

In this issue

In this issue, there are nine original articles covering a range of themes and topics, including a study on the prevalence and potential for developing compassion fatigue burnout of radiation therapists (RTTs), two further studies reviewing different pre-treatment imaging methods and three articles considering the accuracy of treatment and radiation dosimetry. There are three literature reviews, one on an interesting study into the use of peer review to improve quality and safety in radiation oncology. To complete this issue, there are two case reports presenting the treatment outcomes for two patients presenting with rare oncology scenarios.

In the first article, Carol Gillies et al. present their findings on a national study examining the prevalence and potential for developing compassion fatigue and burnout in RTTs. The objective of this study was to examine compassion fatigue, secondary traumatic stress and burnout by investigating the relationship between levels of compassion and secondary traumatic stress (STS) and burnout. The study also aimed to identify RTT groups who may be at risk for developing STS and burnout and investigated the level of social support that RTTs receive. RTTs practicing across Canada were invited to participate in an electronic questionnaire. The results of the study indicate that compassion levels are inversely correlated with burnout and compassion fatigue, although some groups may be at higher risk than others. A possible risk catalyst for compassion fatigue and burnout is associated with underdeveloped managerial workplace support programmes.

In the second paper, Crispin Chamunyonga presents the findings of a study to evaluate the impact of patient set-up errors on the probability of pulmonary and cardiac complications in the irradiation of left-sided breast cancer. Using the CMS XiO Version 4.6 (CMS Inc., St Louis, MO, USA) radiotherapy planning system's

normal tissue complication probability (NTCP) algorithm and the Lyman–Kutcher–Burman model, they calculated the dose–volume histogram (DVH) indices for the ipsilateral lung and heart and the resultant NTCPs for radiation-induced pneumonitis and excess cardiac mortality in 12 left-sided breast cancer patients. The results demonstrated that set-up errors in left-sided breast cancer patients have a statistically significant impact on the lung NTCPs and DVH indices. However, with a central lung distance (CLD) of 3 cm or less ($CLD < 3$ cm), and a maximum heart distance (MHD) of 1.5 cm or less ($MHD < 1.5$ cm), the treatment plans could tolerate set-up errors of up to 1 cm without any change in the NTCP to the heart.

In the third paper, Andrew Gaya et al. undertake a study to evaluate the efficacy of a belly board immobilisation device for rectal cancer patients. A randomised trial in patients receiving neo-adjuvant chemoradiation for rectal carcinoma was established. Patients who were prone with control arm were treated according to standard departmental protocol and experimental arm with the use of a belly board. All treatments were planned using a three-field technique. The primary endpoints were reproducibility and irradiated small bowel volume. Questionnaires were used to assess secondary endpoints of patient comfort, ease of set up and acute toxicities. Pre-planned interim analysis was performed after recruiting 30 patients. In all, 348 portal images were analysed retrospectively. In all, 8 out of 12 parameters measuring set-up reproducibility were in favour of the belly board arm. Random error in the antero–posterior (AP) direction was improved and statistically significant in the experimental arm (95% CI, $p < 0.05$). Small bowel V15 was significantly lower in the belly board position (mean V15 = 14.5%) compared with the standard position (mean V15 = 21.4%), paired *t*-test (95% CI, $p = 0.035$). In addition, patients' comfort satisfaction

was greater in the belly board arm. The authors conclude, set-up reproducibility, small bowel V15, patient comfort and satisfaction were all significantly improved by the use of the belly board.

In the next paper, Tomasz Piotrowski et al. investigate the possible optimisation of the image guidance procedure for prostate cancer patients with respect to imaging frequency and patient body mass index (BMI). The 6,085 set-up correction shifts and BMI for 216 prostate cancer patients treated on tomotherapy units in two centres were analysed. Margins needed to account for inter-fraction target motion with daily only automatic correction and with automatic and manual corrections during one, three or five first fractions as a reference for further treatment without imaging were calculated. The planning target volume margin calculated for the daily automatic correction only scheme was significantly lower than the margins calculated for the image guidance limited to a few initial fractions. Manual corrections after automatic fusion were more important for patients with higher BMI. On average, the patients with normal BMI had manual correction shift of 0.7 mm in AP direction, while overweight and obese patients required, correspondingly, the shifts of 1.3 and 1.4 mm. The authors conclude that, overweight and obese patients require daily imaging with time saving available by performing automatic kV/MV CT registration only. The patients with normal BMI may be treated with imaging guidance during a few initial treatment fractions.

