AbstractID: 9315 Title: Verification of the rotational accuracy of the Brainlab Robotics 6D couch and the ExacTrac X-ray 6D fusion System

Purpose: The Brainlab's Robotics 6D couch is integrated with ExacTrac X-ray 6D system to compensate the rotational deviations in patient positioning. The purpose of this study is to quantitatively demonstrate the magnitude of improving the rotational accuracy by the 6D system

Method and Materials: Two tests were conducted. A self-made tool was first used to verify that the rotation angles given by the ExacTrac matched with the actual rotation angles measured by geometry calculation and a level. A wedge was used to raise one side of the test tool for various rotational angles. A Rando head phantom with four BBs implanted was used for the second test. One BB was at the isocenter, with two others 5cm laterally, and the fourth 5cm superior. The relative rotational angles of each BB to the isocenter were calculated from CT images. The phantom was randomly setup within 5^{o} rotations. Portal films were taken after each Robotics 6D couch corrections. BBs positions in the portal films were measured and the rotations were calculated and compared with that in the simulation.

Results: The difference between the results determined by X-ray 6D fusions and actual angels for various setups were $0.113^{o}\pm0.06^{o}$ and $0.05^{o}\pm0.09^{o}$, according to level measurement or geometry calculation, respectively, for the pitch direction. The corresponding differences were $0.23^{o}\pm0.09^{o}$ and $0.08^{o}\pm0.09^{o}$ for the roll. After the Robotics 6D couch correction, the actual rotation was $0.03^{o}\pm0.05^{o}$. and $0.13^{o}\pm0.04^{o}$ for the pitch and roll directions. For the second test, the final setup rotation angles compared with the Simulations were $0.42^{o}\pm0.24^{o}$, $0.30^{o}\pm0.16^{o}$ and $0.06^{o}\pm0.02^{o}$ for pitch, roll and yaw rotations, respectively.

Conclusion: The study demonstrated that the rotational accuracy was in the acceptable limit to use in the clinic. This has a great potential to improve the clinical targeting accuracy of radiosurgery. .