Conclusion: When using KV-CBCT for set-up verification in stereotactic treatment a large inter-observer variability can be seen in a significant proportion of scans, particularly in extracranial treatment. Such a difference may have an impact on target coverage or organ at risk irradiation, thus requiring a proper margin. Further evaluation is needed, particularly focusing on methods to decrease such inter-observer variability.

EP-2112
Intrafraction setup errors in single fraction stereotactic radiosurgery with Elekta Fraxion system
W. Vásquez Rivas1, J. Luna Tirado1, M. Rincón Pérez2, D. Esteban Moreno3, A. Ilundain Idoate4, A. Pérez Casas5, M. García-Castejón6, J. Olivera Vegas7, I. Prieto Muñoz7, J. Yara Santos7
1Hospital Universitario Fundación Jiménez Díaz, Oncología Radioterápica, Madrid, Spain
2Hospital Universitario Fundación Jiménez Díaz, Oncología Radioterápica, Madrid, Spain

Purpose or Objective: Frame-based stereotactic radiosurgery (SRS) using rigid immobilization with head ring continues to be the standard treatment when it comes to intracranial SRS. We wanted to assess setup accuracy and intrafraction errors of patients treated with single fraction intracranial stereotactic radiosurgery using the Elekta Fraxion® immobilization system (Frameless SRS) and HexaPOD® positioning platform (translational and rotational set up error).

Material and Methods: 5 patients with a diagnosis of brain metastases were treated with single fraction frameless stereotactic radiosurgery (SRS) at our institution between April 2015 and September 2015. Patients were initially immobilized using Fraxion® immobilization system (Fraxion comprises a head frame with a mouth-bite, thermoplastic mask and vacuum occipital cushions) and HexaPOD couch platform (HexaPOD™ is a robotic patient positioning platform providing six degrees of positioning freedom). Cone-Beam computed tomography (CBCT) were acquired before and after treatment to assess for intrafraction set up errors. Translational and rotational set up errors were obtained in Right/Left (R.L.), Postero/Anterior (P.A.), Inferior/Superior (I.S.) directions. Means and one standard deviation of the intrafractional errors in all six directions were analyzed.

Results: A total of 10 images were analyzed. A summary of the means and one standard deviation of the intrafractional errors (in mm for translation and degrees for rotation) were 0.01 ± 0.10 (RL), 0.00 ± 0.20 (PA), 0.04 ± 0.10 (IS), -0.76 ± 0.80 (RL rot.), -0.02 ± 0.81 (PA rot), 0.58 ± 0.97 (IS rot). All of the patients were within the intrafractional errors described as for frame-based SRS.

Conclusion: Single fraction intracranial stereotactic radiosurgery utilizing frameless immobilization system like Elekta Fraxion® and HexaPOD® platform it’s a secure, precise and reproducible technique. Comparable results with Frame-based SRS were obtained, keeping between 1 mm and 1 degree margin range.

EP-2113
Clinical implementation of an optical surface monitoring system (OSMS®) in breast irradiation
A. Tiní1, I. Pytko1, S. Lang1, C. Winter1, M. Guckenberger1, C. Linsenmeier1
1University Hospital Zürich, Department of Radiation Oncology, Zurich, Switzerland

Purpose or Objective: The optical surface monitoring system (OSMS®) was implemented in our clinic to improve our daily radiation therapy workflow, to avoid frequent repositioning and unnecessary skin marks on breast cancer patients.

Material and Methods: 6 breast cancer patients were positioned with OSMS® and the set-up was then compared with MV imaging. The patients were treated using 3D tangential fields with free breathing and were positioned on the breast board. The OSMS cameras acquired the patient’s positioning in 2D and a computer algorithm reconstructed the image in 3D. Prior to that, the patient’s reference surface was imported from the planning CT scan and the region of interest within the treated area was selected. For the positioning with OSMS® the breast, hips and part of the upper arm on the treated side were used as a region of interest (ROI). After aligning the patient, MV imaging and bone match on the chest wall was used to correct for positioning error. 2 patients were aligned according to the CT skin reference marks prior to positioning with OSMS®. The other 4 patients were directly set up with OSMS. We compared this data with previously collected data on the difference between positioning, based on the skin marks of the patient using a laser system and MV imaging.

