AbstractID: 8376 Title: Interactive medullobalstoma patient setup with real-time surface imaging

Purpose: To explore the use of real-time surface imaging technologies for interactive non-invasive head setup in craniospinal irradiation.
Method and Materials: A real-time surface imaging system was installed in a treatment room at our proton therapy center. The system provides surface motion monitoring up to 10 frames per second. Real-time deltas of patient misalignments can be displayed at the same frame rate. Phantom and patient studies were performed to investigate the feasibility of surface imaging based interactive setup, relying on the real-time deltas graphic interface. Interactive setup on a head phantom was carried out by multiple users, with offline evaluation of residual shifts/rotations. Patient studies were focused on checking surface visibility in two adult subjects.
Results: As for translational misalignments, all users were able to reposition the head phantom within tolerance. Rotations turned out to be more critical, with residual values slightly above the threshold. Pre-alignment with lasers is recommended to achieve better performance. Translational misalignments can be handled more efficiently when relying on the treatment couch console to apply the displayed deltas. Patient studies revealed that, when the viewing angle is not obstructed, visibility in the neck and lower head region is satisfactory: blank areas in the 3D surface image occur where thick hair is in place. Average surface reproducibility, compared to the treatment planning CT scan, was found to be within 3 mm. Breathing motion in one patient was quantified in less than 1.5 mm.
Conclusion: Interactive head setup relying on real-time surface imaging is feasible. Residual alignment errors can be kept within tolerance even by naive users by relying on a real-time display of measured misalignments. The application in medulloblastoma patient setup can potentially reduce imaging dose and the time needed for patient alignment, providing valuable tools for intra-session monitoring of patient positioning and breathing during treatment.