keywords: Prostate cancer, Carbon ion radiotherapy
Risk Factors and Predictive Value of Local Recurrence in Chinese Upper Tract Urothelial Carcinoma Patients

Li Xiaoqing

Purpose: This study aimed to evaluate the influence of factors and the predictive value of local recurrence in patients with upper tract urothelial carcinoma (UTUC) after nephroureterectomy.

Materials and Results: We retrospectively analyzed the clinical and pathological data of the 330 patients with upper tract urothelial carcinoma (UTUC), who underwent nephroureterectomy between 2010 and 2016 in Peking University First Hospital, Beijing, China. The median follow-up of 47 months (range: 4-110 months), local recurrence occurred in 73 patients (22.1%). The median interval of local recurrence was 39 months (range: 1-80 months). The probability of local recurrence-free survival at 12, 36, and 60 months was 96.2%, 90.9%, and 86.8% respectively. Univariate and multivariate logistic regression analysis was used to address the prediction for local recurrence. In multivariate analysis tumor multifocality, T stage, G grade were significant risk factors influencing the local recurrence (P < 0.001). 5-year metastasis recurrence-free survival (51.2% vs 93.9%, p < 0.01) and 5-year overall survival (47.1% vs 78.2%, p < 0.01) were statistically lower in patients who had local recurrence. There were no significant differences in 5-year bladder recurrence survival between the two groups (66.5% vs 68.5%, P = 0.321).

Conclusions: Local recurrence after RNU is a common event in patients with UTUC especially in T3 and T4 group. Patients with high Grade and multifocality were at high risk of recurrence. Patients with local recurrence tended to develop a metastasis recurrence and have a poor OS.

Keywords: Upper Tract Urothelial Carcinoma, local recurrence, risk factor
Asian nutrient supplement Cordyceps sinensis promotes the growth of prostate cancer cells

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Cordyceps sinensis (CS), the most expensive Asian nutrient supplement, is reported to have androgen-like effect. Since androgen is involved in the initiation and progression of prostate cancer, we determined the impact of CS on the growth of in vivo and in vitro prostate cancer models. Firstly, we demonstrated serum testosterone level was significantly elevated in mice fed with CS (8.28 ± 1.94 ng/ml for CS vs. 2.08 ± 1.24ng/ml for control, p = 0.023), prostate was also significantly enlarged (weight index 0.53±0.04 mg/g for CS vs. 0.31±0.04 mg/g for control, p=0.006). Furthermore, cell viability was twice more in the androgen-responsive prostate cancer cell line (VCaP) treated with CS extract. However, this promoting effect on cell viability disappeared after bicalutamide(10 uM), an AR antagonist, was added. In addition, serum prostate-specific antigen (PSA) of the mice bearing VCaP xenografts treated with oral CS extract significantly elevated (0.66 ± 0.04ng/ml for CS vs. 0.26 ± 0.06ng/ml for control, p < 0.001). Finally, VCaP tumor of mice in CS group grew much faster than control (479.2 ± 78.74 mm3 for CS vs. 283 ± 58.97 mm3 for control, p=0.074). However, the above similar promoting effects of CS were not observed in parallel studies using PC-3 cell line that lack AR expression. The results suggest that intake of CS might promote growth of prostate cancer cells through increase of testosterone and AR-dependent pathway.

Keywords: Prostate cancer; nutrition; androgen receptor; herbs
Patterns Of Local Failure After Radical Nephroureterectomy in Upper Tract Urothelial Carcinoma :Association With Primary Tumor Locations

Li Xiaoying

Purpose: There was little research about the local recurrence failure pattern of upper tract urothelial carcinoma (UTUC) after radical nephroureterectomy (RNU). This study aimed to explore the high risk areas of local recurrence for UTUC patients stratified by primary tumor locations after surgery.

Methods and Results:

329 UTUC patients with radical nephroureterectomy were enrolled in our study. A total of 155 sites of local relapse were observed in 45 patients with detailed relapse sites in our study.

Of the 45 patients, 15 (33.3%) patients had surgical bed recurrences, 40 (88.9%) patients had lymph node recurrences. Lymph node recurrence was the main local recurrence type. Para-aortic lymph node region was the most common recurrence area for all the UTUC patients(77.8% for all the patients). Recurrence in internal and external iliac region were rare (<15% for all the four groups). The distribution and characteristics of para-aortic region recurrence in the four groups were different.

Most of the recurrent para-aortic lymph nodes of left-sided UTUC patients occurred in LPA(90.4%) region. For right sided UTUC patients, recurrent para-aortic lymph nodes distributed in LPA(24.4%),AC(48.7%) and RPC(26.9%) regions. Surgical bed recurrence for UTUC with different locations were also different. Renal pelvic fossa recurrence in renal pelvic and upper ureter tumor group were higher(P=0.005). Ureter tumor bed recurrence rate were higher in middle and lower ureter tumor patients(P=0.016).

