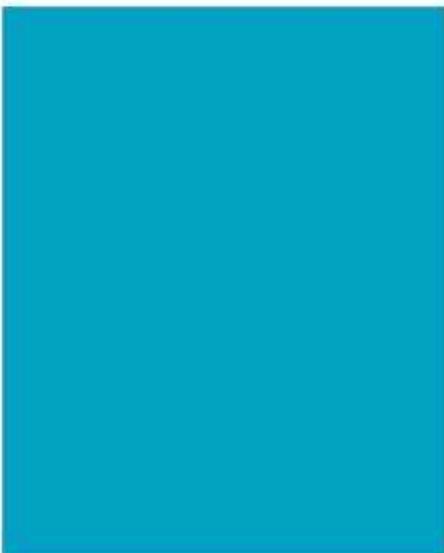


**Clinical Commissioning Policy:  
Radiosurgery/Radiotherapy for  
Cavernous Venous Malformations  
(Cavernomas)**

**September 2013**

**Reference: NHS ENGLAND D05/P/g**



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# NHS England

## **Clinical Commissioning Policy: Stereotactic Radiosurgery / Radiotherapy for Cavernous Venous Malformations (Cavernomas)**

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Radiosurgery**

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## **Policy Statement**

NHS England will commission in accordance with the criteria outlined in this document.

In creating this policy NHS England has reviewed this clinical condition and the options for its treatment. It has considered the place of this treatment in current clinical practice, whether scientific research has shown the treatment to be of benefit to patients, (including how any benefit is balanced against possible risks) and whether its use represents the best use of NHS resources.

This policy document outlines the arrangements for funding of this treatment for the population in England.

## **Equality Statement**

Throughout the production of this document, due regard has been given to eliminate discrimination, harassment and victimisation, to advance equality of opportunity, and to foster good relations between people who share a relevant protected characteristic (as cited in under the Equality Act 2010) and those who do not share it.

## **Plain Language Summary**

Cavernomas are clusters of abnormal blood vessels mainly found in the brain and spinal cord.

They are sometimes known as cavernous angiomas, cavernous hemangiomas or cerebral cavernous malformations.

A typical cavernoma looks a bit like a blackberry. It is filled with blood that flows slowly through vessels that are like 'caverns'. Cavernomas vary in size from a few millimetres to several centimetres across.

Stereotactic radiosurgery (SRS) or stereotactic radiotherapy (SRT) destroys abnormal tissues in the brain by the administration of a strong and highly focused dose of radiation.

No high level evidence exists for any intervention (either microsurgery or SRS) in patients with cavernomas. In the management of cerebral cavernous malformations where possible without risk of neurological deficit, microsurgery is preferred.

SRS is recommended for cavernomas that are in an anatomical situation (brainstem, basal ganglia, thalamus, internal capsule, motor cortex), where microsurgery is deemed to have unacceptably high risk of neurological deficit.

It's appropriate for clinicians to consider SRS for a small subset of patients with cavernomas that are in a difficult and unacceptable high risk anatomical situation (brainstem, basal ganglia, thalamus, internal capsule, motor cortex), where there is evidence of effectiveness for SRS, and where conventional surgery is contra-indicated or the risk of functional disability would be increased through surgery.

## 1. Introduction

The basic principle of stereotactic radiosurgery (SRS) for this application is the administration of a strong and highly focused dose of radiation.

The procedure allows radiation to be limited to the target area and thus helps spare the surrounding tissues as much as possible. This causes a scarring process in the malformation, reducing the risk of further bleed into the brain.

This policy considers the use of SRS for patients with cavernomas and states the criteria to identify which patients should be considered for the intervention.

## 2. Definitions

Cavernomas (also known as “cerebral cavernous malformations”, “cavernous angiomas”, or “cavernous haemangiomas”) are blood-filled clusters of abnormal vessels. About half of them are symptomatic, and about a quarter of them are in a surgically inaccessible place in the brain. Cavernomas have an estimated prevalence of 0.15-0.9%<sup>1</sup>. 76% of the lesions located supratentorially (within reach of surgery), but 8% in the basal ganglia/thalamus and 18% in the brainstem where surgery is high risk.

### **Stereotactic Radiosurgery (SRS) and Stereotactic Radiotherapy (SRT)**

The basic principle of stereotactic radiosurgery (SRS) and stereotactic radiotherapy (SRT) is the elimination of a functional disorder, or destruction of abnormal tissues, by administration of a strong and highly focused dose of radiation. The procedure allows radiation to be limited to the target area and thus helps spare the surrounding tissues as much as possible.

For the purpose of this policy the term “SRS” is used to mean treatment given as a single dose, and “SRT” as a hypofractionated treatment of not more than 5 fractions. This policy applies to both of these approaches. Commissioning arrangements for fractionated treatments utilising a larger number of fractions are beyond the remit of this policy but fall within the Radiotherapy CRG policy remit.

