or by ultrasound, respectively. The planning algorithms convert iso-ionisation matrices into iso-energy dose matrices [Gy]. Corrections are performed for varying energy absorption, for altering SSDs, for asymmetric small angle electron scatter from the applicator wall as well as for lateral electron scatter within the irradiated volume.

Results: Individualized planning was done for patients with head and neck and rectal cancer, prolonging the IORT procedure by 2–4 minutes. In all cases, the graphical display of real dose distributions permitted the appropriate selection and mixing of beam energies. Monitor units were calculated in order to match the target volume with the prescribed dose.

Conclusions: Treatment planning for IORT can be done on time. Conformation and reliability of the applied doses are increased.

342 POSTER

Variation in dose distribution for breast radiotherapy: A trial based quality assurance programme in the UK

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Introduction: An integral part of the START (standardisation of breast radiotherapy) fractionation trial in the UK is a detailed QA programme implemented by a dedicated team. The team has visited thirty-one departments, which have indicated an interest in the START trial, to evaluate their breast radiotherapy techniques. Two 2D phantoms have been designed to measure the dose at points through the breast and chest wall. These measurements are compared to plans generated by the department.

Results: 12 different planning systems are used across the 31 centres, 8 are commercial and 4 locally designed. Various energies were used to treat the phantoms; 24 departments used 6 MV, 4 used 5 MV, 2 used 4 MV and 1 used cobalt. 15 departments applied a lung density correction. A variety of weighting and wedge combinations were used. Dose distributions fell into one of three patterns: 'hot spots' close to the breast surface, the chest wall or equal dose throughout. The mean measured dose at the reference point, for an expected dose of 4 GY using a linear accelerator, was 3.94 Gy (S.D. 0.04) and 3.91 (S.D. 0.07) for breast and chest wall phantom respectively. For Cobalt 60 mean results from 3 departments on the breast phantom were 3.83 (S.D. 0.03). The dose gradient between the apex of the breast and the lung surface was within the 10% required for the trial for 28 of the 31 departments.

Conclusion: Variations in planned distribution and reference doses have been demonstrated across 31 centres studied. In general, doses calculated by the planning system are slightly higher than those measured in the phantom.

343 POSTER

3D planning for tangential breast irradiation: Feasible and relevant?

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Purpose: to evaluate the practical use of CT scan for the simulation of the breast and the impact of 3D-planning on dose homogeneity.

Methods: 11 patients with early stage breast cancer were simulated using 2 tangential fields (arm position in 90° abduction). Using a simulator with CT option 3 CTslices were taken first in treatment position and then in a modified position (with the hand on the head) which permits passage through a conventional CT scanner. Finally a complete CT scan (1 cm slices) with this modified arm position was performed at the radiology departement. Different distances and angles on the central axis plane of these 3 modalities were compared to evaluate the effect of the arm position on breast configuration and treatment. The clinical target volume (breast) was outlined on the complete CT scan and virtually simulated. Different treatment plans, based on the central slice, on 3 slices and on all slices of the complete CT scan were made. The hotspot (>107%) on the total volume of the breast and the volume of the breast receiving less than 95% or more than 107% of a 50 Gy midline prescription, were calculated for each of these plans.

Results: Small differences in arm position appeared to have a limited effect on breast configuration. But comparison of the standard treatment plan based on 3 CT slices (simulator) with the treatment plan based on CT scan of the radiology departement showed an important impact on dose homogeneity. The second part of this study indicates that differences in "ICRU-treated" breast volume between planning based on 1 or 3 slices were minor. Only planning based on full CT resulted in an important amelioration of dose homogeneity and hotspot.

Conclusions: 3D planning for tangential breast treatment is feasible as long as the arm position does not change between simulation and CT planning. Planning on a complete CT scan results, even for small breast, in a more homogenous CTV dose distribution than planning on 1 or 3 slices.

344 PUBLICATION

Total body irradiation – Prospective evaluation of early side effects

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Purpose: Since 12/1997 total body irradiation (TBI) as part of conditioning therapy before BMT or PBSCT is provided in our clinic. We use the translation method established by Quast (Essen, Germany) where the patient is moved slowly through a radiation beam lying on a translation couch (focus-couch distance: 207 cm). We developed a detailed follow-up program in order to evaluate any early and late side effects according to Common Toxicity Criteria (CTC) (1997).

Methods: Until 01/99 hyperfractioned TBI (12.6 Gy, 2 × 1, 8 Gy/day, lung dose <10 Gy) was performed in 26 patients using a 6 MV photon beam (linear accelerator; dose rate: 1 Gy/min in 207 cm) (dose inhomogenity: <10%). Underlying diseases were ALL (n = 8), AML (n = 6), NHL (n = 10) and other (n = 2). Radiogen side effects were registered at day −7, day −4 before and day +90 after transplantation.

Results: We observed no toxicity grade III–IV at day −4 except of leucocytopenia (30%), thrombocytopenia (12%) and alopecia (76%). At day +90 the corresponding data were 6%, 26%, and 53%, respectively. Other side effects often observed (toxicity grade I–II; day −4/day +90) were nausea (65%/6%), skin erythema/dry desquamation (46%/33%), mucositis (30%/26%), vomiting (26%/6%), xerostomia (26%/46%), loss of appetite (26%/13%), headache (20%/0%), and diarrhea (0%/20%).

Conclusion: We present our first prospectively evaluated data demonstrating that TBI under translation condition is securely feasible and that toxicities grade III–IV are seldom observed at day −4 and day +90 after BMT or PBSCT.

345 PUBLICATION

Is the vaginal rod an accurate method to localise the vaginal apex?

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Purpose: To determine the accuracy of the radiopaque vaginal rod method in localisation of the vaginal apex, compared with contrast vaginography.

Methods: Twelve patients, who needed pelvic radiotherapy, were studied on the simulator. Each patient had AP and lateral X-rays using contrast in the vagina, with and without the rod positioned against the apex of the vagina. The contrast medium was a Diatrizoic acid 50% vaginal gel developed by two of the authors (TjW and AvS). The hypothesis was that the anatomical position of the vagina, displayed using vaginography, was changed by the rod. On the X-rays the distance from the top of the rod to the apex in anatomical position was measured in mm in the craniocaudal and dorsoventral direction and called the inaccuracy (of the rod method). The resulting total inaccuracy in the sagittal plane was calculated using Pythagoras' law. Furthermore, the size of the vaginal vault was measured in the transversal plane, using the contrast vaginography.

Results: The inaccuracy ranged from 0 to 19 mm in the craniocaudal direction (median 9 mm) and from 0 to 22 mm in the dorsoventral direction (mediam 7 mm). The resulting total inaccuracy in the sagittal plane ranged from 6 to 22 mm (median 14 mm). The maximal width of the vagina measured on the AP film ranged from 32 to 68 mm (mediam 40 mm); measured on the lateral films it ranged from 5 to 17 mm (median 10 mm).

Conclusion: The distance from the top of the vaginal rod to the apex of the vagina in anatomical position varies from 6 to 22 mm; therefore the rod is an inaccurate method to localise the vaginal apex. Furthermore the rod gives no information on the actual size of the vaginal vault. Contrast vaginography is the method of choice to localise the vagina.