Conclusions:

The local recurrence types were different for UTUC patients with different locations. This result implies postoperative CTV may be different according to primary tumor locations.

Keywords: Upper Tract Urothelial Carcinoma, local recurrence, risk factor
**Moderate hypofractionated intensity-modulated radiotherapy for localized prostate cancer**

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**Purpose**

To evaluate the efficacy and toxicity of moderate hypofractionated intensity-modulated radiotherapy (MH-IMRT) for localized prostate cancer.

**Materials and Methods**

From May 2009 to May 2013, localized prostate cancer patients treated with MH-IMRT (64.4Gy in 23 fractions, three times a week at 2.8Gy per fraction) were retrospectively analyzed. According to D’Amico risk categories, patients in the low-risk group were treated with IMRT without androgen deprivation therapy (ADT). For patients in the intermediate-risk group, IMRT was performed with short-term neoadjuvant ADT. For patients in the high-risk group, IMRT was performed with long-term neoadjuvant and adjuvant ADT. Biochemical relapse free survival (bNED) was defined Phoenix definition. Adverse events were evaluated according to CTCAE ver. 4.0.

**Results**

One hundred and forty-six patients were enrolled in this study (11, 39, 96 patients in the low-, intermediate-, and high-risk group, respectively). Median age was 72 years (range: 51-82 years). Median follow-up time was 64 months (range: 17-100 months). The 5-year bNED rates in patients with low-, intermediate-, and high-risk were 100%, 97.1%, 90.8%, respectively. The 5-year Overall survival rates in patients with low-, intermediate-, and high-risk were 100%, 94.8%, 95.0%, respectively. Grade 3-4 acute toxicity was not observed. Grade 3 late rectal toxicity in one patient and grade 3 late urinary toxicity in one patient were observed.

**Conclusion**

MH-IMRT for localized prostate cancer has a favorable outcome with tolerable late toxicities.

**Keywords:** prostate cancer, moderate hypofractionated intensity-modulated radiotherapy
Simulative examination of the deep inspiration breath-hold technique for lung cancer proton therapy

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Purpose: To evaluate the accuracy of proton therapy for lung cancer with the deep inspiration breath-hold technique.

Methods and Materials: Computed tomography (CT) data sets acquired under the deep inspiration breath-hold technique for X-ray lung cancer radiotherapy were acquired for this study. Each CT data set consisted of two planning CT images acquired on the same day, and cone beam CT (CBCT) images acquired within 12 days from acquisition of the planning CT. We created virtual plans of conventional X-ray radiotherapy (CRT), intensity-modulated radiotherapy (IMRT), and proton therapy for lung cancer with these CT images and transferred and recalculated these plans on other CT images using bony structure matching.

Results: Four patients with six CT data sets were enrolled. The median displacement between the two planning CT images taken on the same day was 2.89 (range: 0.71–5.75) mm and that between planning CT and CBCT on another day was 3.38 (range: 0.57–8.25) mm. There was no significant correlation between these two displacements (r² = 0.0566). In one case, percentage of the minimum dose covering 95% of the clinical target volume relative to the prescribed dose (CTV %D95) of original CRT, IMRT, and proton plans were 90.1%, 96.7%, and 96.8%, respectively. And dose distributions recalculated with another CT image showed CTV %D95 values of CRT, IMRT, and proton to be 89.5%, 96.3%, and 96.3%, respectively.

Conclusions: The deep inspiration breath-hold technique might be useful for lung cancer proton therapy. Further data acquisition is needed.

Keywords: proton therapy, deep inspiration breath-hold technique, lung cancer, cone beam CT
PL010

Implementation of Quality Audit (QA) in Clinical Radiotherapy Units in HCG Oncology Institutions in India – A Report

Mohan P. Ramesh.S.Bilimagga, Ajai kumar

Basis of the Study:
Quality Audit Analysis of process and evaluation lead the radiotherapy technologists’ attention in treatment delivery as a key method to achieve the global standard and ethical practices, thereby upholding the quality of high standards in a continual manner. An assessment of these efforts evolve culture of technical human resources in utilization of optimal man and machine hours, helping satisfactory management of patients’ scheduling, improve throughput and attaining revenue targets. The present study analyses data between 2013 and 2016 and is similar to a previous study by Rosenblatt et al. (1)

Radiation technologists function as competent, technically proficient, well communicative, with professional outlook, and have logical and ethical approach in practice, tailored to the needs of clinical radiation oncologists, to deliver satisfactory patient care.

