Magellan HEALTHCARE

VOLUME, ISSUE 3

Advanced Imaging Digest

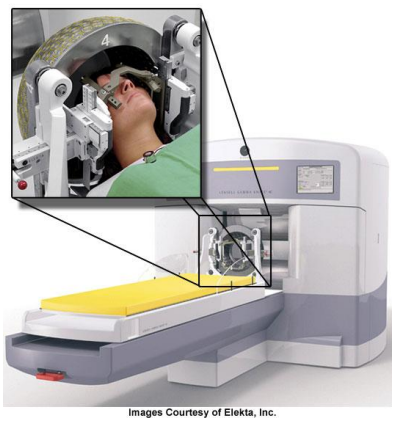
Gamma Knife Radiosurgery

Introduction

Stereotactic radiosurgery uses highly specialized equipment to focus beams of radiation only where they are needed to treat brain and spinal tumors, vascular lesions or neurologic conditions, such as trigeminal neuralgia, without damaging healthy brain tissue.

Radiosurgery differs from conventional radiation therapy in several respects. With standard external beam radiation therapy techniques, tumors and some of the surrounding normal tissues are treated to the same dose of radiation. The radiation dose is given in small increments over several weeks to allow normal adjacent tissues to recover from its effect, while tumor tissue is less likely to recover. Ultimately, the brain can absorb a maximal dose of radiation beyond which no further treatment is advisable. There is increasing evidence that over long periods of time, high doses of radiation are harmful to a normally functioning brain. Radiosurgery treats only the abnormal tissue in a single session without significant radiation to the adjacent brain.

Gamma Knife® Machine and Helmet



Images Courtesy of Elekta, Inc.

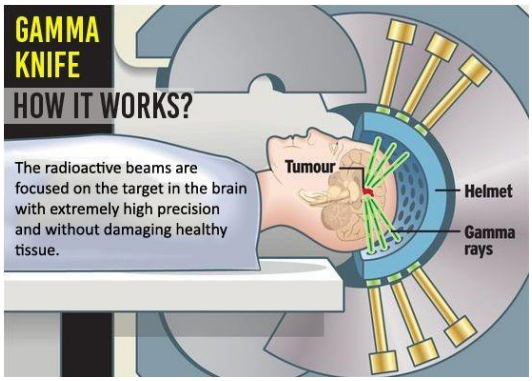
The Elekta Gamma Knife (GK) is a cutting-edge, non-invasive stereotactic radiosurgery instrument that doesn't use a scalpel or require an incision—in fact, it's not a knife at all. Instead, the GK uses 192-201 small cobalt sources of gamma rays arrayed in a hemisphere within a thickly shielded structure. A collimator aims the radiation emitted by these sources to a common focal point. This is analogous to focusing the radiant energy of the sun with a magnifying glass to a hot focus. Near the glass there is not much heat, but the energy is intense at the focal point. Optical lenses cannot focus gamma rays, rather individual beams are allowed to summate by overlapping at the focal point of the collimator,

Magellan Healthcare clinical leaders continually review imaging trends and needs in light of current medical concerns, available literature, and society and Centers for Disease Control and Prevention recommendations and guidelines. This document is a summary of our latest findings. Please consult references for detailed information.

achieving the same effect. The collimator allows the beam focus size to be adjusted from 4 to 18mm in size.

GK radiosurgery can be especially beneficial when a brain tumor is hard to reach with traditional neurosurgery or when a patient is not healthy enough to undergo traditional surgery. GK radiosurgery doesn't require an incision or general anesthesia. Most patients can resume their daily activity within a day or two, depending on their doctor's advice.

