

**Purpose:** The purpose of this study is to develop an independent calculation method for treatment time verification of Leksell Gamma Knife GammaPlan radiosurgery plans for the Perfexion treatment unit.

**Method:** An independent dose calculation method is performed to verify the result of the treatment planning system for each patient prior to treatment for most radiotherapy procedures. Due to the complex patient and source geometry such a check is not commercially available for Gamma Knife stereotactic radiosurgery. The main goal of this study is to develop a program that verifies the irradiation time as calculated by the Leksell Gamma Knife GammaPlan PFX. The Leksell Gamma Knife Perfexion unit delivers ionizing radiation from 192 cobalt-60 sources arranged in eight sectors and embedded within the shielded radiation unit. The beams of gamma radiation that arise from the cobalt sources coincide at a fixed focal point within the radiation unit. The dose is shaped to the precise contour of the target by combination of shots using different collimator sizes and blocking of sectors. Our program is implemented in MATLAB. To obtain the irradiation time for each shot in the treatment plan, we first determine the depth that each of the individual 192 beams penetrates the patient's skull to the isocenter. Once the depth of each beam has been determined, the Tissue Maximum Ratio (TMR) is obtained and the dose rate at isocenter for each individual shot is calculated. The individual and total treatment times are calculated and compared to that obtained from GammaPlan PFX.

**Results and Conclusions:** We have developed a MATLAB program which could be used for independent verification of the treatment planning irradiation times prior to Gamma Knife radiosurgery. Treatment times calculated from our program agree with GammaPlan PFX within 3%.