Materials and Methods:
HCG has largest cancer care chain in South East Asia with state-of-the-art radiotherapy technology and skilled human resources, with 22 linear accelerators in 18 Centers, 1 Cyberknife and 1 Tomotherapy infrastructure with 85 radiotherapy technologists. Quality Audit is aimed at addressing the challenges in implementing uniform and qualitative practice across the facilities. The present audit was done between 2013 and 2016 for 11, 10, 8, and 16 centres each year. Process implementations with approved radiotherapy forms, prescription cards, treatment charts, demographic stickers, radiotherapy process protocols and standard operating procedures (SOP) including a professional outlook (grooming and dress code) as per NABH approved format were audited. The quality guidelines were implemented in 2013 and the audit of four years of implementation was done in 2016. Entries in registers of different radiotherapy process chains in mould-rooms, treatment rooms, X-ray and Computed Tomography (CT) simulations, were systematically evaluated. Audit on treatment machine variables (daily LINAC checklists, EPID quality assurance, and CT/X-ray daily checks) and adverse events were recorded. Uniformity of practice in different centres based on initial training programme (Quality and Uniform Practice of Radiotherapy Technologists (QUPORTT-2013) was checked. Advanced training (QUPORTT-2016) along with the discussions on audit programme and internal department audits were carried out in 2016.

Results:
This quality audit resulted in achievement of 82.4% on the professional outlook variables, 88.9% standards of quality assurance in NABH approved patient documents, 94.4% in radiotherapy process standards and SOP and 100% in treatment registers. Recommendations based on these quality indicators included development of mandatory radiotherapy and allied infrastructure and achieving excellence in the expertise of RTT personnel.

Conclusions:
Present-day care for patients receiving radiotherapy, calls for high standards in treatment delivery with complex technology in order to ensure accurate tumour control and treatment outcomes. (2) RT Technologists play a crucial role in treatment set-up, reproducibility and execution of treatment delivery. Quality practices are ensured whereby; complex situations are made streamlined and implementable even in tier 2 and tier 3 cities, by the help of QUPORTT. This training also could help upcoming centres at an initial level for ensuring gold standard practices.
PL011

Moderately hypo-fractionated radiotherapy for localized prostate cancer: Early results

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Objective
To evaluate the results of moderately hypo-fractionated radiotherapy for localized prostate cancer.

Materials and Methods
Fifty patients with localized prostate cancer were treated from 2012 to 2017. All patients were treated by the dose of 70Gy in 28 fractions to the whole prostate gland. Elective pelvic nodes were treated as indicated to the dose of 50.4Gy in 28 fractions. The dose statistics to the planning target volume (PTV), rectum, bladder, bowels and penile bulb were evaluated and reported related to ICRU no. 83. Biochemical control, Disease-free survival and overall survival were calculated. Short-term and long-term toxicities according to RTOG-EORTC toxicity criteria were reported.

Results
The mean age of these groups was 72.5 years old (range 47-86 years). Eighty-four percents of patients were high-risk group. The mean value of initial PSA was 73.5ng/ml. The mean dose in EQD2 concepts of D50% of PTV, D2% of Bladder and D2% of Rectum were 80.1Gy, 78.3 and 76.5Gy, respectively. At the mean follow-up time of 23.9months, the biochemical control, disease-free survival and overall survival rates were 96%, 98% and 96.0%, respectively. Two patients (4%) developed grade 3 radiation-induced proctitis.

Conclusion
Moderate hypo-fractionation for localized prostate cancer is quiet safe and effective. By the way, this study has short monitoring, the further evaluation is needed

Key words: Prostate cancer, radiotherapy, moderate, hypo-fractionation, early results

Back to Link
Meta-analysis of the robustness of clonogenic assays for cancer cell radiosensitivity

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Precision medicine based on biological information of individual patients has been widespread over the field of cancer treatment. To accomplish precision medicine in radiotherapy, compilation of radiosensitivity data is crucial. Clonogenic assays are the gold standard for determining radiosensitivity and a tremendous number of studies of clonogenic assays on cancer cell lines have been published. However, the robustness of this technique has not yet been elucidated fully. To address this issue, we took a meta-analytical approach using published and in-house experimental data. Comprehensive mining of publications pertaining to radiosensitivity as assessed by clonogenic assay in 1039 cancer cell lines revealed that A549 cell line is the cell line most frequently studied in this context. Analysis of all the available publications (n = 192) and in-house data (n = 20) for A549 demonstrated that the coefficients of variation for SF2, the surviving fraction after 2 Gy irradiation, and D10, the radiation dose that reduces survival to 10%, were below 30% for both data sets regardless of the experimental settings; i.e., radiation type, dose rate, and timing of cell seeding. Multivariate analyses of the published data showed that timing of cell seeding significantly affected SF2. These data indicate that SF2 and D10 of clonogenic assay have acceptable inter-assay precision, and that timing of cell seeding influences the inter-assay precision of SF2. These data provide a rationale for combined analysis of published clonogenic assay data, which will help to discover biological properties targetable by precision radiotherapy.

Key words (if requested):
clonogenic assay, radiosensitivity, cancer cell, meta-analysis, precision medicine
Hypofractionated intensity modulated radiotherapy for intermediate-and high-risk prostate cancer

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Objective
We present the clinical outcome and the toxicity analysis in the hypofractionated radiotherapy for prostate cancer retrospectively in a Japanese institute.

