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In this issue

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I am pleased to introduce the 'in this issue' for the fourth issue of Volume 17 of the *Journal of Radiotherapy in Practice*, published in December 2018. In this issue, there are 12 original articles on a range of topics and a literature review on the training of radiographers in dementia care. There are two technical notes: in the first, authors study the quality assurance (QA) of volumetric modulated arc therapy (VMAT) in head and neck cancer (HNC) treatment and the second note is on a planning study to optimize simultaneous boost in the treatment of laryngeal cancer. To complete this issue, there is a case study on a case of dermatofibrosarcoma protuberans (DFSP) of the scalp treated with a customised surface mould high dose rate brachytherapy and a short communication on the subject of the much-awaited Venezia applicator.

In the first paper, the authors Flinton, Cherry, Thorne, Mannion, O'Sullivan and Khine present their paper on an investigation into the levels of compassion satisfaction and fatigue being reported by radiotherapy students. Studies have investigated the prevalence of compassion satisfaction and compassion fatigue in various health care professions. However, the majority of evidence is linked to the nursing profession and little is known about paramedical professions such as radiography; even less is known about its prevalence in students. The purpose of this study was to describe the levels of compassion satisfaction and compassion fatigue in the student population and how they varied over time.

Students undertaking radiotherapy training at the researcher's host sites were surveyed using the professional quality of life questionnaire at the end of each final clinical block in each year of their training.

During the 3 years of training, compassion satisfaction falls and burnout increases in the student population, although the change is not significant. Secondary traumatic stress increases significantly during the 3 years of training, $F = 5.725$, $p = 0.005$. Considerable variation also exists in the three scores depending on the student's clinical training site. Relationships are also observed between some personality traits, particularly conscientiousness and neuroticism and compassion scores.

In the second paper, the authors ElBeltagi, Wall and Marignol present their study on planning target volume (PTV) margin practice patterns in adults and paediatrics among the Paediatric Radiation Oncology Society members. Evolving data show the need for consideration of smaller PTV margins in paediatrics compared with adults treated for the same body site. This study evaluated the current patterns of practice regarding the PTV margin in paediatric patients compared with adult patients through an international survey.

A four-item questionnaire was created to address the PTV margins for paediatrics and adults as part of a comprehensive survey. International Paediatric Radiation Oncology Society members were selected to partake and were contacted via email.

A total of 43 people responded to the survey. The majority of the responders have written guidelines for PTV margins, while the majority of those who have guidelines do not have separate guidelines for paediatrics. The implemented PTV margin for paediatric patients was in the majority 3–5 mm for the head region and 5–10 mm for the torso region and the difference from the PTV margin implemented in adults was not statistically significant.

The study concludes that the majority of responders employ a series of site-specific PTV margin protocols that are applied to both adults and paediatrics, and do not take into consideration patient age or size. These results highlight the need for a separate policy for PTV margins in adults and paediatrics in every institution.

In the next paper, Mirsadraei, Seilanian Toussi, Mohebibi and Khalili-Hezarjaribi present their study of the evaluation of doses to the thyroid gland in women treated for breast cancer with radiotherapy to the supraclavicular fossa. The aim of this study was to compare thyroid gland radiation absorption during radiotherapy with different anterior–posterior beams of 6–15 MV and 15–15 MV photon beam energies.

A total of 29 patients with breast cancer were recruited for this study. Adjuvant radiotherapy with a total dose of 50 Gy was performed for each participant. Thyroid gland dosimetric measurements were evaluated, including mean dose, minimum and maximum dose, and V_{20} , V_{30} , V_{40} and V_{50} (percentage of thyroid volume receiving ≥ 20 , ≥ 30 , ≥ 40 and ≥ 50 Gy, respectively). The irradiation delivered doses were measured using Prowess Panther treatment planning system (TPS) (version 5.5). Data were evaluated using SPSS software.

The authors conclude that using 15–15 MV photon beam energies can significantly reduce the absorbed dose to the thyroid gland and consequently can reduce the risk of developing hypothyroidism as a long-term side effect of treatment.