Results: The most suitable ROI was found to be the irradiated breast itself, excluding the shoulder and clavicular region, but including a 2 cm margin of chest wall surrounding the breast. Positioning based on OSMS® was in good agreement with the positioning based on MV imaging. The mean deviation between the two techniques was 1.3 +/- 1.6 mm, 1.3 +/- 1.8mm and 0.8 +/- 0.8mm in vertical, longitudinal and lateral directions for the all 6 patients. This was superior to positioning based on patient skin marks alone (1.4 +/- 1.4, 1.8 +/- 2.8 and 1.7 +/- 1.1 mm). The corrections of patient rotations were difficult to perform with OSMS®. Out of 112 treated fractions, 15 fractions showed on the MV image a rotation which was out of clinical tolerance and the patients had to be repositioned.

Conclusion: According to our preliminary data-patient positioning based on OSMS® is easy, time efficient and reproducible. Additionally, patient skin marks can be avoided. More data will be collected to confirm these findings. In the future we plan to use the OSMS® system for deep inspiration breath hold techniques and the set-up of extremities and bolus.

EP-2114
3D-Transabdominal Ultrasound and ConeBeam-CT: comparison of prostate positioning
A. Boschetti1, S. Bartocci2, C. Fiandra1, A. Guarneri2, C. Cavallini2, F. Arcadipane1, E. Trino1, M. Levis1, R. Ragona1, U. Ricardi2
1Università di Torino, oncology, Torino, Italy
2Città della salute e della scienza, Radiotherapy, Torino, Italy

Purpose or Objective: External beam radiotherapy (EBRT) is a mainstay therapeutic option for prostate cancer and hypofractionated schedules were proposed as a suitable approach. Image guidance procedures are strongly needed to provide adequate accuracy precision, minimize geometric uncertainties and further diminishing unintended normal tissue irradiation. The Elekta ClaritiTM platform allows the acquisition of three-dimensional ultrasound scans (3DUS) of the pelvic regions to perform image-guided radiotherapy. In our department, 3DUS is the reference IGRT modality and is used into daily clinical practice for prostate cancer radiotherapy (since from 2009) with optimal clinical results in terms of biochemical control and a good toxicity profile on 160 patients. Moreover 3DUS is a non invasive method with avoidance of extra radiation. In this study 3DUS was compared to grey-based positioning in kilovoltage Cone-Beam Computed Tomography (CBCT) during radiotherapy sessions.

Material and Methods: 10 patients affected with organ-confined prostate cancer were included. All patients should have a reliable ultrason visualization of the prostate gland within the Clarity Platform. All patients received 61.1 Gy/26 fractions to the prostate gland and seminal vesicles and 70.2 Gy/26 fractions to the only prostate gland. The prostate positioning was controlled by 3DUS and CBCT. Patients were aligned to skin marks before all of the 26 treatment sessions. Control of the remaining inter-fractional setup error by 3DUS was successfully employed 147 times. During the
remainder of fractions, insufficient bladder filling and patient movement were the most frequent obstacles to 3DUS. In total, 210 3DUS scans were compared to CBCT.

Results: The average differences in the anterior-posterior (AP), superior-inferior (SI) and lateral (LL) directions from CBCT were 0.25±0.53 cm, -0.08±0.52 cm, -0.16±0.57 cm for AP, SI and LL directions from CBCT. Student’s t-test was used to test the difference between this US modality against CBCT and the distribution of the differences is reported in Figure 1.

Conclusion: Based on the obtained results, significant differences with CBCT were found in all directions. However the average difference in all directions is always less than 3 mm in all directions. Differences greater than 1 cm were observed in the AP direction (5%) showing that CBCT imaging modality is not safely interchangeable with 3DUS.

EP-2115 Breast radiotherapy: comparation of set up error using All In One system and dedicated breast board

V. Manestar1, V. Karadža1
1Clinical Hospital Center Zagreb Rebro Hospital, Clinic for Oncology and Radiotherapy, Zagreb, Croatia

Purpose or Objective: The aim of this study was to determine whether proper selection of fixation equipment has positive effect on the reduction of setup error for breast radiotherapy.

Material and Methods: The study has been performed on 10 breast cancer patients positioned on All In One system, and 10 patients treated using dedicated breast board. Selected patients represent average breast cancer patients. Patients with special setup needed, were excluded. (eg. patients with reduced arm mobility, patients with large contra lateral breast etc.). On both fixation systems the same setup protocol was used. Imaging and setup correction were performed on fractions 1, 2, 3, 8, 13, and every 5th further fraction. All the correction data were written in specially prepared forms. All the data collected were entered in excel worksheet, and further analyzed.

Results: The results showed that All In One system had standard deviation of set up error 0.31 cm in sagital axis, 0.3 cm in longitudinal axis, and 0.36 cm in coronal axis. Compare to that, standard deviations of setup error for dedicated breast board were: 0.28 cm in sagital axis, 0.24 cm in longitudinal axis, and 0.24 cm in coronal axis.

