Journal of Radiotherapy in Practice

Journal of Radiotherapy in Practice (2017)
16, 1–4 © Cambridge University Press 2017
doi:10.1017/S1460396917000085

In this issue

In the first article, in this issue, Hutton, Baker, Naismith, Carver and Jessop present their development and evaluation of an image-guided radiotherapy (IGRT) protocol for prostate and pelvic node treatment.

This study comprised of nine patients receiving radiotherapy (RT) for node negative prostate cancer, who had a pair of planar kV images taken for 37 treatment fractions. The positioning accuracy for both implanted fiducial markers and pelvic bony anatomy was calculated using random and systematic errors. Appropriate margins were also determined. All patients followed a strict bladder and bowel protocol before computed tomography (CT) planning and treatment.

In total, 292 sets of images were used for fiducial marker and pelvic bone registration.

The authors conclude that the margins used in combination with an online image-IGRT strategy ensure both the fiducial match and the bone match correlate within 5 mm thus allows good coverage of both prostate and nodal target volumes. It is essential that this is combined with a strict bladder and rectal preparation protocol to ensure accuracy and reproducibility.

In the next article, Magwaro poses the question: How consistent is breast boost RT practice across the United Kingdom? The aims of this project were to identify the national range of breast boost RT doses and variations in treatment practice in the United Kingdom.

A cross-sectional study design was selected. An electronic questionnaire using the website Survey Monkey® tool was utilised to collect categorical data from practicing Therapeutic Radiographers within the United Kingdom. Participants were invited to participate from 52 RT departments across the four countries of the United Kingdom (England, Scotland, Wales and Northern Ireland).

In conclusion, there was no general consensus among therapeutic radiographers about whether factors such as age, tumour size, tumour grade or the presence of negative or positive margins, influence the therapeutic doses prescribed for different patients. This may be attributed to the absence of clinical research evidence to support evidence-based practice.

In the next article, Lee and Kumar, research into an alternative option to reduce lung dose for electron scar boost irradiation in post-mastectomy breast cancer patients with a thin chest wall. The authors evaluated water-equivalent slabs as an alternative to bolus, to reduce radiation dose to the underlying lungs during electron scar boost irradiation in breast cancer patients with a thin chest wall undergoing post-mastectomy radiation therapy.

Per cent depth doses and attenuation factors were obtained for 6 MeV with solid water slabs (1–10 mm by 1 mm increments) placed on top of electron cones. Scatter dose to contralateral breast caused by the solid water slabs was measured on a human-like phantom using two selective scar boost patient setups.

The results demonstrated the feasibility of using water-equivalent slabs to reduce lung dose for electron scar boost treatment in mastectomy patients with a thin chest wall. However, the increase in treatment time and scatter dose to the contralateral breast are the disadvantages of this approach.

In the next paper, Aghdam, Baghani, Mahdavi, Aghamiri and Akbari, present their Monte Carlo (MC) study on effective source to surface distance for electron beams from a mobile dedicated intraoperative RT accelerator. The

effective source to surface distance (SSDeff) for different combinations of energy/applicator size of the electron beam produced by the LIAC, a mobile dedicated intraoperative RT accelerator, has been calculated in this study.

Both ionometric dosimetry and MC simulation were followed to obtain the SSDeff for different combinations of electron energy/applicator size. Simulations were performed using a general Monte Carlo N Particle (MCNP) MC code. Measurements were performed by Advance Markus chamber and inside a PMMA slab phantom. Inverse square law method was employed to determine the SSDeff from acquired dosimetry data.

The results of this study showed that SSDeff of an intraoperative electron beam is highly dependent on the applicator size and is a mild function of electron beam energy. These facts are in accordance with those reported for conventional electron beam. The good agreement between the results of MC simulation and ionometric dosimetry confirms the application of MCNP code in modelling of an intraoperative electron beam and obtaining the intended parameters.