In the next paper, Osei, Wajid, Fleck and Darko present their study to investigate the detailed angularly dependent attenuation characteristics of three different commercial

couch-tops used in radiation therapy (RT): Varian IGRT, Qfix kVue Standard and Qfix kVue Dose Max.

The attenuation of photon beams by the treatment couch-tops was measured using a farmer chamber inserted at the centre of a 16 cm diameter cylindrical acrylic phantom for five different photon energies: 6 MV, 6FFF MV, 10 MV, 10FFF MV and 15 MV photon beams. The Varian IGRT couch-top has three different thicknesses; thus attenuation measurements were taken at three different longitudinal locations. Measurements were made with the sliding support rails of the Qfix kVue Standard and Qfix kVue Dose Max couch-tops at both 'rails-in' and 'rails-out' positions. All measurements were taken for several projections through 360° movement of the gantry and for two different field sizes; $5 \times 5 \text{ cm}^2$ and $10 \times 10 \text{ cm}^2$.

The results indicate that the maximum attenuation of the Varian IGRT couch-top at the thin, medium and thick portions are 5.1, 5.7 and 8.9%, respectively; the Qfix kVue Standard couch with the rails-in and rails-out are 11.2 and 13.7%, respectively, and the Qfix kVue Dose Max couch-top with rails-in and rails-out are 9.7 and 13.8%, respectively. The results from this study can be used to account for the couch-top attenuation during radiation treatment planning of patients treated with these couch-tops.

In the next paper, authors Kataria, Mishra, Gupta, Goyal, Bisht, Malik, Abhishek, Banerjee, Narang, Basu and Tayal present their evaluation of the survival outcomes and toxicities experienced by non-metastatic HNC patients receiving modulated radiotherapy.

A total of 608 HNC patients treated consecutively from March 2010 to December 2014 with common subsites (oral cavity, oropharynx, hypopharynx, larynx and nasopharynx) of HNCs formed the study group. Eligible patients included those treated with radical or postoperative radiotherapy between March 2010 and December 2014. More than 90% of patients received modulated radiotherapy [intensity modulated radiation therapy (IMRT) or VMAT] with concurrent chemotherapy as per stage guidelines. Demographic parameters and disease-related factors were analysed. Disease-free survival was calculated from the end date of radiotherapy till last follow-up or last date of disease control. Overall survival was calculated from the date of registration to last follow-up date if alive. The primary endpoint was survival. The statistical analysis was performed using SPSS version 20.0, and the Kaplan–Meier method was used for the calculation of survival.

The results of the study indicate that 2 and 3 years overall and disease-free survival rates were found comparable to the international data with acceptable toxicity profile with the use of modulated radiotherapy. This seems to be possible because of stringent departmental protocols and good medical physics support. This data re-validates the need for and benefit of advanced radiotherapy techniques like image-guided IMRT and VMAT for both postoperative and radical HNC treatment at the cost of minimal long-term side effects. Future stringent follow-up and quality of life issues are being considered in a prospective manner.

In the next paper by Sebastian, Sidhique, Varghese, Prabhu, Titus, Backianathan and Nayak, the authors present their study on the impact of RT on DFSP, a locally aggressive intermediate malignancy. The purpose of this retrospective analysis was to determine the efficacy of RT in local control of DFSP.

The recurrence-free survival of 45 patients treated for DFSP at the authors' institution was estimated and compared between surgery alone and postoperative RT groups. The authors conclude

that RT delays the time to recurrence in DFSP and RT improves the outcome of DFSP for recurrent tumours and those with positive margins.

The paper by Iqbal is an analysis of the comparison of IMRT QA using GAFCHROMIC® EBT3 film, electronic portal imaging device (EPID) and MapCHECK®2.

A total of 20 patients were planned on the eclipse TPS using 6 and 15 MV separately.

The author concludes that the EPID results are better than the other methods and hence the EPID can be used effectively for IMRT pre-treatment verifications.

In the next paper, Iqbal presents his study to determine the feasibility of an anthropomorphic breast polyurethane-based 3D dosimeter with a cavity to measure dose distributions and skin dose for a commercial strut-based applicator SAVI™ 6-1.

