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Comparison between Lightning and Leksell GammaPlan

🏆 **Member-In-Training Research Achievement Award Winner** 🏆

Victor Goulenko, MD - Roswell Park Comprehensive Cancer Center; Dheerendra Prasad, MD, MCh, FACRO - Roswell Park Comprehensive Cancer Center; Matthew Podgorsak - Roswell Park Comprehensive Cancer Center

Objectives: The new plan-optimization tool, Lightning, was added to the Leksell GammaPlan (LGP) software for the Gamma Knife Radiosurgery usage. We compare four planning modalities, two using standard LGP and two using the new Lightning planning software.

Methods: Thirty-eight cases were compared under four different planning techniques. First, using the LGP, a forward planning added by the standard optimization tool (Manual+Opt). Second, we analyzed the inverse planning (InverseP). Third, the Lightning without consideration for risk structures (LNR), and fourth, the Lightning with consideration of organs at risk (LWR). Both LGP optimization and Lightning were kept in their default mode, without changing their parameters and all plans had the same dose prescription. At the end of the planning, it was analyzed and compared the total time for planning, number of shots, coverage, selectivity, gradient index, beam-on time, and maximum dose received by risk structures.

Results: The Lightning software was able to provide plans with better coverage and gradient index (8% and 15% improvement respectively) but had 12% decrease in selectivity. Delivery time had 5% reduction with 226% increase in the number of shots and 57% reduction on time needed to plan. Only Compared to the other modalities, only Lightning with protection of risk structures were able to create an adequate tolerance dose to organs at risk. Histogram comparison showed similar plan qualities, for exception when maximum protection dose was considered.

Conclusion(s): The new Lightning software showed to be efficient to deliver a quick and good plan allowing the planner to test different options of settings to achieve the most desirable plan. It took less time to calculate shot placement, protection of structures and the ideal isodose line than the standard planning with the LGP. This can be useful to plan multiple and complex targets at a faster time, orient beginners to develop their planning skills, maintain an adequate coverage while preserving risk structures, and increase the patient's tolerance and acceptance to the treatment.