In the next paper, Tharavichitkul, Chakrabandhu, Klunklin, Onchan, Jia-mahasap, Janlaor, Tippanya, Nobnop, Wanwilairat, Pukanhaphan,Galalae and Chitapanarux, present their 5-year results of image-guided brachytherapy (IGBT) combined with whole pelvic radiation therapy (WPRT) for cervical carcinoma.

In all, 52 patients with locally advanced cervical carcinoma were enroled into the study. WPRT was used to treat the clinical target volume with a dose of 45–50·4 Gy in 23–28 fractions. IGBT using CT was performed at the dose of 6·5–7 Gy × 4 fractions to the D90 of high-risk clinical target volume.

The authors conclude that the combination of WPRT plus IGBT showed very promising long-term results with excellent local control and toxicity profiles.

In the next paper, Jeong, Wook, Weon, Chung and Mijoo report on a study to estimate the risk of secondary malignancies following intraoral electron radiotherapy (IORT) for tongue cancer patients. The authors measured dosimetric characteristics for linear accelerator-based electron beams, which are applied through locally manufactured acrylic tubes for intraoral RT and to calculate the secondary cancer risk for organs at risk.

Six different acrylic tubes were exposed to a 6-MeV electron beam; they had tips with three angles (0°, 15° and 30°) and two diameters (2·5 and 3·0 cm). Gafchromic EBT2 film was horizontally and vertically inserted in a solid water phantom to measure the dose profiles and percentage depth doses (PDDs). The measured data from radio-photoluminescence glass dosimeters placed on the neck and both eyes were used to estimate the lifetime attributable risk of secondary cancer resulting from intraoral RT for tongue cancer.

The conclusions drawn are that the dosimetric characteristics for linear accelerator-based IORT treatment beam were confirmed. In addition, they found that 0·1% of tongue cancer patients would get secondary malignancies for both eyes and thyroid from this treatment.

In the next article, Sarakr and Pradhan, present their work in which they aimed to assess the impact of advanced multileaf collimator (MLC) models and flattening filter free (3F) beam in volumetric modulated arc therapy (VMAT) based cranio-spinal irradiation (CSI). CT scans of five medulloblastoma patients who had previously received CSI were used for this study. Patients were planned for a prescription dose of 35 Gy to cranio-spinal axis. A three dimensional conformal plan (3DCRT) plan and a VMAT plan using 1 cm MLC leaf width were generated as the gold standard (reference arm). Test VMAT plans were generated using Agility MLC Model (MLC leaf width 5 mm) for various combinations of flattened beam and 3F beam for treating the brain and spine planning target volume (PTV). Organs at risks (OARs) were analysed for dose to 5, 50, 75 and 90% volumes, mean dose and maximum dose.

The authors conclude that the reference arm plans and test arm plans exhibit no statistically

https://doi.org/10.1017/S1460396917000085 Published online by Cambridge University Press

significant difference. However, as compared with 3DCRT, VMAT plans are more conformal and produce less dose to OAR at the cost of higher delivered monitor units. 3F beams or finer width MLC's (width <5 mm) have no advantage over the conventional 1 cm MLC and flat beam except that 3F beams have a shorter beam delivery time.

In the next article, readers are given an insight into the thoughts and views of Dr Denyse Hodgson, the head of Radiotherapy and Oncology Education at Sheffield Hallam University, who shares her experiences of working in RT.

In the first of three literature reviews, Durrant and Bridge determine the optimal technique for ovarian preservation in pre-menopausal women receiving pelvic RT. The traditional method of preservation comprises of surgical transposition; intensity modulated radiotherapy (IMRT) and other emerging techniques may offer alternative non invasive means of sparing ovaries and minimising dose.

A critical review of the evidence pertaining to pelvic RT and ovarian sparing was performed. Evidence was subjected to critical appraisal using the CASP tool and findings were further subjected to thematic analysis.

The authors conclude that ovarian transposition has a proven track record for preservation of ovarian function, but the potential value of IMRT as a viable alternative to date remains unexplored. New work should be encouraged to determine the potential value of IMRT as a non-surgical alternative.