Method
Seventy-five patients with prostate cancer were treated with hypofractionated intensity modulated radiotherapy (IMRT) protocol (63 Gy in 21 fractions over 7 weeks) between 2010 and 2013. The clinical target volume (CTV) was defined as the prostate and proximal seminal vesicles. The planning target volume (PTV) was defined by adding 7 mm margin in all directions from CTV except 4 mm in posteriorly. The dose was prescribed at PTV D95%.

Results
The median age of patients was 70 years (range, 55–84). Among 75 patients, 34 had intermediate-risk, and 41 had high-risk disease. The median follow-up period was 52 months (range, 16–79 months). Median duration of the hormonal therapy were 23 months for intermediate risk group and 37 months for high risk group. The 5-year PSA relapse-free rates were 100% and 85.8% for intermediate- and high-risk groups (P = 0.04), respectively. There was no grade 3 or worse toxicity in this study. Acute and late grade 2 gastrointestinal toxicities were seen in 0% and 1.3%, respectively. Acute and late grade 2 genitourinary toxicities were seen in 20.0% and 16.0%, respectively.

Conclusion
This study suggests that hypofractionated IMRT (63 Gy/21 fractions) for intermediate- and high-risk prostate cancer is seemingly effective and safe.

Keywords: prostate cancer, moderate hypofractionation, IMRT
Radiotherapy as a Part of Multi-modality treatment of Ewings Sarcoma: Experience of a Tertiary Cancer Center

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Background: Current standard treatment in Ewings Sarcoma (ES) is neoadjuvant chemotherapy followed by local treatment such as surgery, radiotherapy (RT), or a combination of both modalities. This is followed by further adjuvant chemotherapy. The aim of this study was to analyse our experience in RT in the management of ES.

Materials and Methods: The medical records of ES patients who received RT in our department from Jan 2012 to Dec 2017 were reviewed. The patients received 3D conformal radiotherapy (CRT), Intensity Modulated Radiotherapy (IMRT) or Brachytherapy on Elekta or Siemens. The data were entered in excel sheet and was imported in SPSS, version 20 for statistical analysis.

Results: Twenty patients with localized ES treated from 2012 to 2017 were included in this analysis. Two patients received extracorporeal radiotherapy. Primary tumor size was ≥ 8 cm in 60% patients. Median follow-up was 36 months. The 5-year overall survival (OS), progression-free survival, and local control (LC) were 60%, 50%, and 80%, respectively. According to treatment, 5-year LC was 60% with RT and 90% with combined surgery and RT (p=0.04). The important prognostic factors for OS were tumor size (≥ 8 cm, p < 0.001) and surgical resection (p < 0.001).

Conclusion: RT is an important modality in the management of ES. Our patients had comparable outcomes to that of previously published literature.

Keywords: breast cancer, tumor bed, boost, IBTR, age
PL015

**Behaviour therapy: An effective alternative to anaesthesia for children undergoing Radiation therapy (RT)**


**Purpose/Objective**

Children undergoing radiation treatment are often subjected to anaesthesia to minimize their distress and improve treatment compliance. We explored behavioural techniques to replace anaesthesia for these patients. This study demonstrates the efficacy of behaviour therapy in facilitating radiation without anaesthesia while illustrating some of the challenges faced.

**Materials/Methods**

We assessed about 21 subjects (9 female) with intracranial malignancies to highlight the role of Psychoncologist in facilitating radiation treatment without anaesthesia. The Psychological Assessment of children involved clinical interview, behavioral observation, Visual Analogue Scale of Distress and Ped-Quality of life. The children were subjected to multimodal behavior therapy program: Systematic desensitization, play therapy, storytelling, music etc. of 8 daily sessions, 3 hours each. Also, 4 Parental counselling and family therapy sessions of 2 hours each were conducted.

**Results**

In our setting, two parents refused radiation with anaesthesia for their children, one for fear of toxicity and the other concerned about child’s inability to deal with the requirements of pre and post anesthesia fasting. The video based illustrations depict successful completion of RT without anaesthesia. Parental report and behavioural observation revealed decreased distress levels and improved quality of life.

**Conclusion**

Behaviour therapy can be an effective approach to replace anaesthesia for children undergoing Radiation therapy and impact treatment compliance and fewer toxicities.

