

Gamma Knife Surgery Compared With Linac-Based Radiosurgery Systems in the Treatment of Intracranial Lesions or Tumours and Functional Neurosurgery: A Review

Context

Stereotactic radiosurgery (SRS) is a non-invasive treatment for a variety of intracranial lesions. Unlike conventional radiation therapy or whole brain radiotherapy, SRS is designed to focus a radiation dose on a predefined target while minimizing the radioactive dose outside of the target.

Technology

Gamma Knife is the most common SRS system used for intracranial radiosurgery and is considered by some to be the gold standard. It uses about 200 convergent sources of radiation and a fixed frame that attaches to the patient's head to ensure accuracy. Another technology that can be used for SRS is a linear accelerator (linac), such as CyberKnife, Novalis, or X-knife. This type of system differs from Gamma Knife in that it uses a single radiation source, is frameless, and the radiation source moves instead of the patient.

Issue

A review of the evidence comparing Gamma Knife with linac-based SRS systems with regard to accuracy and precision, clinical effectiveness, safety, and cost-effectiveness, as well as a review of the evidence-based guidelines for particular SRS systems, will help inform decisions about which radiosurgery system to use to treat intracranial lesions and tumours and in functional neurosurgery.

Methods

A limited literature search was conducted of key resources, and titles and abstracts of the retrieved publications were reviewed. Full-text publications were evaluated for final article selection according to predetermined selection criteria (population, intervention, comparator, outcomes, and study designs).

Key Messages

- Although differences in accuracy and precision between Gamma Knife and linac-based SRS systems were found, the impact of the differences on clinical outcomes is unclear.
- In terms of clinical effectiveness, safety, and cost-effectiveness, there appears to be no difference between Gamma Knife and linac-based SRS systems.
- No evidence-based guidelines were found.

Results

The literature search identified 186 citations, with 23 additional articles identified from other sources. Of these, 39 were deemed potentially relevant and 6 met the criteria for inclusion in this review — 1 meta-analysis, 1 cost comparison, and 4 retrospective comparative studies.

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