

AbstractID: 11586 Title: Virtual Simulation of Frame Placement for Gamma Knife® Perfixion™

**PURPOSE:** To optimize the frame placement for patients receiving stereotactic radio surgery (SRS) using GammaKnife® Perfixion™, a simulation program was developed and its accuracy of collision clearance was compared with the planning system, Leksell Gamma Plan 8.0 (LGP).

**METHODS AND MATERIALS:** A simulation program was designed in Matlab to do the following: import patient DICOM images with or without frame, automatically measure skull dimension from the images, simulate the frame, post, and pin placement, create isocenters, and check for collision for each isocenter. The program employs a graphical user interface that can be compiled to run on a personal computer. MR images from ten study patients were imported into the simulation program. Frame placement at the time of treatment was reproduced using the MR fiducial marker of the image in the simulation program. Post and pin length measured at the time of frame setup were used in the simulation. A total of 600 isocenters were selected for the comparison of clearance computed from the simulation program and from LGP.

**RESULTS:** Average clearance at 600 isocenters tested was 6.7mm (standard deviation (SD) of 2.6 mm) from LGP and 6.9 mm (SD of 2.5 mm) from the simulation program. Mean differences between the computed clearance from the simulation program and LGP were -0.6, -0.3, 0.9 and 0.9 mm in anterior left (AL), anterior right (AR), posterior left (PL) and posterior right (PR) respectively. Standard deviations of the differences were 0.9, 1.0, 1.9, and 1.9 mm in the AL, AR, PL and PR directions respectively.

**CONCLUSION:** A simulation program for virtual frame placement was developed to guide an optimal frame setup for patients receiving SRS using gamma knife Perfixion™. It is a reliable tool that can guide optimal frame setup to reduce the chance of collision.