**Keywords:** RT- Radiation Therapy
Analysis of nucleolar stability after ionising radiation

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Nucleolus is the intra-nuclear organelle that contains cellular ribosomal DNA. It has not been fully elucidated how cells maintain nucleolus stability after ionizing radiation (IR). In our study, we aim to examine the effect of IR on nucleolar stability by immunofluorescence staining of Nucleolin. In human colorectal cancer derived HCT116 cells, we found that there was an increase in number of nucleoli per cell with associated nucleolar fragmentation at 24, 48 and 72 hours after X-rays. The increase in fragmentation was more prominent in HCT116 p53-/ cells, particularly at 72 hours after X-rays. Similarly, depletion of p53 by siRNA knockdown in human osteosarcoma derived U2OS cells caused an increase in nucleolar fragmentation after X-rays. This data suggests that p53 is an important factor maintaining nucleolar stability after IR. Furthermore, we found that carbon-ion particle irradiation caused greater nucleolar fragmentation than X-rays. Importantly, we observed an additive increase in nucleolar fragmentation in p53 defective background after carbon-ion irradiation. Taken together, our study suggests that p53 and DNA damage complexity are factors affecting nucleolar instability after IR.

Keywords: nucleoli, ionising radiation, p53
Initial experience of remote radiation planning support network system

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We installed TomoTherapy Radixact system in 2018, which is a dedicated unit that delivers image-guided IMRT. Along with the installation of new radiation treatment unit, we constructed a remote radiation planning support network system between Hidaka hospital in Takasaki and Gunma University Hospital in Maebashi. Two radiation planning system Accuray Precision and RayStation client were connected between two institutions by Citrix’s GoToMyPC remote desktop service and virtual private network (VPN) supplied by NTT east, respectively. Network security was based on the data encryption with Security Architecture for Internet Protocol (IPSec) and usage of cloud services or VPN. This system enables the radiation oncologists at Gunma University hospital to make or approve radiation therapy planning for the patients at Hidaka hospital. Also, it facilitates real-time information sharing between two institutions and make our discussion more efficient. Our remote radiation planning support system will be possible to strengthen cooperation with Gunma University and it is useful for providing higher quality radiation therapy. It would be also useful for educating young radiation oncologists and staffs involved in radiation therapy.

Keywords: remote radiation planning, Telemedicine
Evidence Based Cost Effective Accelerated Fractionation in Primary Definitive Radiotherapy of Squamous Cell Cancers of Head and Neck in Pakistan

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The aim of this study was to examine whether reduction in overall treatment time by increasing the number of weekly radiotherapy fractions from 5 to 6 and maintaining the same total dose and fraction number (66-70 Gy in 33-35 fx) would improve the tumour response and acceptable with regard to early and late morbidity, as well as being a suitable therapeutic principle in all therapeutic environments especially with reference to countries with low income and limited resources.

This clinical trial provided an opportunity to work in the face of so many clinical, technical, financial, administrative, human resource, and socio economic constraints and proved to be a milestone to answer certain important questions based upon level one scientific evidence, like:

The efficacy of 6 fractions per week versus 5 fractions per week (fx/wk) in improving 5 year actuarial rate for loco regional control was 42% versus 30% (HR: 0.63; 95% CI (0.49 – 0.83; p=0.004) and the disease free survival rates of 50% vs. 40% for 6 fx/wk versus 5 fx/wk group respectively (HR:0.70; 95% CI 0.54-0.91; p=0.03) [1]

Acute morbidity in the form of confluent mucositis was significantly more frequent in 6 fx/wk versus 5fx/wk arm 10% vs. 5% at 95% CI;HR 2.15;(1.27-3.35) but there was no difference in late morbidity [1]

It also helped in dispelling the impressions regarding the compliance to treatment completion and follow-up in context of a developing country. By adopting certain proactive measures, at IRNUM 91.4% patients completed the total planned dose in 6fx/wk arm and 87.5% in 5 fx /wk arm, with a follow up rate of 99%.

The use of this moderately accelerated fractionation regimen (6fx/wk) in Pakistan and other countries with similar low income and low resource settings can have the following advantages:

Biologically more effective as reflected in improved 5 year actuarial loco regional control and disease free survival rates

Acceptable acute toxicity with no increase in late morbidity

Reduction in treatment time of one week

No additional resources are required

Using this evidence based data, national management policies for HNSCC in Pakistan and other regional countries with similar health care environment can be rationalized for optimum utilization of scarce resources and future trials on these lines could be planned to further improve the treatment outcome and quality of care of these patients.
Recurrence and Quality of life Study after Post Excision Radiation Therapy in Keloids : Data From a Single Institution


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Introduction Post excision radiotherapy is an established treatment to prevent recurrence of keloids. We did a retrospective analysis of 21 patients of keloids to evaluate the recurrence rate and Quality of life post radiation therapy within 24 hours after excision.

Materials and Methods: It includes patients treated between September 2008 and October 2017, Median age is 37 years (range, 9-66 years) and male to female ratio is 1:4. Sites of the lesions are ear lobule- 14/21 (66.7%), anterior chest wall – 3/21 (14.2%), right neck- 2/21 (9.5%), right shoulder – 1/21 (4.7%), left cheek – 1/21 (4.7%). The mean dose of radiation received by the post operative tumour bed is 17.5Gy +/- 2.57Gy with 6 Mev to 9 Mev electron. Dermatology Life Quality of Index (DLQI) questionnaire was used to assess the quality of life of these patients.