Conclusion: The result showed that usage of dedicated breast board offers better setup precision, especially in coronal axis. This can be due to more rigid construction of dedicated breast board, compare to foamy structure of All In One system. However, this difference is not so big to completely exclude usage of All In One system, especially in situations where his comparative advantages makes him a fixation of choice. Also, this was relatively small sample of patients, so further study should be performed.

EP-2116 Optimization of whole breast irradiation setup: comparison between two different positioning systems

E. Sanfilippo1, C. Galeotti1, P. Cornacchione2, Y. Wandael1, A. Nacca1, M. Morroni1, B. Onorati1, D. Gresto1, P. Bonomo1, N. Grocca1, R. D’Angelillo2, S. Ramella1, I. Meattini1, L. Livi1
1University of Florence, Scienze Biomediche Sperimentali e Cliniche, Florence, Italy
2Università Campus Bio-Medico, Radiation Oncology Unit, Rome, Italy

Purpose or Objective: A precise and reproducible patients’ setup, within established thresholds, may lead to a reduction of time spending in breast radiotherapy treatment positioning, and highly precision in targets irradiation, sparing organs at risk (OAR). The aim of this study is to compare two different breast positioning systems.

Material and Methods: Overall 278 portal images film were analyzed with EPID system, for a total of 40 female patients treated with tangential fields breast RT. EPID acquisitions were made in two different Italian University Centers. Twenty patients were treated with a supine positioning on a 12.5 degrees inclined breast board, while 20 patients were treated with supine positioning using a wing board. Each EPID imaging couple were acquired weekly using medial and lateral tangential fields. Images were newly acquired in case of 5 mm error shift. The EPID images were subsequently compared to the referring DRR, using the three spatial axes: X (lateral), Y (longitudinal), and Z (vertical). The systematic and random errors of the two different studied groups were then calculated.

Results: Breast board system showed a systematic error of ∑1.41 mm on the X, 2.23 mm on the Y, and 1.69 mm on the Z axis; the median random error was 0.3 mm, 0.46 mm and 0.36 mm, respectively. Concerning the wing board system, the systematic errors were ∑1.34 mm on the X, 3.12 mm on the Y, and 2.68 mm on the Z axis; with random errors of 0.63 mm, 0.6 mm, and 0.53 mm, respectively. Assuming as acceptable the shift with a maximum threshold of 5 mm, it was possible to calculate the probability of setup accuracy. It was 99% on the X, 94% on the Y, and 97% on the Z axis, using the breast board setup; while it was 91%, 86%, and 88% using the wing board system.

Conclusion: Since the small sample series, these data should be interpret with caution. Preliminary results of our analyses showed an high accuracy sensitivity for both setup approach. However a better accuracy in favor of the breast board positioning system was shown.

EP-2117 Is Rotational shifts necessary in SBRT? A geometric analysis using a 6-degree of freedom(6-DoF)couch

A.R. Aliotto1, S. Chiesa1, S. Menna1, L. Azario2, M. Massaccesi1, F. Greco2, M. Ferro3, V. Frascino1, M. Baldacci1, V. Valentini1
1Università Cattolica del Sacro Cuore, Radiation Oncology Department- Gemelli-ART, Rome, Italy
2Università Cattolica del Sacro Cuore, Physics Institute & Operative Unit of Medical Physics, Rome, Italy

Purpose or Objective: To study the relevance of rotational shifts using 6DoF robotic couch in patients treated with stereotactic body radiation therapy(SBRT)to improve setup accuracy.

Material and Methods: Patients affected by primary or metastatic lung tumours with a diameter until 5 cm were enrolled to SBRT. Breast board(CIVCO support system) was used for set-up of supine patient in all phases of treatment. Gross target volume was defined by a radiation oncologist on 4D TC scan. Treatment planning was carried out with Eclipse™ Treatment Planning Systems (Varian Medical System®, Palo Alto, CA) and Volumetric arc therapy was used. Total dose was prescribed on the basis of tumours position and dimensions: 42 Gy in three fractions, for lesions with diameter smaller than 3 cm, or 50 Gy in five fractions, for lesions between 3 and 5 cm. Daily Cone Beam Computed Tomography(CBCT) was performed before dose delivery. Then images were compared with CT scan for radiotherapy planning(automatic and manual 3D-3D match) in order to determine the magnitude of set up error and organ motion: translational(Lateral, Vertical and Longitudinal) and rotational(Pitch, Yaw and Roll) shifts were identified(Varian 6D Online Review System). The collected shifts were applied