radiation in medicine, (b) the elaboration of the model, standards and recommendations for Quality Management System (QMS) in radiotherapy based on the experience of Great Poland Cancer Centre.
Materials and Methods: The comparison analysis of EU and Polish acts of law issued in years 1980–2006. For the elaboration of QMS in radiotherapy, the universal industrial ISO norm 9001:2000, referring to quality management system was used. Recommendations of this norm were completed with detailed quality standards based on authors' work experience, the review of articles on quality assurance and quality control standards for radiotherapy published between 1984–2006 and the review of current recommendations and guidelines of American, International, European and National bodies (societies, agencies etc). for quality assurance in radiotherapy.
Results: As a result of the comparison analysis of selected documents: (I) the level of transposition of EU law into the Polish law was verified and several phases of implementation were observed. (II) The original model of QMS in radiotherapy with the package of 352 quality standards in radiotherapy: organizational, physical-technical and clinical, documentation for QMS and detailed instruction for implementation of QMS in hospitals were elaborated.
Conclusions: The national mandatory regulations regarding quality management in radiotherapy were elaborated mostly due to: continuing transposition of EU law into the Polish law and the irradiation accident in Bialystok in 2001. The elaborated QMS in radiotherapy, can be used in any institution using ionizing radiation for medical procedures, and its implementation, as it was done in Great Poland Cancer Centre could be the first step for the improvement of the organization of work in radiotherapy due to (i) the improvement of safety conditions, (ii) optimization of treatment through the identification of processes and the relation between them, and identification of resources essential for the correct realization of these processes, (iii) decrease of the risk of radiation accidents and incidents, (iv) establishment of clear organizational structures in the hospital.

934 POSTER

Cone beam CT (CBCT) for breast-planning: reliability and quality

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Introduction: Cone Beam CT (CBCT) can be used for Target delineation and planning, image guided radiotherapy and adaptive treatment planning. Systematic and ad random errors can be avoided. But, soft tissue contrast is inferior compared to a classic CT scan (CCT).
Purpose: 1. Is breast-planning on a CBCT reliable? 2. Has respiration a significant impact on soft tissue contrast?
Methods and Materials: 1. When implementing CBCT in clinic, 10 patients had both a CCT and a CBCT. We compared 13 plans: photon tangential breast plans (n = 3); photon and electron parasternal plans (n = 10). Comparison was done by measurement of differences in MU and in equivalent path length (EPL) (= corresponding length in a density equal to water). Planning was based on a Pencil Beam Algorithm. 2. During simulation, the movement of the sternum was quantified by the Varian RPM system (n = 62). The EPL was measured on a parasternal plan. We tested the hypothesis of a correlation between large amplitudes in movement of the sternal bone due to respiration and large differences in EPL.
Results: 1. EPL is significantly shorter for CBCT compared to CCT ($p < 0.0001$), which means that the density of the CBCT is consistently less than for the CT scan. For breast planning with photons, this results in a statistically significant ($p = 0.002$), but clinically acceptable (<2%) difference in MU between CBCT and CCT. For electrons, larger differences were seen. 2. We found no correlation between respiration movement and EPL.
Conclusions: 1. We can conclude that CBCT is a reliable tool for breast planning with photons. For electrons, it appears to be less reliable. 2. Soft tissue contrast on CBCT might be influenced by respiration movement, but with the method used, we could not detect a correlation.

