AbstractID: 13097 Title: Comparison of Positional Accuracy for kVkV, kVMV, and CBCT OBI for Cranial Localization

Purpose: To quantify and compare the positional accuracy and precision of an OBI device for use as a localization system for cranial alignment. Quantification of these errors will allow for discussion of the efficacy of OBI as a replacement for invasive head ring systems.

Methods and Materials: A 6.5mm BB is placed in an anthropomorphic head phantom at five positions located throughout the head. A treatment planning CT is taken and a simple plan and DRR's are generated to precisely define the isocenter. The phantom is then aligned to isocenter using a traditional three-point setup and kVkV, kVMV, and CBCT images are acquired. These images are then auto-fused with either setup DRR's (kVkV & kVMV) or with the planning CT (CBCT). Shifts are applied and 2x2cm port films are taken. Measurement of the displacement of the BB from the center of the field in each direction (A-P, LAT, Sup-Inf) indicate residual systematic error.

Results: Results for displacement in the A-P, Sup-Inf, and Lat directions are *-1.3±0.7mm* (*1.5mm* RMS), *0.1±0.8mm* (*0.8mm* RMS), and *0.2±1.1mm* (*1.1mm* RMS) for 2D2D kVkV fusion; *-1.5±0.7mm* (*1.7mm* RMS), *0.7±0.8mm* (*1.1mm* RMS), *0.0±1.2mm* (*1.2mm* RMS) for 2D2D kVMV fusion; and *-1.5±0.5mm* (*1.6mm* RMS), *0.1±0.7mm* (*0.7mm* RMS), and *0.2±0.9mm* (*0.9mm* RMS) for 3D3D CBCT fusion. For each technique positive values indicate the BB is displaced in the anterior, superior, or patient left direction. The average magnitude of the total displacement from isocenter is *1.3±0.6mm*, *1.7±0.5mm*, and *1.6±0.3mm* for kVkV, kVMV, and CBCT respectively.

Conclusion: We have shown that OBI imaging can place the target at isocenter with millimeter accuracy in all directions and for each technique. A large ≥ 1.5mm systematic error is present in the posterior direction for each technique. Further investigation is ongoing to isolate the cause of this error.