In the second literature review, Midon and Bridge ask the question:

What are the current and future requirements for magnetic resonance imaging (MRI) interpretation skills in RT? With the increasing usage of MRI in RT and the advent of MRI-based IGRT, suggests a need for additional training within the RT profession. This critical review aimed to identify potential gaps in knowledge by evaluating the current skill base in MRI among therapeutic radiographers as evidenced by published research.

Papers related to MRI usage were retrieved. Topic areas included outlining, planning and IGRT; diagnosis, follow-up and staging related papers were excluded. After selection and further text analysis papers were grouped by tumour site and year of publication.

The authors conclude that the current use of MRI in RT is mainly restricted to sites where MRI offers a considerable imaging advantage over CT. Given the changing use of MRI for image-guidance, emerging therapeutic radiographers will require training in MRI interpretation across a wider range of anatomical regions.

In the third literature review, Chamunyonga, Crowe and Burbery undertake a review of the clinical benefits and implementation of peer review of treatment plans in undergraduate medical dosimetry and radiation therapy training. Peer review of treatment plans has been used to improve planning consistency, decrease the need for re-planning and improve quality of care through the safe delivery of high-quality RT plans. This narrative review summarises the clinical benefits and addresses the implementation of peer review of treatment plans in undergraduate medical dosimetry and radiation therapy training.

The authors conclude embedding skills in peer review of treatment plans at undergraduate teaching level can be a powerful tool to impart clinical treatment planning knowledge.

In the educational note presented in this issue, Hodgson, Taylor, Knowles and Colley, describe how they involved patients and carers in developing the RT curriculum to enhance compassion. In the wake of the Francis report in the UK, 2013 and a call for compassion to be a central tenet of health programmes, this project was a timely opportunity to enhance the RT curriculum.

Collaboration between University staff and patients and carers using the service improvement model Plan-Do-Study-Act was the method employed for the curriculum project. Two key discussion forums helped shape the curriculum plan, with module and course evaluation continuing to inform developments.

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The key outcome of the project is that it has shaped the 'care' theme evident in the current undergraduate programme. Co-production methods resulted in the development of a range of shared classroom activities that focus on experiences, care values and communication strategies.

The authors conclude that working together, with patients and carers is an ideal method to enhance the curriculum and reflect the requirements in practice of current health and social care professions. Further developments in student assessment are planned.

In the technical note, by Giri, Sarkar, Jassal, Munshi, Ganesh, Mohanti and Pradhan, authors present their study of a comparison of techniques between VMAT, forward planning IMRT and conventional technique for left sided breast RT after conservative surgery.

In all, 20 post-operative left breast carcinoma patients were included in this study. In all plans the PTV was only the breast tissue. The contouring was done on a Monaco Sim (V5·00·02; CMS Elekta, Sunnyvale, CA, USA) contouring workstation. All patients were planned using partial arc VMAT in Monaco treatment planning system (TPS) (V5·00·02; CMS Elekta, Sunnyvale, CA, USA) and treated on Elekta Synergy (Elekta, Crawley, UK) linear accelerator. The 3-D CRT and forward IMRT (FIMRT) planning were done in CMS XIO (V5·00·01·1) (CMS Elekta, Sunnyvale, CA, USA) TPS. The 3DCRT planning consisted of conventional medial and tangential wedge portals with MLC field shaping conforming to the target volume. For all the plans generated the following metrics were scored: V105%, V100%, V95%, mean dose (for PTV), V5%, V20%, D2cc, mean dose (for OARs).

This study concluded that there was equivalent result between FIMRT and VMAT. However VMAT was found to be the choice of RT technique as it produces lesser dose to the heart compared with any other technique.

To complete this issue, Ül Barlazus and Temelli present an interesting case study on the evaluation of the dose received by ovaries in the treatment of a Desmoid tumour presenting in the lower extremity, using IMRT and tomotherapy.

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