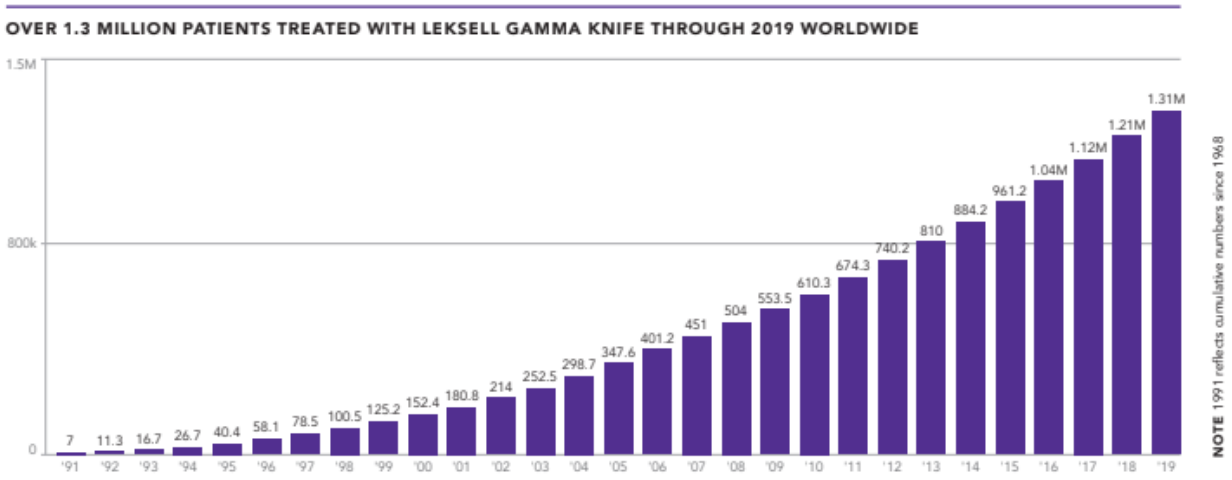
How Gamma Knife works

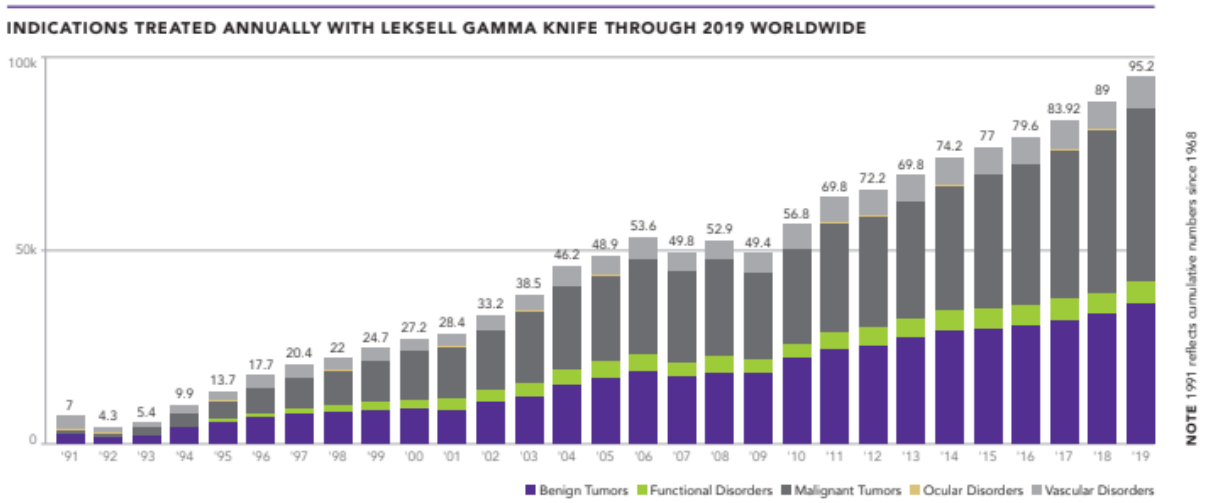


Leksell Gamma Knife

SUMMARY OF NEUROLOGICAL DISORDERS TREATABLE WITH LEKSELL GAMMA KNIFE

		Annual Incidence (per million)	% indicated for Gamma Knife treatment	Annual Gamma Knife cases (per million)
Vascular Malformations	Arteriovenous Malformations	8.9–13.4 [1–3]	70	6.2–9.4
	Cavernous Malformations	1.5–5.6 [4]	15	0.2–0.84
	Dural Arteriovenous Fistulas	1.7 [5]	50	0.85
Functional Disorders	Trigeminal Neuralgia	126–289 [6–7]	50	63–144.5
	Essential Tremor	237 [8]	50	118.5
	Parkinson's Tremor	200 [9]	15	30
	Epilepsy	610 [10]	5	30.5
Benign Tumors	Meningioma	86 [11]	50	43
	Pituitary Adenoma	40.1 [11]	15	6
	Vestibular Schwannoma	20 [11]	80	16
	Craniopharyngioma	1.3 [12]	20	0.26
Malignant Tumors	Metastases	300–500 [13–14]	90	270–450
	Glioblastoma Multiforme	32 [11]	20	6.4
	Anaplastic Astrocytoma	5.9 [11]	20	1.1
	Diffuse Astrocytoma	4.6 [11]	20	0.9
	Lymphoma	4.3 [11]	10	0.43
	Uveal Melanoma	5.1 [15]	40	2.04
TOTAL				**595–861**





Open surgery versus Gamma Knife radiosurgery

The average 12-month cost of open surgery versus GK radiosurgery:

- Brain metastases: $55,938 vs. $23,069
- Acoustic neuroma: $67,538 vs. $37,840
- Arteriovenous malformations: $78,332 vs. $46,293

Patients typically are in and out of the hospital in one day for a single treatment and back to their normal routines quickly. GK radiosurgery may be used in place of or in addition to traditional brain surgery or whole brain radiation for the treatment of complex brain conditions.

Despite the significant advantages of GK radiosurgery, appropriate selection of eligible patients based on published data will result in preventing overutilization of this procedure.

About the author

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Dr. Hart completed her residency in radiation oncology and a year of research at Washington University. She is board certified by the American Board of Radiology. She was a clinical assistant professor in radiation oncology at Loyola University School of Medicine in Chicago before moving to Houston where she has been in private practice for the past eighteen years. With six years of prior experience in utilization review, Dr. Hart has been a physician clinical reviewer, at Magellan Rx since December 2019. In November of 2021, she became a senior physician clinical Reviewer in radiation oncology. She is passionate about evidence-based healthcare delivery and looks forward to expanding her role at Magellan Rx.

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