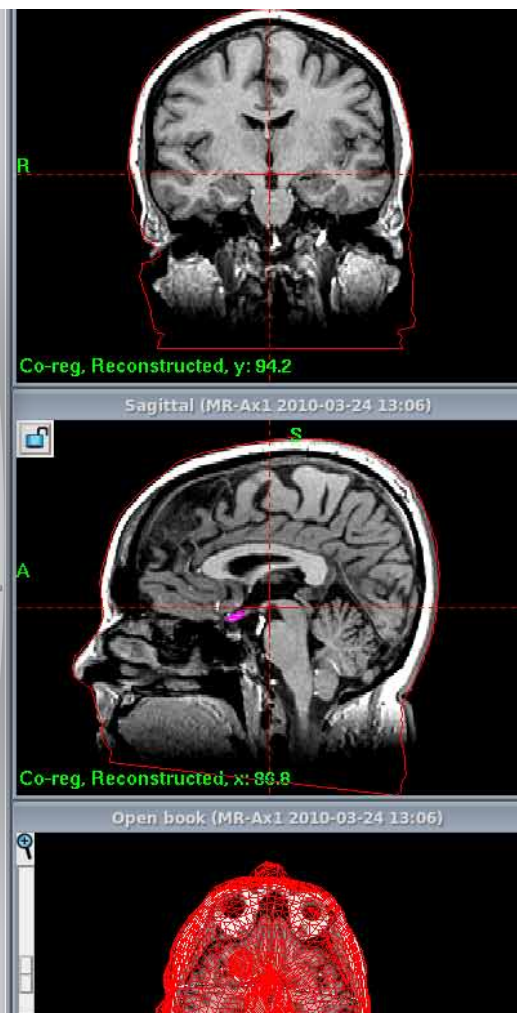
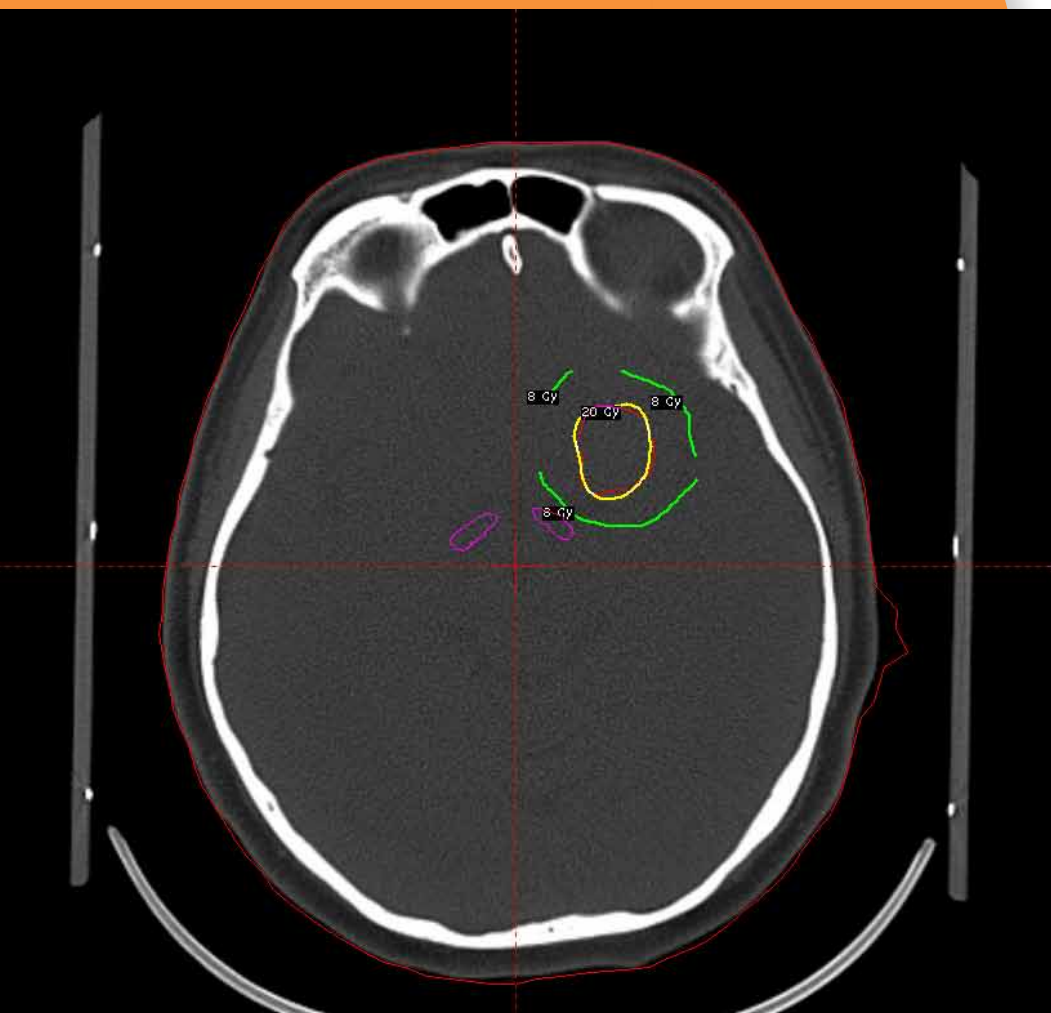


