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In this issue

I am pleased to present the final issue of this volume of the journal. The first original article is concerned with learning from patients about their experiences whilst undergoing treatment. The next three articles share the same theme of brachytherapy dosimetry. The following three articles are all concerned with the treatment of prostate cancer and the final article considers electron dosimetry. To complete this issue there is a technical note on oxygen in S phase of a cell cycle.

In the first article by Farnan and Blyth, the authors explore the effect that hospital clothing had on the time patients spend in the treatment room and aimed to identify patients' opinions of the clothing. Potential time saving was determined by covertly timing patients currently undergoing radiotherapy treatment as they entered and exited the treatment room. A total of 348 patients were timed in their own clothing and 341 were timed when they wore hospital clothing. The timings of these two groups were compared to determine whether hospital clothing saved treatment unit time. Patient opinions of the clothing were examined by issuing a short questionnaire, designed to gather ordinal data, at the end of their course of treatment. Questionnaires were issued only to patients who had worn hospital clothing in the radiotherapy department. The authors found that introducing hospital clothing saved a significant amount of treatment room time and patients were generally positive about wearing the clothing. It is suggested that hospital clothing is a welcome addition to the radiotherapy department to increase efficiency without detriment to patients.

In the next article, Hayman and Palmer, undertake a multi-centre audit in the United Kingdom and Ireland to assess the reliability of post-implant CT (PICT) dosimetry for I-125 prostate seed brachytherapy by investigating the variation between centres in performing PICT. In this audit, CT data sets from four I-125 prostate brachytherapy patients were circulated to nine participating centres. Centres followed local protocol for PICT outlining and seed identification, dosimetry for D90, V100 and V150 for the prostate was reported. Outlines were compared to determine the variation in: quality parameters (D90, V100 and V150), dose–volume histograms (DVHs) and approach to PICT dosimetry between the centres.

The authors found there was significant variation in the prostate outlines drawn by the nine centres; for a prostate with mean volume 43 cm^3, the range was 39–57 cm^3 that led to variations of D90 of 119–154 Gy (mean 140 Gy) and V100 of 80–93% (mean of 88%). Using automatic seed-finder software reduced discrepancies between centres identifying seeds; overall consistency in seed location was good.

The authors conclude there was a significant uncertainty in the outlining of the prostate volume for PICT dosimetry with an uncertainty value of around ± 20 Gy on D90. PICT is a valuable technique but its accuracy and consistency limitations must be appreciated.

In the third article, Passi et al., undertake a dosimetric evaluation of the variation in applicator positions during interfraction high dose rate brachytherapy in carcinoma cervix. This study was designed to review the variations in different geometrical and dosimetric parameters. In this study, two groups comprised 21 and 28 patients, who were treated with 9.5 Gy $\times$ 2 Fx and 7.5 Gy $\times$ 3 Fx, respectively, using microselectron HDR remote control unit. All patients were analysed using orthogonal radiographs to evaluate variations in different parameters. Variations in different parameters are more in Group II patients than in Group I patients. Results of this study indicate that the variation in geometrical and dosimetrical parameters increases with increasing HDR number of fractions. Therefore, during reporting an outcome of multiple fractionation HDR treatment resultant dosimetric parameters must be evaluated.

In the next article, Aparpalvi, Mehta, Mutyala, Kuo, Hong and Kalnicki, investigate if inadequate dose to Point A necessitates treatment plan changes in a time of CT-image-guided brachytherapy treatment planning for cervix cancer. A total of 125 T&O insertions from 25 cervix patients treated were reviewed. CT-image-based treatment planning was performed for each insertion. Point A is identified and the dose documented, however, dose optimisation in each plan was based on covering target while limiting critical organ doses (PlanTarget). No attempts were made to equate prescription and Point A dose. For each insertion, a second hypothetical treatment plan was generated by prescribing dose to Point A (PlanPoint A). Plans were intercompared using DVH analyses.

A total of 250 treatment plans were analysed. For the study population, the median cumulative dose at Point A was 80 Gy (range 70–95) for PlanTarget compared to 84.25 Gy for PlanPoint A. Bladder and rectal doses were higher for PlanPoint A compared to PlanTarget ($p < 0.0001$). Target D90 did not correlate with Point A dose ($p = 0.60$). The authors conclude, depending on applicator geometry, tumour size and patient anatomy, Point A dose may vary in magnitude compared to prescription dose. Treatment plan modifications purely based on inadequate Point A dose are unnecessary, as these may result in higher OAR doses and not necessarily improve target coverage.

