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In this issue

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In this issue

I am pleased to introduce the 'in this issue' for the fourth issue of the *Journal of Radiotherapy in Practice* for Volume 18. In this issue, there are 10 original articles on a range of radiotherapy-related topics, including one on the views on euthanasia and assisted dying in the terminally ill. The literature review, in this issue, is on the subject of the principles of quantum physics in oncology. To complete this issue, there are two case studies, one on the importance of communication skills during radiotherapy treatment planning and another on the clinical implications of the use of molecular information to guide clinical management of a thoracic liposarcoma following resection.

The first article is a study on the use of biodegradable oesophageal stents used as a potentially adjunct in the treatment of dysphagia in patients undergoing radiotherapy for oesophageal carcinoma. In this study, White, Thampy, Sheikh, Bhatt, Laasch and Mullan aim to determine the clinical effectiveness of biodegradable stents to help with malignant dysphagia due to radiotherapy for oesophageal cancer and to establish the complication and re-intervention rates associated with their use.

The authors propose that biodegradable oesophageal stents are safe and may have benefits over self-expanding metal stents. They recommend that stents are placed alongside a radiologically inserted gastrostomy in a combined procedure prior to radiotherapy planning.

In the next article by Byrd, Warren, Fenwick and Bridge, the authors present their work on the development of a novel 3D immersive visualisation tool for manual image matching.

The novel Volumetric Image Matching Environment for Radiotherapy (VIMER) was developed to allow users to view both computed tomography (CT) and cone beam CT datasets within the same 3D model in virtual reality (VR) space. Stereoscopic visualisation of both datasets combined with custom slicing tools and complete freedom in motion enables alternative inspection and matching of the datasets for image-guided radiotherapy (IGRT).

A qualitative study was conducted to explore the challenges and benefits of VIMER with respect to image registration. This study provided initial evidence for the achievable benefits and limitations to consider when implementing a 3D voxel-based dataset comparison VR tool including a need for extensive training and the minimal interruption to IGRT workflow. Key advantages include efficient 3D anatomical interpretation and the capability for volumetric matching.

The next paper by Chow, Jiang and Xu is an evaluation of plan optimisers in prostate volumetric modulated arc therapy (VMAT) using the dose distribution index (DDI). DDI is a treatment planning evaluation parameter, reflecting dosimetric information of target coverage that can help to spare organs-at-risk (OARs) and remain volume of risk (RVR). The index has been used to evaluate and compare prostate VMAT plans using two different plan optimisers, namely photon optimisation (PO) and its predecessor, progressive resolution optimisation (PRO).

Twenty prostate VMAT treatment plans were created using the PO and PRO optimiser in this retrospective study. The 6 MV photon beams and a dose prescription of 78 Gy/ 39 fractions were used in plans with the same dose-volume criteria for plan optimisation. Dose-volume histograms (DVHs) of the planning target volume (PTV), OARs such as the rectum, bladder, left and right femur were determined in each plan. DDIs were calculated and compared for plans created by the PO and PRO optimiser based on DVHs of the PTV and all OARs.

The authors conclude that based on the very similar DDI values calculated from the PO and PRO optimised plans, with the DDI value in the PRO plan slightly larger than the PO, that the PRO optimiser can create a prostate VMAT plan with slightly better dose distribution regarding the target coverage and sparing of OARs. Moreover, authors found that the DDI is a simple and comprehensive dose-volume parameter for plan evaluation considering the target, OARs and RVR.

In the next article, Cummings, Youn, Abu-Aita, Herman, Hare, Zhang, Chen and Singh present their study on the dosimetric changes achieved and changes in target and parotid volumes in patients undergoing adaptive planning during chemoradiation therapy with helical delivery of treatment. Replanning mid-treatment, with adjustment of target volumes, has been performed as part of the normal workflow at their institution. Authors sought to quantify the benefit of this approach and identify factors to optimise plan adaptive strategies.

Patients with locally advanced oropharyngeal cancer treated to 70 Gy with concurrent chemoradiation (CCRT) on TomoTherapy® who underwent replanning during treatment were eligible. Survival and prognostic factors were evaluated with Kaplan–Meier and Cox proportional hazards, two-side p-value <0.05 significant. It was concluded that adaptive

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planning generates a superior plan for the majority of patients but there is modest overall parotid gland sparing.

In the article by Miguel, Llana, Martinez, Castillo, Alonso, Frutos, Andrés, Agulla, Torres and López-Lara, authors investigate the impact of anatomical changes in prostate cancer patients on the target coverage when using 6 MV beams-VMAT therapy and to propose strategies that allow them to evaluate the dose or correct it through normalisation without having to perform a new simulation.

The findings of the study are that weight changes resulted in considerable dose modifications to the target and critical structures, and the dosimetry estimation presented in this study shows important data for the radiation oncology staff to justify whether a CT rescan is necessary or not when a patient experiences weight changes during treatment.

The next article by Sophie Duxbury is on the subject of assisted dying in the terminally ill and an evaluation of the views on euthanasia. The purpose of this study was to evaluate views and attitudes concerning the legality of assisted death and euthanasia in the UK, and to identify the circumstances in which individuals would or would not consider assisted death. The views of a sample of the general population in the UK were sought through the use of a mixed methods questionnaire open to the public for 3 weeks.