In the next article, Giovanni Franchin et al. undertake a study to assess the efficacy of IMRT with concomitant boost (SIB-IMRT) compared with conventional radiation in the setting of sequential chemoradiotherapy (ICRT) for patients with advanced oropharynx cancer (OPC). A single institutional retrospective review was performed on 84 patients (conventional radiation, $n = 36$; SIB-IMRT, $n = 48$) with stage III–IV OPC who underwent definitive ICRT from 2002 to 2012. The study endpoints included overall survival (OS) and locoregional control (LRC). The results indicated the median follow-up of the matched cohorts resulted similar (30 months for 3D-RT versus 37 months for IMRT), and baseline characteristics were generally balanced between the

two groups. However, patients managed with conventional radiation were less likely to have positron emission tomography computed tomography (PET-CT) for staging and to receive induction chemotherapy with TPF. A multivariate Cox proportional hazard model showed that OS and LRC were associated with several known prognostic factors, along with radiation modality (SIB-IMRT versus conventional radiation, hazard ratio 0.27, $p = 0.004$ and 0.31, $p = 0.006$ for OS and LRC, respectively). The authors concluded that the adoption of SIB-IMRT versus conventional radiation may produce a clinical benefit in OS and LRC among patients receiving ICRT for advanced OPC.

Authors Samy Algizawy et al. undertake a study to compare the outcome among patients with invasive bladder cancer treated with cystectomy alone with outcome among those treated with combined modality treatment in a randomised phase III trial. Patients with histologically confirmed invasive non-metastatic bladder cancer T2–3, N0, M0 were randomly assigned to two arms: Arm 1, of which all patients underwent radical cystectomy alone; and Arm 2, of which all patients were subjected to maximal transurethral resection of bladder tumour followed 2 weeks later by combined chemoradiotherapy. The whole pelvis received 46 Gray in 23 fractions over 4.5 weeks. Chemotherapy was administered concomitantly with radiotherapy with: cisplatin 70 mg/m² q 3 weeks and gemcitabine 300 mg/m² d1, 8 and 15 q 3 weeks for two cycles. Patients who had complete response were shifted to phase II treatment: 20 Gray/10 fractions/2 weeks to the bladder. Patients with residual tumour underwent radical cystectomy. The authors conclude that this study demonstrates that trimodality bladder-preserving approach represents a valid alternative for suitable patients. The OC and disease-specific survival rates of patients treated with trimodality bladder-preserving protocol are comparable with the results reported with patients treated with immediate radical cystectomy.

In the next article, Bhavana Rai et al. report on their study to assess the feasibility of using CT (\pm diagnostic magnetic resonance imaging (MRI)) instead of MRI of brachytherapy in image-guided brachytherapy in cervical cancer.

The purpose was to compare the contours and DVH parameters of the high-risk clinical target volume (HRCTV) contoured on CT using clinical findings at brachytherapy, clinical findings of brachytherapy with MRI at diagnosis and HRCTV defined on MRI at brachytherapy in cervical cancer patients. In all, 15 patients undergoing MRI-guided image-based brachytherapy underwent both CT and MRI after applicator insertion. Two sets of contours were defined on CT. In the first set, the HRCTV was defined with the help of clinical findings at brachytherapy (CT-HRCTV). In the second set, HRCTV was defined with MRI at diagnosis and clinical findings at brachytherapy (CT-HRCTV_{dmri}). This was compared with the HRCTV defined on MRI at brachytherapy (MR-HRCTV). The doses to the organs at risk were compared for CT and MRI. The authors conclude CT may be an alternative when facilities for MRI image-based brachytherapy are lacking, provided at least one MRI is available before brachytherapy.

In the next paper, Kaveh Tanha, Seied Rabi Mahdavi and Ghazale Geraily present their research on verifying the accuracy of two common absorbed dose calculation algorithms in comparison to Monte Carlo (MC) simulation for the planning of the pituitary adenoma radiation treatment. After validation of Linac's head modelling by MC in water phantom, it was verified in Rando phantom as a heterogeneous medium for pituitary gland irradiation. Then, equivalent tissue air ratio and collapsed cone convolution algorithms were compared for a conventional three small non-coplanar field technique. This technique uses 30° physical wedge and 18 MV photon beams. The results and conclusions reveal the difference between calculation and true dose value affects radiation treatment outcome and NTCP. It is of prime concern to select appropriate treatment planning system according to our clinical situation. It is further emphasised that MC can be the method of choice for clinical dose calculation algorithms verification.

