intraoperative US was done, there was one uterine perforation (14%) and six proper applications (86%).There was no statistical difference (Fisher's test = 1).

Conclusions: Real-time US guiding for cervical cancer brachytherapy decreased proportion of uterine perforation. A larger study would be needed to bring out a statistical difference. For our daily practice, we now use systematically US imaging during cervical cancer brachytherapy procedure.

EP-1279

Non coplanar positioning evaluation on stereotactic cranial treatments with a TrueBeam On Board Imaging.

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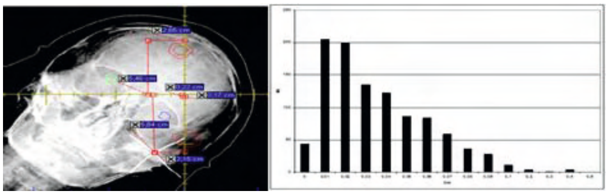
Purpose/Objective: Cranial stereotactic treatments are planned with Volumetric Arctherapy (VMAT) and delivered with an accelerator TrueBeam (STX-HD) / Varian. Several arcs are defined with three iscocentric treatment table rotations. The images used to control the positioning are obtained only with the KV imager OBI (On Board Imaging). The accelerator room does not contain any additional in-room imagers. Each table rotation is validated with specific planar KV images.

Materials and Methods: The patient positioning is assessed with the help of a CB-CTcompared to the reference treatment planning CT. An automatic table displacement is performed when set-up errors appear. This position being defined as a reference; two additional anterior and posterior planar images are performed.Three markers are placed on the tabletop (MT), on the mask at the front isocenter projection (MI) and on the patient's skin (MP) through a hole above an orbit. Positions of the 3 markers in the orthonormal coordinate system are recorded (L-R and H-F directions). The markers positions are then compared to those measured at the other treatment table rotations. The A-P table position is measured and recorded for all table rotations.

Results: The A-P table position measurements are within 1 mm.

The evaluation involved 1094 measurements of 360 images and 15 different sessions. The images comparison is carried out for three markers in the two orthogonal directions. The measurement error, due to the use of a graphic rule, is estimated to be 0.2 mm.The evaluation is performed for each marker (MT, MI, MP). The maximum deviation is, respectively, 0.9, 0.9, 4.2 mm. The average deviation is, respectively, 0.4, 0.3, 0.4 mm. The standard deviation is, respectively, 0.3, 0.2, 0.5 mm.



Conclusions: Knowing that no additional in-room imagers are used, comparing the position of every marker between the images obtained at table rotations, relative to the reference position, ensures the traceability of each non-coplanar position. The three markers provide additional information on the three elements (table, patient, mask) related to the target. The results are consistent with the mechanical precision of the TrueBeam accelerator and its treatment table. We finally validate the safety margin PTV set to 3mm.

EP-1280

A surface imaging system for setup verification of radiotherapy treatments in pelvic and thoracic regions.

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Purpose/Objective: In radiotherapy treatment, most of the setup verification systems, as portal imaging device or cone beam computed tomography (CBCT), use ionizing radiation. These systems give an additional dose of radiation to patients and this can be an issue for use on daily basis. A completely different approach is achieved by surface imaging systems which compare the external body surface acquired with an optical system with another of reference. The absence of any additional radiation exposure make surface systems an interesting solution for daily repositioning checks. The aim of this work is to investigate the performances of Sentinel, a laser/camera surface imaging system, when used on patients. The system accuracy was evaluated comparing registrations results from concurrent Sentinel and CBCT acquisitions of patients being treated in the thorax or pelvic regions. System employment conditions and patient setup procedures that provide more accurate results are also reported.

Materials and Methods: The system was tested on two groups of patients. In first group 11 patients were treated in thorax and 22 in pelvic regions. No changes to the usual setup procedures and a surface extension limited to the treated region was considered for patients of the first group. For the second group 6 patients were treated for cancer in the pelvic region and 8 in the thorax region. For this group the reproducibilityof external body surfaces was optimized and a wider surface was captured. All patients were CT scanned using a Philips Brilliance Big Bore with 3mm slice thickness. As reference external body surfaces extracted from planning CT studies were used. For the second group also surface data captured by Sentinel system at the first treatment was employed. All patients were treated using an Elekta Synergy® beam modulator Linac equipped with an HexaPODRT CouchTop and an XVI CBCT. In all the considered cases the system accuracy was evaluated comparing registrations results from concurrent Sentinel and CBCT acquisitions.

Results: Better performances were observed for the second group of patients. Mean absolute differences between CBCT and Sentinel registration results were less than 2.7 mm and 0.9° and 2.8 mm and 1° for thorax and pelvis respectively. No advantage in considering surface data captured by Sentinel as a reference instead of the surface extracted from the planning CT was observed. For the first patient group mean absolute differences between CBCT and Sentinel were less than 3.5mm and 2.1° and 3.7mm and 1.3° for thorax and pelvis, respectively. For a small percentage of the considered cases,differences of up to 8mm between CBCT and Sentinel were obtained.

Conclusions: The accuracy of Sentinel system is influenced by the extension and reliability of the surface used. No advantage in considering a Sentinel acquisition as reference was observed. Differences between CBCT and Sentinel registration parameters resulted less than 6 mm and 2° in the 90% of the pelvis and thorax considered cases.

EP-1281

Tumor-based positioning protocol in helical treatment for moving bronchial tumors: a phantom validation study.

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Purpose/Objective: Tomotherapy integrates a slow MV-CT scanner that can partly render tumor motion. In terms of density distribution, it bears some similarity with the averaged kV-CT, reconstructed from the planning 4D-CT without binning. We used this similarity to validate a tumor-based correction protocol for helical treatment of bronchial tumors.

Materials and Methods: MV-CT and 4D-CT of a sphere placed on the BrainLab moving platform and an anthropomorphic phantom (Dynamic Thorax Phantom,Model 008A, CIRS, Norfolk, VA) were acquired. These acquisitions were performed with various motion amplitudes (10, 15, 20 and 30 mm), directions (cranial-caudal (CC) and left-right (LR)) and periods (3, 4, 5 and 6 s). For each acquisition, the averaged kV-CT was reconstructed from 4D-CT data without binning and rigidly registered with the corresponding MV-CT. Different kV-MV registration on a region of interest strategies have been assessed, using as a metric either (1) the sum of squared voxel intensity differences (SSD-IR), (2) the normalized correlation (NC-IR), registration of the centres of mass estimated from either (3) voxel intensity distribution (VI-CM) or (4) masks delineated witha threshold-based method on MV-CT and the internal target volume on averaged kV-CT (M-CM). The registration between the static positions of the phantom on kV- and MV-CT was used as a reference to compute the residual registration errors of the various motion scenarios.

Results: Considering only motions with amplitude of 20 mm, period of 4, 5 and 6 s, in LR and CC direction, our preliminary results indicates that the NC-IR strategy leads to the smallest error, i.e., 1.5±1.4 mm (mean±1SD), although no statistically significant differences were observed for this registration method compared to the others (p-values of 0.35, 0.24 et 0.17 compared to (1), (3) and (4) respectively). Target motion parameters causing resonance effects with the gantry