Results: Median follow up is 55 months (6m -116 m), only one recurrence out of 21(4.7%) patients. This Keloid was re excised and re irradiated, without any recurrence till last follow up. DLQI scores are interpreted based on the preset ranges(3); score 0 or 1 – 2/21 (9.5%), score 2 to 5 – 3/21 (14.2%), score 6 to 10 – 12/21 (57.2%), score 11 to 20 – 4/21 (19.0%), score 21 to 30 – 0/21 (0%).

Conclusion: Treating keloids with electron beam radiation therapy post surgery provides excellent control and good quality of life in long term follow up of patients.

Keywords: keloid, radiotherapy, quality of life, recurrence
PL021

Single centre Post-treatment psychological analysis of cancer patients: A review

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Abstract: Psycho- Oncology is an inter-disciplinary approach to cancer therapy which deals with emotional and social aspect of the disease. The primary clinical challenge for the oncologist is to segregate the expected and short-live distress which required psychological intervention. Cancer can affect the quality of life and mental wellbeing. The effectiveness of different psychological and psychopharmacological interventions in psycho-oncology is vital.

Method: A review of 50 patients treated in a single institute with advance cancer, coming for regular follow up. Eligibility: Advance stage of malignancy of any site, age >18yrs, English or Hindi speaking, satisfactory cognitive capability, qualified interviewer administered with HADS.

Results: Out of 50 patients 48% patients are females and 52% males. The study was conducted on the patient were diagnosed with oral, thorax, abdominal, blood and brain cancer. The 40% of the cases had oral cancer, 28% had thoracic cancer, 24% had abdominal cancer and, 4% had blood and brain cancer. The scale was divided into two parts 14% of patients were found normal in depression, and 30% were normal in anxiety. Psychological intervention was needed in 56% patients for depression and 24% for anxiety. Borderline cases for depression and anxiety was 30% and 26%.

Conclusion: It was found that > 50% patients needed psychological intervention in the absence of the disease. Intervention of support system can help these patients.

Keyword : Psyco- Oncology

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Oral mucositis (OM) is a common side effect of cancer therapy, especially for haematological malignancies and head and neck chemoradiation. It has negative effect on nutritional status, compromise quality of life and quite often interrupts therapy regimen. Management of the condition is limited, especially in developing markets with limited financial resources. The authors reviewed the literature on povidone iodine for OM and noticed that there was fairly convincing evidence for its prophylactic usage, especially during chemoradiation for Head and Neck Tumours. Comparatively, limited information is available for haematological tumours.

As part of initial assessment, we evaluated three patients on chemotherapy, including high risk agents such as high dose Melphalan, for lymphoid malignancies (multiple myeloma, plasmacytoma and primary CNS lymphoma). The patients were instructed to gargle four times a day starting from first day of chemotherapy and continue for a week after completion of the course. None of the patients developed any troublesome complications of OM, though in one patient there was some erythema. We believe that the possible mechanisms of actions could be a combination of anti-inflammatory, microbicidal, anti-oedematosus and anti-haemostatic properties of povidone iodine that are documented in literature. Our initial results indicate that, patients receiving therapies with high risk of OM, benefit by prophylactic povidone iodine gargling. More cases are being collected at our hospital to put forward this regimen as part of guidelines. Effective and affordable prophylactic therapies such as povidone iodine should be encouraged to minimize the impact of OM.

Keywords: oral mucositis, povidone-iodine, povidone iodine
Should Pregnancy Testing be done in Women of Child Bearing Age prior to Radiation Therapy? A Literature Review

Ella Mae Cruz-Lim

Purpose: The harmful effects of radiation on the fetus are well-established. In the Philippines, one in three births is from unplanned pregnancy. Unknowingly irradiating a pregnant patient during radiation therapy is an avoidable harm, yet pregnancy screening is not consistently implemented in most radiation treatment facilities. Limited data is available concerning pregnancy testing for radiation therapy patients. This literature review seeks to identify available evidence which can help us in developing appropriate pregnancy screening policies applicable to our setting.

Methods: The literature was queried through Medline, PubMed and Google Scholar using MeSH terms focusing on “pregnancy,” “pregnancy testing,” “cancer patients,” “cancer treatment,” AND “radiation therapy.”

Results: Pregnancy testing should be administered to rule out pregnancy before initiating radiation treatment. However, the optimal frequency of pregnancy testing is unknown. Serum hCG testing is the most sensitive pregnancy test. In most institutions, urine pregnancy testing is more often used in screening. Screening questions in medical history can alert the provider about pregnancy risk but have a lower sensitivity and specificity for detection.

