

AbstractID: 3885 Title: High Precision Mask Based Patient Positioning System

Purpose: Island mask with infrared (IR) markers is designed for camera based high precision patient positioning system. This system is suitable to monitor head and neck IMRT, edentulous and pediatric patients' inter-fractional and intra-fractional movement where current industrial standard bite plate system is not able to apply on the above described patients.

Method and Materials: Thermoplastic and Styrofoam are used to make an island mask with the following procedures: First, cut the thermoplastic into a predefined template shape; Styrofoam cut into wedge shape with 1 inch in height and has area at least $9 \times 9 \text{cm}^2$ for supporting five IR markers. Second, put the upper portion of template between philtrum and forehead and wrap the lower portion of template around with the Styrofoam wedge in it. Third, make two ear straps to fix the mask through the ears. Exactrac (BrainLAB Inc.) IR camera system is used for this study. The positioning reproducibility of mask system is examined against the bite plate system. The shrinkage of mask and optimal position of placing IR markers are also assessed.

Results: The shrinkage of mask is within 1 mm and become stable 30 minutes after the mask has been cooled down. The positioning reproducibility of individual marker is worse for the marker located near the peripheral of the mask, and also symmetric pattern of markers is not allowed due to the "ambiguity" of the IR camera system. Therefore, the pattern of markers is an irregular shape and markers are located at the flat platform near the center of the mask. The overall positioning reproducibility of mask is within 1.4mm on five non-patient subjects.

Conclusion: Our study shows that this mask based patient positioning system is an alternative of patient who can not use bite plate system but needs inter-fractional and intra-fractional movement monitoring.