An anthropomorphic breast 3D dosimeter was created with a cavity to accommodate the SAVI™ strut-based device. A dose of 2 Gy was prescribed to the breast dosimeter having D_{95} to planning target volume evaluation (PTV_EVAL) while limiting 125% of the prescribed dose to the skin. Independent dose distribution verification was performed with GAFCHROMIC® EBT2 film. The dose distribution from the 3D dosimeter was compared with the distributions from commercial brachytherapy TPS and film. Point skin doses, line profiles and dose-volume histograms for the skin and PTV_EVAL were compared.

The author concludes that the 3D anthropomorphic polyurethane dosimeter with a cavity gives comparable results to the TPS dose predictions and GAFCHROMIC® EBT2 film results in the context of high dose rate brachytherapy.

In the study by Barlazus, Celik, Olacak and Tavlayan, the authors undertake an evaluation of air cavities on dose distributions with air-filled apparatuses with different volumes using GAFCHROMIC EBT3 films in brachytherapy. The data used in brachytherapy planning are obtained from homogeneous mediums. In practice, the heterogeneous tissues and materials affect the dose distribution of brachytherapy. In this study, the aim was to investigate the effect of air cavities on brachytherapy dose distribution using a specially designed device.

For this study, a special device was used that was designed with different volumes of air and water to be irradiated and measured at different depths using EBT3 GAFCHROMIC films. EBT3 GAFCHROMIC films were preferred because they can be cut to the shape of the experimental geometry, are water resistant, and have double directional usability.

The authors conclude that the effect of heterogeneity may be neglected according to clinical guidelines and suggest that the dose effect of heterogeneity is taken into account so that the dose can be estimated sensitively. Brachytherapy plans using dose data without considering air gaps may cause erroneous dose distributions due to heterogeneity of tissue.

In the paper by Baziar, Gholamhosseinian and Forghani, the aim of the study was to assess skin dose and incidence of skin reactions in early breast cancer patients treated with Intrabeam™ intraoperative radiation therapy device.

A total of 250 breast cancer patients treated with a single fraction of 20 Gy using a 50 kV photon beam were recruited. The applicator to skin distance was measured before the initiation of the radiation and the skin dose in each patient was accordingly calculated based on the TPS.

The conclusions drawn from the study are that the Intrabeam™ TPS did not seem to be very reliable for accurate skin dosimetry. However, breast cancer treatment using Intrabeam™

could result in fewer incidences of skin reactions than the MammoSite™ machine.

In the next paper, Lee investigates the necessity of rotational shifts by considering the dosimetric impact of rotational errors during stereotactic body radiation therapy (SBRT).

A total of 20 randomly selected lung patients with lesion sizes of < 5 cm and treated with SBRT have been used for dosimetric analysis. The 3D dose was rotationally shifted ($\pm 1^\circ$, $\pm 3^\circ$, $\pm 5^\circ$ for pitch, roll and yaw) and overlaid onto the original computed tomography (CT) images. The dose–volume histograms of 18 rotational plans of each patient were compared with those of the original plan.

The author concludes that it was found to be unnecessary to perform rotational shifts up to 5° for lung SBRT treatments; the translational shift is sufficient for the cases used in this study. This method may be applied and tested after planning and before treatment initiation to rule out exceptionally extreme cases.

The aim of Singh's study was to understand how the regulatory requirements for radiotherapy practices in India to control risk were conceptualised, perceived and applied accordingly in the radiotherapy facilities. It further examined how the social factors influenced the decision-making process for implementing regulatory requirements in the radiotherapy facilities.

This study was carried out in nine radiotherapy facilities located in the north-eastern Indian states of Manipur, Assam, Meghalaya, Tripura and Mizoram. The study adopted both the semi-structured and in-depth questionnaire developed on the basis of multi-disciplinary fields.

The study found that the facilities needed to explore various means, including to narrow the gap that existed in respects of perceived risk (within the facilities), and adopt better communication to enhance work coordination and mutual trust among workers. The adoption of the institutional policy for conducting an internal audit of working practices and encouragement of workers to participate in continuing education programmes would enhance effective utilisation of already existing infrastructure/equipment and work procedures, including QA programs.