Conclusion: In resource-limited settings, alternative methods to serum hCG testing are available which can be integrated into pregnancy screening policies. Knowledge of positive pregnancy status prior to radiation therapy can direct efforts to decrease radiation dose to the fetus. Sufficient contraception counseling and patient education is vital to avoid unplanned pregnancies during cancer treatment.
Radiotherapy Post Operative in Pigmented Villonodular Synovitis : Case Report

Yuki Andrianpto; Irwan Ramli

A 19 years old boy had inflammation on left knee since last year. He got an open synovectomy of the left knee in November 2017. The histopathology was reported as PVNS. The post operative MRI of left knee in December 2017 showed thickening lesion from perifemoral fat distal to suprapatellar recess. He was treated with external beam radiotherapy on left knee with linac with 3D 4 fields technique to a total dose of 36 Gy in 18 fractions. He completed the treatment in February 2018 with good clinical response and the MRI scan showed the thickening lesion was reduced.

DISCUSSION

PVNS is proliferative disorder of synovial tissue affecting joint, tendon sheath and bursa; with pigmentation related to the presence of hemosiderin. Recurrence rate after excision in PVNS is high. This recurrence is common in inadequate excision because of difficulties resection area and was highest in the knee joint. In incomplete resection, total radiation doses ranged from 30 - 50 Gy in 15 - 25 fractions followed up for 29 months without recurrence and 82.9% had no or only slight functional impairment. Myers et al recommended a dose of 36 Gy with conventional fractionation.

CONCLUSION

Radiotherapy post operative PVNS is an effective and safe modality to minimize recurrence and preserve joint function.

Key words : PVNS, radiotherapy, post operative
PL025

Analysis of set up uncertainties of the patient treated at our institute (HCG –Health Care Global Enterprises –Bangalore-India) in Siemen’s Artiste CT Vision And Siemen’s Artiste In line KView Teletherapy linac based Radiotherapy equipment’s

Mohan p, Ramesh s Bilimag, Mahadevappa, Ajai kumar B S

Objective: To treat the patient within the set departmental protocols.

1. Head, Head & Neck <3mm
2. Thorax<5mm
3. Abd & Pelvis <8mm.

Material & Method:

Analysis of Image verification for Head, Head & Neck, Thorax and Abdomen –Pelvis treatment site respectively carried on for 66 patients treated in Siemen’s Artiste In line K View and 59 patients treated in Siemen’s Artiste CT Vision.

Procedure:

As per the departmental protocol, for the first 3 days of the treatment, portal image verification will be done and the average values obtained marked as an isocenter. It will be re verified during day 4th and 5th day of the treatment. Followed by alternate (Volumetric) or weekly (Two dimensional) image verification which will be taken based on treatment technique ( 3D CRT or IMRT) respectively.

Analysis of 66 patients treated in Siemen’s Artiste In line K View and 59 patients treated in Siemen’s Artiste CT Vision are being analysed for Head, Head & Neck, Thorax and Abdomen –Pelvis treatment site respectively.

Results: After the assessment of 125 patients portal verification of radiation treatment, the variations recorded between inter fractions are well within the departmental protocols in head, head and neck, thorax and abdominopelvic malignancies respectively

Conclusion:

Portal verification values obtained for different sites proves, that CTV –PTV margins are well covered during the treatment process.
PL026

Deterioration of quality of life in head-neck malignant patients received ICT-RT in presence of diabetes mellitus

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Introduction:
Cancer is one of the most important non-communicable disease. The prevalence of cancer patients is more than 14 million worldwide and approximately 15 lakhs in our country. Malignancy causes deterioration of general body condition. Moreover the presence of other co-morbidities may hamper the quality of life to a greater extent. The total number of diabetic patients in Bangladesh is approximately 5.1 million as of 2013. In this study, diabetic-head neck malignant patients were evaluated clinically and biochemically who received ICT-RT.

Method:
This cross sectional study was carried out over 2 & ½ months at NiCRH, Dhaka. Data were taken from 150 head-neck cancer patients who were selected by purposive sampling came for follow up received ICT-RT. Among them 50 were diabetic and 100 were non-diabetic. Diabetic arm was named group A and non-diabetic as group B. Data were collected by a pre-formed interview schedule.

Result:
Data analysis reveals, anorexia in group A- 96% & B-76%, oral mucositis A-94% & B73%, tingling and numbness of limbs A- 44% & B-20%, oral candidiasis A- 58% & B-31%, moist desquamation A-28% & B-12%, low Hb (<10 gm/dL) in A-62% & B-43%, hypokalemia A- 22% & B-09%.

Conclusion:
Treatment with chemotherapy and radiotherapy in cancer patients impair the quality of life due to toxicities of these modalities. Presence of diabetes mellitus increases the risk.