The author concludes that the majority of respondents in this study indicated that they believe assisted suicide should be made legal, and that the option should be available for those who are terminally ill. Views indicated that if assisted dying were legal, it would allow terminally ill patients to die with dignity and without prolonging pain.

In the article by authors Osei, Behinaein, Darko, Harland and Bassi, they present their study of the dosimetric changes achieved and changes in target and parotid volumes in patients undergoing adaptive planning during chemoradiation therapy with helical delivery of treatment. An increasing number of external beam treatment modalities including intensity modulated radiation therapy, VMAT and stereotactic radiosurgery use very small fields for treatment planning and delivery. However, there are major challenges in small photon field dosimetry, due to the partial occlusion of the direct photon beam source's view from the measurement point, lack of lateral charged particle equilibrium, steep dose-rate gradient, and volume averaging effect of the detector response and variation of the energy fluence in the lateral direction of the beam. Therefore, experimental measurements of dosimetric parameters such as percent depth doses (PDDs), beam profiles and relative output factors for small fields continue to be a challenge.

The authors compared dosimetric parameters such as PDD, beam profile and relative output factors in water phantom and isocentre point dose measurements in an anthropomorphic head phantom representing a patient. It was observed that measurements using the W1 Exradin scintillator agreed well with Monte Carlo (MC) simulations and can be used efficiently for dosimetric parameters such as PDDs and dose profiles and patients-specific quality assurance measurements for small fields. In both homogeneous and heterogeneous media, the AXB algorithm dose prediction agrees well with MC and measurements and was found to be superior to the AAA algorithm.

In the next paper, authors Omran and Hamour assess the effectiveness and tolerability of selective internal radiation therapy (SIRT) in patients with liver tumours. In a retrospective study, patients with unresectable liver tumours treated with yttrium-90-labelled resin microspheres (SIR-Spheres®, Sirtex, Sydney, Australia) at the King Fahad Specialist Hospital Dammam were followed up for at least 12 months or until death. Data were extracted from medical records. The primary outcome measure was overall survival. Tumour response was recorded using the modified Response Evaluation Criteria In Solid Tumours: tumour control was defined as the proportion of patients with stable disease, partial response and complete response. Findings suggest that SIRT showed similar efficacy to that in other studies, with an acceptable tolerability profile. SIRT appears a feasible procedure for liver tumour treatment.

In the next paper, Pallath, Lahiri, Misra, Roy, Maji, Ray and Misra present their study on hypofractionated VMAT with simultaneous integrated boost (SIB) adjuvant to breast preservation surgery. The incidence of breast cancer has surpassed cervical cancer in India, and it has now become the most common cancer in women. Multiple randomised studies have reported low α/β value in the range of 3–4 for breast cancer that predict a potential radiobiological advantage for hypofractionated radiotherapy resulting in such schedules becoming standard in many centres, with reduction in overall treatment time. VMAT is a novel technique of delivering radiotherapy that reduces treatment delivery time, requires less monitor units and offers good conformity. The mean dose to normal tissue may be minimised using this technique, though there will be inferior sparing if we consider the low dose volume such as V5, the effect of which is not quantifiable yet. The overall aim of this study is to report acute toxicity, cosmetic effects and quality of life in patients of early breast cancer treated with adjuvant hypofractionated VMAT with SIB. The authors conclude that this technique is associated with minimum acute toxicity, good to excellent cosmesis and acceptable quality of life.

In the next article, Liu, Dai, Qiu, Zhang, Shi, Hu, Chen, Gao and Wang present their survey to assess helical tomotherapy (TOMO) clinical application and practice in mainland China. Data were collected for all TOMO units clinically operational in mainland China by April 30, 2016, including the distribution of installation and staffing levels; types of cancers treated; utilisation efficiency; quality assurance; maintenance; optional features; and satisfaction levels. The data were collected as a census and were analysed qualitatively and quantitatively.

The findings indicate that the overall operation of TOMO is good, but there are some issues due to running at full capacity, lack of clinical efficacy research and insufficient quality assurance regulations.

In the literature review presented in this issue, Osei, Raghunandan, Voll, Osei, Darko and Laflamme review the applications of the principles of quantum physics in oncology and ask the question: do quantum physics principles have a role in oncology research and applications?

Research in the applications of the principles of quantum physics in oncology has progressed significantly over the past decades, and several research groups with professionals from diverse scientific background including electrical engineers, mathematicians, biologists, atomic physicists, computer programmers and biochemists are working collaboratively in an unprecedented and pioneer economic, organisational and human effort searching for a wider and more effective, potentially definitive, understanding of the cancers. It is hypothesised that the principles of quantum physics could open new and broader understanding of the cancers and the development of new effective, targeted, accurate, personalised and possibly definitive cancer treatment.

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Conclusions drawn are that the applications of the principles of quantum physics in oncology, chemistry and biology are providing new perspectives and greater insights into a long-studied disease, which could result in a greater understanding of the cancers and the potential for personalised and definitive treatment methods.

To complete this issue, there are two case studies. In the first case study, Merlotti, Reali and Russi share their experience of the importance of communication skills in reducing set-up errors in the radiotherapy planning phase. The authors discuss two clinical cases that highlight the importance of time dedicated to communication and revision of the first CT acquisition during a virtual simulation procedure.

The second case study by Stolten, Sahasrabudhe and Constine is a case of a patient presenting with liposarcoma of the left hemithorax and the use of molecular information to guide clinical management of thoracic liposarcoma following resection.

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