Editorial

The Role of Stereotactic Gamma Knife Radiosurgery in the Treatment of Brain Lesions

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Gamma knife (GK) radiosurgery is a noninvasive, stereotactic, dedicated system for intracranial radiosurgery that is sometimes described as surgery without the scalpel. There are six generations of Leksell Gamma Knifes, which have been the leading radiosurgery platform for more than 50 years. The first device Gamma unit was introduced in 1968 by Lars Leksell, a Swedish neurosurgeon (1907-1986) and was employed primarily for indications in the field of functional neurosurgery.[1]

The device is a complex machine that uses cobalt 60 as its energy source, and is able to focus a precise intersection of beams of gamma rays to perform radiosurgery. The target is clearly defined stereotactically through the use of high-resolution CT and MRI scans coupled with computer technology to perform a virtual target seen in the patient`s diagnostic images with the actual target position in the patient.[2]

During the procedure up to 192 tiny beams of radiation are focused on a single tumor or other targeted area. Low-dose radiation is delivered simultaneously through these tiny beams that converge to deliver a highly effective dose of radiation. The beams' approach can be shaped to best conform to the target. Treatment with GK differs from conventional brain radiation therapy as it is programmed very precisely to deliver radiation at a finely focused point, where all of the beams converge to treat diseased tissue while sparing healthy surrounding tissue. The accuracy of the treatment is unsurpassed.[3]

It has unrivaled precision and accuracy when it comes to sparing healthy brain and body tissues, no other radiosurgery technique can match Leksell Gamma Knife.

Preserving tissue helps to maintain normal function that can impact the quality of life.[4]

Typically outpatient treatments are performed in single or multiple sessions, depending on the size of the lesion or those abutting very sensitive areas such as the optic chiasm, most patients can return to their routine activities within a day or two.[5]

Gamma Knife can be used to treat a number of neurological disorders, including:

- Brain metastases; single or multiple
- Recurrent gliomas
- Benign tumors such as meningiomas, which begin in the membranes surrounding the brain and spinal cord
- Acoustic neuromas (vestibular schwannomas),
- Post-surgical & inoperable pituitary tumors
- Vascular malformations such as arteriovenous malformations and cavernomas
- Functional disorders such as trigeminal neuralgia and medication-refractory tremor.
- lesional and nonlesional epilepsy with variable causes such as hamartomas, mesial temporal sclerosis and corpus callosotomy.[5]

Depending on the diagnosis, the treatment by GK radiosurgery can do the followings :

- Destroy or stop the growth of tumors by damaging cell DNA.
- Alter function, as in the case of hormone-producing tumors in the pituitary gland or pain sensations in the trigeminal nerve.
- Generate changes in blood vessels in the brain by reducing size and volume in (arteriovenous malformations) [4,5]

Gamma knife radiosurgery is now considered an alternative primary treatment to open surgical treatment for brain lesions when the surgery carries a high risk, is contraindicated or even not preferred, and it carries a low risk and few side effects due mainly to brain inflammation.

The severity of symptoms tends to be associated with the duration and location of the radiation treatment. Also, GK radiosurgery treatment is associated with less morbidity and cost than open surgery.[6]

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