Stereotactic radiosurgery: an update

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Authors' objectives
The author's objective appears to have been to assess the evidence for the effectiveness of stereotactic radiosurgery (SRS) treatment.

Searching
Seven electronic databases were searched without language restrictions to identify relevant studies; the search terms and dates were reported. In addition, the websites of Health Technology Assessment Agencies were individually checked.

Study selection
Study designs of evaluations included in the review
No restrictions were placed on the study design, but case series were only included if they assessed 20 or more patients. Previous health technology assessment reports and systematic or good-quality narrative reviews, as well as primary study reports, were eligible for inclusion. Technical descriptions of apparatus, dose calculations, imaging and treatment planning reports, and procedural descriptions were excluded.

Specific interventions included in the review
Studies that assessed SRS were eligible for inclusion. The specific types of SRS assessed in the review were fractionated stereotactic radiotherapy (FSRT), focused linear accelerated versions of SRS and gamma knife (GK)-SRS.

Participants included in the review
Studies that assessed human participants with conditions that could alternatively be treated with radiosurgery were eligible for inclusion. The specific conditions of participants included in the review were acoustic neuroma, arteriovenous malformations (including participants with epilepsy), trigeminal neuralgia, brain metastases, brain tumours, meningiomas, pituitary tumours, other forms of tumour (unspecified) and Parkinson's disease.

Outcomes assessed in the review
No inclusion criteria were stated in relation to the outcomes. The specific outcomes assessed depended on the disease type. The outcomes included tumour decrease and shrinkage, tumour response, survival rates, preservation of hearing, numbers seizure free, actuarial obliteration rates, pain relief rates and tremor control.

How were decisions on the relevance of primary studies made?
One reviewer selected the studies.

Assessment of study quality
The author stated that the validity of the included studies was not assessed.

Data extraction
One reviewer extracted the data for the review. Data on the interventions (type of radiosurgery, other treatment technologies) and outcomes (nature of the outcome, measurement, time of follow-up, numbers followed up) were extracted.

Methods of synthesis
How were the studies combined?
The studies were grouped according to the participants’ condition and study design. The studies were then combined in a narrative discussion.
How were differences between studies investigated?
Differences between the studies were discussed in relation to the different types of SRS procedure and the baseline severity of the participants' conditions.

Results of the review
The number of studies included in the review was not reported. From the study tables it appeared that 184 primary studies were included: 2 randomised controlled trials, 2 controlled clinical trials, 7 cohort studies, 3 case-control studies and 170 case series. In total, these involved approximately 13,878 patients.

The main results were as follows. Acoustic neuroma (28 studies): microsurgery remained the primary treatment option for patients with acoustic neuroma. However, SRS had a useful place when surgery would have had an unacceptable risk or been refused. The long-term follow-up data on SRS treatment were still relatively limited, but some studies indicated that FSRT appeared to be an alternative to linear accelerator-based radiosurgery (LINAC) or GK-SRS.

Arteriovenous malformations (32 studies): microsurgery and SRS should be regarded as two complementary options, with surgery being preferred if the lesion could be excised safely.

Trigeminal neuralgia (12 studies): the role of SRS in the treatment of trigeminal neuralgia was not established. Other more established treatment options may, therefore, have been the preferred option.

Brain metastases (46 studies): SRS could be seen as a useful option when a patient could not be a candidate for surgery, and may have offered advantages in terms of relief of neurological symptoms. SRS plus radiotherapy appeared to be more effective than radiotherapy alone.

Brain tumours (16 studies): SRS may have been a treatment option when surgery was not possible, or when it carried an unacceptably high risk. In appropriately selected patients, SRS appeared to be a useful adjunctive treatment, but it had limited success in malignant glioma.

Parkinson's disease (4 studies): the place of SRS in the treatment of Parkinson's disease was not established.

Epilepsy (number of studies not reported): the role of SRS in the treatment of epilepsy was not established.

Cost information
Seven cost and economic studies assessed SRS treatment. The results from several of these reflected local situations and were not necessarily generalisable. Two studies indicated that a modified LINAC approach was the least costly option for small caseloads, with dedicated SRS having the advantage of higher patient numbers. One analysis showed a cost-advantage to LINAC over GK-SRS over a range of scenarios. A further comparison reported costs associated with treatment, and showed that the cost of a course of FSRT was about $US 17,000 compared with $US 25,000 for a course of LINAC SRS.

Authors' conclusions
The author's conclusion appeared to be that any referral of patients for treatment with SRS should be to centres of excellence with experience of managing the patient's condition, and should take account of the availability of other, appropriate treatment options.

CRD commentary
This was a broad review in which the review question was only loosely defined in terms of the interventions, participants and study designs. The author's objective was not explicitly stated, and it had to be inferred from the text of the report. A number of sources were searched for relevant studies, with efforts being made to minimise language bias. However, no efforts were made to minimise publication bias, and this was not assessed in the review. The review methodology was poorly reported, and it appears that no efforts were made to minimise reviewer bias and errors during this process. The quality of the included studies was not assessed, thus it was not possible to comment on how the
quality of the included studies might have impacted on the results of the review.

Given the number of studies and type of study designs, a narrative discussion of the results was appropriate. However, not all of the studies included in the tables appear to have been discussed in the text, and it was unclear as to how many studies were actually included in the review. Overall, due to the level of review methodology reported and the paucity of the evidence base reviewed, the author's conclusions may well have been subject to bias.

**Implications of the review for practice and research**
The author did not state any implications for practice or further research.

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