The next paper is a literature review on the subject of the training of therapeutic radiographers in dementia care by authors Carnall and Chianese. The aim of the study was to use the findings to make recommendations for training in the future in order to provide the best care.

A literature search of electronic databases holding peer-reviewed journals was conducted. Search terms were generated using the PICO method and retrieved articles were evaluated using the CASP tool. Additional evidence was accessed through snowballing and from grey literature.

The search failed to find any studies on dementia care education within a radiotherapy setting and only a limited number was found in the acute care setting. There appeared to be a large variation in the education provision for health care professionals on the subject of dementia care, both at the pre-registration and post-registration stages.

There is no evidence of a standardised education programme for health care professionals in dementia care. In the future, therapeutic radiographers are likely to see more patients with dementia but currently some may not have had the education and training to provide effective holistic care.

In the first of two technical notes, presented by Rehman, Khan, Ahmad, Khan Asgher, Gilani, Chow, Afzal and Ibbot, the authors

study the QA of VMAT in HNC treatment. Accurate three-dimensional dosimetry is essential in modern radiotherapy techniques such as VMAT and IMRT. In this research work, the PRESAGE® dosimeter was used as QA tool for VMAT planning for HNC.

CT scans of an image radiation oncology core (IROC) head and neck anthropomorphic phantom with both IROC standard insert and PRESAGE® insert were acquired separately. Both CT scans were imported into the Pinnacle (9.4 version) TPS for treatment planning, where the structures (PTV, OARs) and TLDs were manually contoured and used to optimise a VMAT plan. Treatment planning was done using VMAT (dual arc: 182° – 178° , 178° – 182°). Beam profile comparisons and γ -analysis were used to quantify agreement with film, PRESAGE® measurement and TPS calculated dose distribution.

Conclusions of the study are the PRESAGE® dose measurements, and the calculated dose of Pinnacle show reasonable agreement in both axial and sagittal planes for complex dual-arc VMAT treatment plans. In general, the PRESAGE® dosimeter is found to be a feasible QA tool of VMAT plan for HNC treatment.

In the second technical note, the subject is a planning study to optimise a simultaneously-integrated-boost (SIB) treatment of larynx cancer with seven IMRT beams, presented by authors Erraoudi, Youssoufi, Bentayeb and Malisan.

IMRT is one of the most reported techniques for HNC treatment, as it allows a good coverage of the PTV while sparing the surrounding organs at risk (OARs) better than conventional conformal radiotherapy. The objective of this work was to optimise an IMRT technique for the SIB treatment of larynx cancer delivering a total dose of 69.96 Gy to the boost volume and 54.45 Gy to the elective volume in 33 fractions.

Three IMRT techniques, each using seven equally spaced beams, were planned for a sample of 10 patients. The first two techniques (IMRT-0 and IMRT-26) differ only for the starting angle of the seven beams, while the third (IMRT-CT) combines both these techniques by delivering IMRT-0 in the first half of treatment, and IMRT-26 in the second half, thus taking advantage of using 14 beams in total while using only seven at a time. The planning results were compared according to the dose coverage, homogeneity and conformity of the two PTVs, as well as to the dose to OARs, that is spinal cord, parotids, mandible, brainstem and healthy tissue (defined as the body volume minus the sum of PTVs).

In conclusion, the PTV coverage results were acceptable and comparable with all three techniques. Concerning OARs, statistically better results were obtained in IMRT-CT when compared with IMRT-26 and IMRT-0. The IMRT-CT technique, combining two different seven-beam setups and delivered in two treatment phases, improves dose distribution without increasing delivery time.

The case study in this issue is on a case of DFSP of the scalp treated with a customised surface mould HDR brachytherapy by Basu, Biswas and Ghosh.

To complete this issue is a short communication on the subject of the much-awaited Venezia applicator: the virtues of combined intracavitary and interstitial brachytherapy in locally advanced cervical cancer, by Gangopadhyay and Saha.

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