

Leksell GammaPlan

Leksell GammaPlan (LGP; [ELEKTA](#) Instruments AB, Stockholm, Sweden) is dedicated computer-aided software that was developed for treatment planning and radiation dosimetry during Gamma knife radiosurgery (GKS). Later on, its analog SurgiPlan (ELEKTA Instruments AB) was created to facilitate stereotactic brain surgery, mainly in cases of functional brain disorders. The current versions of these systems provide extensive options for highly accurate and precise coregistration and fusion of various images (computed tomography [CT], magnetic resonance imaging [MRI], digital subtraction angiography, positron emission tomography, magnetoencephalogram, etc.) within the same workspace, their magnification and reconstruction in axial, coronal, and sagittal planes. Moreover, various anatomical structures delineated on the different images may be combined on the composite view and evaluated three-dimensionally from the different angles and directions. These capabilities can be used not only for radiosurgery or stereotactic interventions, but for planning of open neurosurgical procedures as well. Previously we successfully applied a detailed evaluation of regional neuroanatomy with the use of LGP before surgery for complex intracranial aneurysms ¹⁾.

To compare [planning](#) indices achieved using manual and inverse planning approaches for [Gamma knife radiosurgery for arteriovenous malformation](#).

For a series of consecutive [AVM](#) patients, treatment plans were manually created by expert planners using [Leksell GammaPlan](#) (LGP). Patients were re-planned using a new commercially released inverse planning system, IntuitivePlan. Plan quality metrics were calculated for both groups of plans and compared.

Results: Overall, IntuitivePlan created treatment plans of similar quality to expert planners. For some plan quality metrics statistically significant higher scores were achieved for the inversely generated plans (Coverage 96.8% vs 96.3%, $P = 0.027$; PCI 0.855 vs 0.824, $P = 0.042$), but others did not show statistically significant differences (Selectivity 0.884 vs 0.856, $P = 0.071$; GI 2.85 vs 2.76, $P = 0.096$; Efficiency Index 47.0% vs 48.1%, $P = 0.242$; Normal Brain V12 (cc) 5.81 vs 5.79, $P = 0.497$).

Automatic inverse planning demonstrated significantly shorter planning times over manual planning (3.79 vs 11.58 min, $P < 10^{-6}$) and greater numbers of isocentres (40.4 vs 10.8, $P < 10^{-6}$), with an associated cost of longer treatment times (57.97 vs 49.52 min, $P = 0.009$). When planning and treatment time were combined, there was no significant difference in the overall time between the two methods (61.76 vs 61.10, $P = 0.433$).

Conclusions: IntuitivePlan can offer savings on the labor of treatment planning. In many cases, it achieves higher quality indices than those achieved by an “expert planner” ²⁾.

1)

Kawashima A Okada Y Hayashi M Kawamata T Hori T Application of contrast-enhanced constructive interference in steady state magnetic resonance imaging to Leksell GammaPlan for localizing c2-c3 aneurysms: technical note Neurosurgery 2009. 742E1188-E1190.E1190; discussion E1190.

2)

Paddick I, Grishchuk D, Dimitriadis A. IntuitivePlan inverse planning performance evaluation for Gamma Knife radiosurgery of AVMs [published online ahead of print, 2020 Aug 4]. J Appl Clin Med Phys. 2020;10.1002/acm2.12973. doi:10.1002/acm2.12973

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