Recommendations:
Periodic estimation of blood sugar and strict control of DM is mandatory. Multidisciplinary approach should be encouraged regarding management of diabetic malignant patients.
A Case Report; Pitfall in Secondary Trigeminal Neuralgia Stereotactic Radiosurgery as a Primary

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This case report illustrated a patient, sixty five years old woman from other hospital which has been referred to our Hospital with profound facial sensory symptoms. This patient was diagnosed as primary trigeminal neuralgia and underwent stereotactic radiosurgery (SRS) for her trigeminal neuralgia, the SRS was performed by Gamma Knife®, which the dose delivered was 80 Gy to the neurovascular contact at the trigeminal nerve. The SRS procedure didn’t solve her problem, then she went to other hospital for second opinion. During examination, she was diagnosed as adenoid cystic carcinoma (sinus) which extend to sinus cavernous. Currently, the patient has been irradiation at local tumour with total dose 50,4 Gy / 28 fractions, and done in January 2018. The patient was referred to our hospital with new facial sensory symptoms and the partial respon tumour.

The main complication after SRS for trigeminal neuralgia is new facial sensory symptoms caused by partial trigeminal nerve injury. In this case report, we would like to describe the important of determination primary or secondary trigeminal neuralgia and the complication of such procedure. Although in this case, we can’t determine the cause of facial sensory symptoms because of SRS complication or tumor compression to trigeminal nerve.

Keywords: Trigeminal Neuralgia. SRS, Adenoid Cystic Carcinoma
Cancer awareness among the smokers in rural population of Bangladesh

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Introduction: Tobacco in any form, is injurious to human body. However, globally tobacco is the largest preventable cause of death. In Bangladesh, according to WHO, 43.3% adults use tobacco products (men 58.0% women 28.7%), among them, 23.0% smoke tobacco (men 44.7%; women 1.5%). In addition, about one-fourth of the deaths in Bangladeshi men between 25-69 years are due to smoking related illness. Social-educational campaigns are going on against tobacco. The users must know the injuries they are making to environment and themselves. The level of knowledge about tobacco induced cancers and tobacco related diseases must be increased.

Methodology: Hence, we conduct an observational cross sectional study to assess the awareness about malignancies related to tobacco smoking, amongst smokers in Kushtia, Bangladesh. By convenient sampling, 225 respondents are selected.

Result: Result revealed that mean age is 33 years. The mean duration of smoking is 13 years. In Addition, mean expenses for smoking is monthly 1788tk. All the participants agree that tobacco smoking causes cancer and about 82% of respondents know smoking is the leading cause of lung or head-neck malignancies. It is noted that about 26% respondents are aware about 5 or more early signs of malignancy.

Conclusion: We conduct study in the most tobacco producing area of Bangladesh and try to increase social awareness. Most smokers are smoking tobacco being known about the adverse effects and chances of malignancies. Social and legislative measures must be taken to stop tobacco use and its cultivation.
Myositis ossificans

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Myositis ossificans is a biological process characterized by de novo bone formation in tissue which should not undergo ossification in normal condition. Myositis ossificans has been reported to occur after injuries, burns, fractures, dislocation, and joint replacements. Etiopathogenesis for myositis ossificans is still unclear. Clinical symptoms of myositis ossificans appear at late phase, with limitation in movement and pain being the most common presenting symptoms. In this case report, we describe the role of radiotherapy in the management of a patient with recurrent myositis ossificans occurring after a bone graft procedure for traffic accident related fracture.

Keyword: myositis ossificans, radiotherapy, injury, ossification
Base excision repair deficiency upregulates PD-L1 expression in cancer cells

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PD-L1, a ligand expressed on cell surface which interacts with PD-1, is an immune-checkpoint widely discussed for its role in cancer therapy. As we have previously reported, PD-L1 expression is upregulated via signaling from ionizing radiation induced DNA double strand breaks in cancer cells (Sato et al., Nat. Comm., 2017). In this study, we continue our study in exploring PD-L1 after other type of damage. Oxidative stress is a common DNA damage inducer in cancer cells. Base damage and single strand breaks (SSB) are predominantly generated by reactive oxygen species under oxidative stress. Here, we discovered that treatment with hydrogen peroxide (H2O2) upregulated PD-L1 expression in cancer cell lines. The PD-L1 upregulation after H2O2 treatment was enhanced by the depletion of base excision repair (BER) factors. This upregulation required ATR-Chk1 and STAT3 kinase activities. The finding in cancer cell lines is also in accordance with bioinformatics analysis using the TCGA database, that tumor samples harboring mutations in BER genes exhibited increased PD-L1 mRNA expression. Consistent with previous reports, our TCGA analysis revealed that tumor samples showing high expression of neoantigen exhibited high PD-L1 mRNA expression; however importantly, tumors harboring both BER mutations and high neoantigen showed greater PD-L1 mRNA expression than samples with high neoantigen alone. This is the first study demonstrating the involvement of BER and its DNA damage signaling in upregulating PD-L1 expression in cancer cells in response to oxidative stress.

Key words:

PD-L1, DNA damage signaling, base excision repair, oxidative stress
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This proceeding book only contains abstracts that have been submitted to the committee by July 30, 2018.