935 POSTER

IGRT with helical tomotherapy – experiences of the first 8 months in Heidelberg

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Background: Helical tomotherapy was introduced into clinical routine at the department of radiation oncology in the University hospital of Heidelberg in July 2006. This report is intended to describe the experience of the first 123 patients treated with this new for of intensity modulated image guided radiotherapy. Patient selection, time effort, handling of daily image guidance with megavoltage CT and quality of radiation plans shall be assessed.
Materials and Methods: Between July 2006 and February 2007 123 patients were treated with helical tomotherapy in the University hospital of Heidelberg. This very heterogenous group of patients was composed of the following tumor entities: head-and-neck tumors (n = 24), prostate cancer (n = 19), gastrointestinal tumors (n = 20), breast cancer (n = 13), multiple metastases (n = 11), spinal reirradiation (n = 7), thoracic tumors (other than lung) (n = 6), radiosurgery (n = 5), malignant pleural mesothelioma (n = 5), sarcoma (n = 4), lung cancer (n = 3), whole abdominal irradiation for ovarian cancer (n = 3), skin malignancies (n = 2), craniospinal axis treatment (n = 1). In 98% of the fractions a pretreatment megavoltage ct scan was performed. After matching with the kilovoltage planning ct scan corrections for translations and roll were done.
Results: Helical tomotherapy was able to treat very small, very big or multiple targets. Image-guidance with MV-CT allowed precise position correction and hereby safe treatment application even if patients could not be properly immobilized due to obesity, pain, claustrophobia or neurological impairment. For the described tumor entities average time on table was 24.6 minutes, average treatment time 10.6 minutes. Excellent dose distributions with homogeneous target coverage and sparing of organs at risk could be achieved for all the described tumors.
Conclusions: Helical tomotherapy and daily image-guidance with megavoltage ct could be introduced fast and successfully into daily clinical routine. This method is suited to treat standard IMRT cases or patients with very big and complex shaped targets.

936 POSTER

Tomotherapy for prostate cancer – comparison of dose distribution with linac-based IMRT planning and inter- and intra-fraction prostate motions

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Background: With tomotherapy, intensity-modulated radiation therapy (IMRT) and image-guided radiotherapy can be performed readily. In the present study, we compared dose distribution of tomotherapy planning for prostate cancer with linac-based planning and evaluated prostate motion between daily fractions and during treatment.
Patients and Methods: We made linac-based IMRT planning for 15 MV X rays using Pinnacle3 and tomotherapy planning in 13 patients. We then compared dose distribution and dose-volume histogram for PTV, rectum, bladder and femoral heads between the two plans. We measured interfraction prostate motions from distance between a couch position adjusted based on bony structures and that adjusted based on prostate contour in 21 patients (701 fractions). All patients were fixed using a body frame which was fixed to the couch during treatment. Interfraction prostate motions were measured from both the position at the first fraction and the average position. We took megavoltage (MV) CT also after treatment for initial 5 fractions of treatment, and we evaluated intrafraction prostate motions by comparing MVCT images before and after treatment in 21 patients (105 fractions).
Results: Dose distributions of tomotherapy plans were superior to linac-based IMRT plans for many constructions (PTV, rectum and femoral heads). Average (+ SD) interfraction prostate motions were 0.7 ± 0.6 mm in right-left (RL) direction, 1.6 ± 1.6 mm in superior-inferior (SI) direction and 2.3 ± 1.9 mm in anterior-posterior (AP) direction from the prostate position at the first fraction. They were 0.6 ± 0.6 mm in RL direction, 1.3 ± 1.2 mm in SI direction and 1.6 ± 1.5 mm in AP direction from the average position. Intrafraction prostate motions were 0.3 ± 0.6 mm in RL direction, 0.2 ± 0.6 mm in SI direction and 1.4 ± 1.8 mm in AP direction.
Conclusions: IMRT planning using tomotherapy seems to more readily produce an optimal plan than linac-based IMRT planning. Interfraction prostate motions were largest in AP direction and smallest in RL direction. Intrafraction prostate motions were largest in AP direction and relatively small in both RL and SI directions. Based on this study, we are planning to reduce internal margins in both RL and SI directions in order to reduce adverse effects on the rectum and bladder.

937 POSTER

A study on the optimization of beam direction and virtual organ delineation to minimize radiation pneumonitis in the intensity modulated radiotherapy of lung cancer

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Background: This study introduces an intensity modulated radiotherapy (IMRT) process in lung cancer patients and evaluates the utility of intensity