Hypofractionated Radiosurgery of Meningiomas



Institution

University of Virginia, Charlottesville, VA

Patient

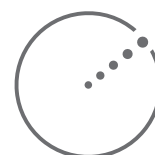
49-year-old female

Diagnosis

Anterior clinoidal meningioma

Treatment

Hypofractionated Gamma Knife® surgery utilizing the Extend™ program for Leksell Gamma Knife® Perfexion™: 21 shots with 11 composite isocenters (8 with ≥ 1 sector blocked), 4 sessions, 5 Gy/session to margin of meningioma



ELEKTA



Neurosurgeon:
Jason Sheehan, M.D., Ph.D.

Medical Physicist:
David Schlesinger, Ph.D.

Radiation Oncologists:
James Larner, M.D., Ronald Kersh, M.D.

Hypofractionated Radiosurgery of Meningiomas

The Extend program enables clinicians to use Leksell Gamma Knife Perfexion in a novel way: a hypofractionated or “multi-session” approach for patients with overly large benign skull base tumors or lesions too close to critical anatomy. In cases such as perioptic meningiomas, Extend radiosurgery—which uses a relocatable frame—avoids the risk of endangering the patient’s vision with a surgical procedure or a potent single-fraction treatment. Components include fixation devices, such as a vacuum assisted bite block and head support with vacuum pillow. Accurate repeat fixation is ensured with one-time use of a CT box to obtain precise stereotactic reference points, and subsequent repeat checks using reposition check instruments for each Gamma Knife session.

Patient diagnosis and history

This 49-year-old patient previously presented to her local hospital’s emergency department with lightening-like flashes and impairment in her left eye’s central and peripheral vision, diagnosed as an ocular migraine. However, physicians also discovered a mass near the orbit of her left eye, diagnosed as an anterior clinoidal meningioma. The patient self-referred to Dr. Jason Sheehan at UVA.

Treatment

Jason Sheehan, M.D., Ph.D., associate professor in the neurosurgery and radiation oncology departments at UVA and co-director of UVA’s Gamma Knife Center met with the patient and explained treatment alternatives. These included microsurgery, stereotactic single-session Gamma Knife surgery, multi-session (hypofractionated) Gamma Knife surgery, in addition to conservative management consisting of periodic clinical evaluation and MRI.

Because meningiomas are slow-growing lesions, an aggressive surgical approach was not indicated. However, due to the mass’s proximity to the optic apparatus (optic nerve and chiasm), the risk of merely monitoring the mass’s growth over time was unacceptable. Similarly, the high dose of single-session stereotactic radiosurgery could impact the patient’s optic nerve and damage her vision.

The Extend program on Leksell Gamma Knife Perfexion offered an attractive option. Multi-session radiosurgery would exploit the radiobiological advantage of hypofractionation while providing the added precision of Gamma Knife surgery. At low radiation doses, normal cells have an increased survival rate because of their ability to repair sublethal damage before the next radiation fraction is delivered. Essentially, it would deliver an optimal dose to the tumor yet spare critical risk structures of any appreciable amount of radiation.

The patient had a custom dental mold created for the bite block, and CT and MRI scans performed and images fused to facilitate Gamma Knife surgery planning. The patient’s four treatments were performed delivering 5Gy per session to the margin of the meningioma. The treatment time was approximately 40 minutes per fraction and encompassed an irradiated volume of 5.6cc.

Conclusion

The Extend™ radiosurgery went very well and the patient tolerated the procedure without any difficulties. Currently, this patient and six other patients who have had this treatment for various indications are awaiting followup MRI and consultation.

The Extend program provides an innovative way to expand the benefits of Gamma Knife® surgery for a variety of indications that are not ideal for traditional radiosurgery or other interventions. These include treatment of larger tumors and arteriovenous malformations, in addition to critically located and sensitive brain structures. Extend also enables treatment with Leksell Gamma Knife® even after most types of radiation therapy and avoids the use of rigid, pin-affixed stereotactic frames.



Figure 1. The patient had a left anterior clinoidal region meningioma. She underwent multi-session Gamma Knife® surgery with the Extend program. The MRI shows the tumor contoured in red, the prescription isodose in yellow, the 8 Gy isodose line in green and the optic tracts in purple.

Since 1989, the Lars Leksell Center for Gamma Surgery at UVA has treated more than 6600 patients from 54 countries and every state in the United States. UVA is the first center in the United States to use the Extend™ program for Gamma Knife® surgery.

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