SRS/SRT is a highly conformal radiotherapy treatment to a precisely delineated target volume, delivered using stereotactic localisation techniques. A multidisciplinary team of neurosurgeons or neuro-oncologists, and neuroradiologists should be involved in SRS case selection, treatment planning and delivery.

## 3. Aim and objectives

The objectives were to establish:

- If there is sufficiently robust evidence of clinical and cost effectiveness and safety to support the use of SRS for patients with cavernomas?
- If the evidence is sufficiently robust, what criteria should be used to identify suitable patients to be considered for SRS treatment?

#### 4. Epidemiology and needs assessment

Contemporary population-based prospective studies detected approximately 6 cases/million/year in Scotland, 47-60% of them being asymptomatic<sup>ii</sup>, 40% of whom becoming symptomatic within 2 years after diagnosis. When patients become symptomatic, typically at the mean age of thirties, 37% present with seizures, 36% with hemorrhage, 23% with headaches, 22% with focal neurological deficits<sup>iii</sup>. The annual risk of haemorrhage specifically from brainstem and thalamic/basal ganglia cavernous malformations has generally been estimated higher, 2.3-6.8%/person/year<sup>iv,v</sup>. It is not clear whether deep-seated eloquent malformations are more prone to bleeding, or whether any bleed is more likely to be symptomatic due to higher functional density. After one bleed, further haemorrhage is more likely, the **cumulative incidence of rebleed is 56% after 5 years, and 72% after 10 years**<sup>vi</sup>. Not only hemorrhage rate, but permanent morbidity and mortality is higher for deep eloquent or infratentorial lesions. A single bleed leads to persisting neurological deficit in up to 40-60% and also carries substantial risk of mortality and each subsequent bleeding episodes cumulatively increase the chance for permanent disability<sup>vii,viii</sup>.

Based on the current England population estimate of 53 million,<sup>ix</sup> we would expect 159 patients to be diagnosed with symptomatic cavernoma each year in England, **40 of these would have the lesion in the brainstem, thalamus and other surgically inaccessible site, where SRS would be considered.**

#### 5. Evidence base

Evidence can be graded according to the robustness of the study design, giving an indication of the degree to which the evidence should be relied upon when making clinical decisions. The grades of evidence range from level 1 (the most robust) to level 4 (the least robust). The diagram in Appendix 3 outlines the levels of evidence.

In the absence of methodologically robust evidence the following statements should remain tentative.

No high level evidence exists for any intervention (either microsurgery or SRS) in this cohort. Retrospective studies show that even in the most experienced centres, microsurgery for deep and eloquent cavernomas carry high risk, with over 50% neurological deficit, over a quarter with perioperative complications of tracheostomy, CSF leak etc and over 3% mortality. Surgery does not even fully prevent further haemorrhages: they still occur at a rate of 2% per year<sup>x</sup>.

Radiation induces hyalinization and thickening of the wall of the endothelial-lined vascular channels in arteriovenous malformations and similar radiation-induced vasculopathy is observed in cavernous malformations<sup>xi</sup>. Though about 50% of lesions reduce in size, the success is measured by the reduced rate of further haemorrhages after treatment. After SRS, re-bleeding rate fell from over 30%/patient/year to 9% within the first two years and to 1 % thereafter<sup>10,xii</sup>. After radiosurgery there was only 7% minor morbidity<sup>10</sup>.

SRS (principally Gamma Knife SRS) compared to surgery appears to provide:

- shorter hospitalisation
- a less detrimental impact on quality of life

- better short and long term morbidity
- avoidance of procedural mortality and lower treatment-related complications

The drawback is the lack of radiological endpoint proving success, though this drawback is shared with microsurgery (see postoperative bleed-rate above).

Gamma Knife, LINAC and CyberKnife appear to provide similar levels of clinical effectiveness. No evidence was identified on which to base comparisons of the relative safety of Gamma Knife, LINAC and CyberKnife.

### **Cost-effectiveness**

There is a lack of evidence addressing the cost-effectiveness of SRS compared to other treatment options in a UK setting. However, there is some evidence from other indications that the overall costs, including ancillary treatment and readmission costs are lower for patients treated with SRS than by microsurgery.<sup>xiii</sup> In 1997 a cost/benefit estimation for conventional fractionated radiotherapy (RT), surgery and radiosurgery (RS) for patients with single brain metastases was undertaken.<sup>xiv</sup> The cost per life year of median survivorship was \$16,250 for RT alone, \$13,729 for RS plus RT, and \$27,523 for resection plus RT. Hence, according to this study a surgical resection resulted in a 1.8-fold increase in cost, compared to radiosurgery. A similar American comparative cost analysis found that the cost per life year gained for radiosurgery was 30% lower than for surgical resection.<sup>xv</sup>

To-date estimates of the cost-effectiveness of SRS/SRT in comparison with surgery have not been robustly determined from a UK NHS perspective.