Thomson et al. report on the outcomes and late toxicity for a hypofractionated dose-escalated radiotherapy schedule in patients treated using intensity-modulated radiotherapy (IMRT) for localised prostate cancer. A total of 88 men with localised prostate cancer were treated with 57 Gy in 19 daily fractions over 4 weeks; 70/88 had high risk disease. Overall survival, cause-specific survival and biochemical progression-free survival (bPFS, Phoenix definition) were reported. Toxicity was measured retrospectively using RTOG criteria and assessed prospectively with a validated LENT/SOMA patient questionnaire. The results, at 5 years, overall survival was 84%, cause-specific survival 88% and bPFS 65%. In patients with high risk disease, 5-year bPFS was 62%. There was no RTOG toxicity above grade III. LENT/SOMA questionnaires were returned by 74% patients. Median scores for bowel and urinary function were <1. Maximum bowel and urinary toxicity scores ≥ 2 were reported by 64% and 59% of patients, respectively. The median score for sexual function was 1.5, but nearly all (96%) patients recorded a toxicity score ≥ 2 for at least one question.

The authors conclude that dose-escalated hypofractionated radiotherapy delivered using IMRT has promising outcomes and acceptable late toxicity. This fractionation schedule is being compared to conventional treatment within an ongoing multicentre phase III clinical trial.

Paper by Qi, Wu, Newman, Li and Hu, analyse interfraction setup using two different image guidance modalities for prostate and head-and-neck (H&N) cancer treatment. A total of 72 prostate and 60 H&N cancer patients, imaged with kilovoltage cone beam CT or megavoltage fan beam CT, were studied retrospectively. The daily displacements in mediolateral, craniocaudal and anteroposterior dimensions were investigated. The setup errors were calculated to determine the CTV-to-PTV margins. The authors conclude that in the absence of IGRT, the CTV-to-PTV margin determined using IGRT data may be varied for different imaging modalities for prostate and H&N irradiation.

In the next article, Ian Gleeson evaluates the effects of bladder and rectal contrast agents on radiotherapy planning of the prostate. The aim of this study was to evaluate the dosimetric effect of the presence of contrast on the monitor units, PTV, rectum and bladder. The prostate, seminal vesicles, rectum and bladder were contoured by a single observer on ten patients with bladder and rectal contrast. To evaluate the dosimetric effect of the presence of contrast, the density of the ten patients with contrast in the bladder and rectum was virtually changed to 1 g/cm^3. A four-field 15 MV conformal radiation therapy technique was applied in which DVHs and monitor units were compared using CT density and the 1 g/cm^3 density.

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The presence of contrast resulted in a 0.09% (<1MU) increase in anterior MUs and decrease of 1% (<1MU) in the posterior beam MUs. Lateral beams were not affected. The PTV and bladder dose increased slightly without contrast. The rectum showed a maximum change of 0.62% dose among the measured dose values. A maximum dose of 0.3 Gy at the 30% volume was also seen.

In conclusion, the dosimetric effect of bladder and rectal contrast agents on monitor units and dose to the PTV and OARs in using this technique was very small. This would not be clinically significant, but only if the extreme limits of dose–volume constraints were being reached.

The aim of the next study, by Taghi, Toossi, Ghorbani, Akbari, Sabet and Mehrpouyan, is simulation of 8, 12 and 14 MeV electrons from a Siemens Primus linac using MCNPX Monte Carlo code and verification of the results based on comparison of the results with the measured data. Electron mode for 8, 12 and 14 MeV electron energies of a Siemens Primus linac was simulated using MCNPX Monte Carlo code. Per cent depth dose data for 10×10, 15×15 and $25 \times 25\,cm^2$ applicators obtained from Monte Carlo simulations were compared with the corresponding measured data. Gamma index values were less than unity in most of points for all the above-mentioned energies and applicators. However, for $25 \times 25\,cm^2$ applicator in 8 MeV energy, $10 \times 10\,cm^2$ applicator and $15 \times 15\,cm^2$ applicator in 14 MeV energy, there were four data points with gamma indices higher than unity. However, among these data points, there are a number of cases with relatively large value of gamma index, these cases are positioned on the bremsstrahlung tail of the percentage depth dose curve, which is not normally used in treatment planning. There was good agreement between the results of Monte Carlo simulations developed in this study and the measured values.

The obtained simulation programs can be used in dosimetry of electron mode of Siemens Primus linac in the cases in which it is not easily feasible to perform experimental in-phantom measurements.

To complete this issue, Syed Akbar presents a technical note on the subject of oxygen in S phase of a cell cycle.

Professor Angela Duxbury

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