In the next paper, Mohammad Mohammadi, Amir Taherkhani and Mohammad Saeed Saboori investigate the dose distribution under the beam area protected by using Cerrobend

blocks. In radiation therapy, to spare normal surrounding tissues, either Multileaf collimators or Cerrobend blocks are used. This paper focuses on the relative dose distribution under the areas protected by Cerrobend blocks. A dual-energy linear accelerator and a Cobalt-60 machine were utilised as radiation sources. Several blocks were designed using commercially available materials to shield radiation fields. The relative dose distribution was then evaluated using extended dose range (EDR2) films. The results demonstrated that the dose distribution under protected areas depends on several parameters including the width and height of protecting blocks, incident photon beam energy, radiation field size and source to surface distance. An increase of Cerrobend block height from 80 to 95 mm significantly decreases the dose at protected areas. Authors conclude that, an increase of the block width and photon energy decrease the relative dose deposition at the protected area. However, electron and neutron contaminations should also be taken into considerations.

The first of the three literature reviews is on the topic of shared decision making in palliative cancer care. In this review, Carina Feuz discusses the importance of shared decision making. Shared decision making is a methodology that promotes a patient-centred approach to informed consent and demonstrates respect for autonomy. The literature identifies that palliative cancer patients desire the opportunity to be involved with decision-making discussions which has shown to increase knowledge and result in better health-related outcomes. However, ethical and legal issues regarding the practicality of including this patient population in shared decision-making discussions raises questions about validity of consent. Treatment options for palliative cancer patients are often complex and shared decision making allows health-care professionals and patients to exchange information and negotiate feasible treatment options based on medical expertise and patient preferences. Legal frameworks have defined current standards of practice for various health-care professions, including radiation therapy. RTTs, as members of the multidisciplinary team, are currently key contributors in providing information to patients regarding the radiotherapy process. Individuals

working within advanced practice roles have the ability to develop skills once considered to be within medical domains and have begun to incorporate the delegated act of obtaining informed consent into practice, which has shown to increase professional autonomy, accountability and improve patient-centred care.

Celia Silva, Dalila Mateus, Sandra Vieira and Margarida Eiras present the second literature review on the subject of the Calypso[®] four-dimensional (4D) localisation system. The Calypso[®] 4D localisation system is a system based on electromagnetic transponders detection enabling precise 3D localisation and continuous tracking of tumour target. This review intended to provide information in order to show how Calypso 4D Localisation System[®] works, to present advantages and disadvantages of this system, to gather information from several clinical studies and, finally, to refer Calypso System as a tool in Dynamic Multileaf Collimator studies for target motion compensation. A structured search was carried out on b-On platform. The key words used in this research were 'Calypso', 'Transponder', 'Electromagnetic Localisation', 'Electromagnetic Tracking', 'Target Localisation', 'Intrafraction Motion' and 'DMLC'. Review: treatment where the implanted transponders are excited by an electromagnetic field and resonate back. These frequencies are detected and Calypso software calculates the position of the transponders. If the movement detected is larger than the limits previously defined, irradiation can be stopped. The system has been proven to be submillimetre accurate. Discussion: Calypso[®] system has been presented as an accurate tool in prostate radiotherapy treatments. The application of this system to other clinical sites is being developed. Authors conclude that the Calypso[®] system allows real-time localisation and monitoring of the target, without additional ionising radiation administration. It has been a very useful tool in prostate cancer treatment.

The final literature review is presented by Crispen Chamunyonga and Pete Bridge, on the subject of using peer review as a tool to raise the bar on quality and safety in radiation oncology. An emerging developmental tool to help RTTs achieve better outcomes is 'peer review'. There is compelling evidence supporting peer review implementation at both individual and departmental level in many professions. Implementing peer review requires that RTTs and other radiation oncology professionals embrace a culture that supports safety. Peer review can identify trends and barriers associated with quality radiotherapy and share best practice or recommend changes accordingly. To drive the issues of quality and safety a step further, RTTs need to accept the challenge of adopting peer review methods in day-to-day practice. This review of the current literature summarises the challenges and benefits of peer review in both individual and departmental practice. It is clear that peer review has the potential to facilitate reflective practice, improve staff motivation and help foster a culture of quality and safety in radiation oncology. Support for peer review must come from pre-registration educational systems as well as clinical managers. Continuing professional development in the workplace is nurtured by peer review of radiotherapy practice and an aptitude for this should be viewed as important to the profession as technical and clinical skills.

To complete this issue, there are two case studies, the first is by Shaakir Hasan and Anna Turaka on the subject of treatment outcomes for a patient presenting with primary mucosa associated lymphoid tissue lymphoma of the thyroid with concomitant papilloma. The second is a case report of long-term survival of a patient presenting with metastatic extraskeletal myxoid chondrosarcoma, treated with surgery and hypofractionated radiotherapy, authored by Haoming Qiu, Mary Hare and Yuhchayau Chen.

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