## **6. Rationale behind the policy statement**

Radiosurgery was introduced as a treatment option for cavernous malformations based on the assumption that the vessels would respond similarly to true arteriovenous malformations that had been proven to be thrombo-obliterated by radiosurgery<sup>xvi</sup>. Since then increasing worldwide clinical experience together with few documented histopathological cases seem to support the initial intuition, therefore radiosurgery has been recommended as treatment option for cavernous malformations with repeated haemorrhages deemed surgically inaccessible.<sup>xvii</sup>

- The evidence base regarding the effectiveness, cost effectiveness and safety of SRS/SRT for treating cavernous venous malformations has been used as a basis for this commissioning policy.
- SRS/SRT can be used to treat cavernomas where anatomical constraints prevent safe microsurgical removal (brainstem, thalamus, basal ganglia).

There is no available robust estimate of the cost effectiveness of SRS/SRT for treatment of cavernoma and ongoing monitoring of numbers and outcomes must be undertaken.

## 7. Criteria for commissioning

Indications for stereotactic radiosurgery/radiotherapy include newly diagnosed cavernomas, residual cavernomas after microsurgery and recurrent cavernomas.

### **Patients meeting all the following criteria will be routinely funded for SRS/SRT:**

- All patients must have undergone prior assessment by the local neurovascular multi-disciplinary team (MDT). The selection of patients for SRS/SRT must include the consideration of surgical or conservative treatment.
- In centres where SRS/SRT is delivered, referral may be made directly to the SRS MDT. In centres where there is no local SRS service, referral should be initially to the local neuro-vascular MDT, who can decide on the appropriateness of onward referral to an agreed SRS centre.
- All patients being considered for SRS /SRT must be discussed by the specialist MDT at the stereotactic treatment centre and must have specialist neurosurgery input. SRS/SRT must not be recommended without the collective agreement of the MDT.
- It's appropriate for clinicians to consider SRS for a small subset of patients with cavernomas that are in a difficult and unacceptable high risk anatomical situation (brainstem, basal ganglia, thalamus, internal capsule, motor cortex), where there is evidence of effectiveness for SRS, and where conventional surgery is contra-indicated or the risk of functional disability would be increased through surgery.

### **Expert opinion suggests that:**

There is no role for fractionated / hypofractionated treatment (SRT) in the management of cavernomas.

## 8. Patient pathway

The service specification for SRS/SRT describes the detail of the care pathways and describes the key aspects of SRS/SRT services being commissioned and should be referred to in conjunction with this policy.

The service will accept referrals from consultant medical staff and appropriate specialist neurovascular MDTs in line with eligibility and referral guidelines. The provider of SRS treatment will discuss all referrals in an SRS MDT prior to accepting the patient for treatment.

Treatment options for cavernoma will depend on the anatomical position of the lesion (dictating the perceived risk of alternative intervention with microsurgery), the presentation (incidentally found cavernomas are left untreated), and the estimated lifetime risk of repeated haemorrhages with progressive neurological deterioration if

untreated (the likelihood of this in a patient over the age of 70 is low).

The three management options for patients with cavernous venous malformations are:

- Surgical removal
- Stereotactic radiosurgery (SRS)
- No intervention

## **9. Governance arrangements**

The service specification for SRS/SRT describes the care pathways and key aspects of SRS/SRT services being commissioned and should be referred to in conjunction with this policy.

## **10. Mechanism for funding**

From July 2013 NHS England became responsible for commissioning Stereotactic Radiosurgery in line with this policy on behalf of the resident population of England.

Funding is transacted as per local contract agreements and terms.

## **11. Audit requirements**

Clinical governance guidelines state that all British neurosurgical centres are required to audit their results

Audit requirements will require the following data requirements for each patient:

1. Treatment parameters
2. History (rate) of previous haemorrhages
3. Post-radiosurgery haemorrhage events

## **12. Documents which have informed this policy**

2012/13 NHS Standard Contract: Service Specification Contract NSSD 8 Neurosciences (adult0 (subsection 4.1 Neurosurgery) Stereotactic Radiosurgery and stereotactic radiotherapy.

## **13. Links to other policies**

This policy follows the principles set out in the ethical framework that govern the commissioning of NHS healthcare and those policies dealing with the approach to experimental treatments and processes for the management of individual funding requests (IFR).

## 14. Date of review

This policy will be reviewed in April 2016 unless information is received which indicates that the proposed review date should be brought forward or delayed.

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