

UPDATE IN RESULTS OF STEREOTACTIC RADIOSURGERY TREATMENT OF ARTERIOVENOUS MALFORMATION

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Arteriovenous malformations (AVM) are an abnormal conglomeration of entangled blood vessels in the brain that are prone to bleed. This bleeding can cause symptoms ranging from headaches and seizures to neurologic catastrophes and even death.

There is about a 3% annual rate of bleeding into the brain in patients with arteriovenous malformations. While neurosurgical techniques can remove many AVM's, many patients are not enthusiastic about open neurosurgery for lesions that can be well treated in a non-invasive fashion.

Data accumulated over forty years shows the effectiveness of stereotactic radiosurgery - a non-invasive method of treatment of AVM and other abnormalities within the head.

A recent evaluation by Pollock et al evaluated radiosurgery for "operable" AVM's.

As the authors point out "although complete microsurgical resection immediately eliminates the risk of new AVM hemorrhage, various patients are either unwilling or unsuitable (because of concurrent medical or anesthesia risks) for surgical removal. Radiosurgery offers an effective alternative management strategy for such AVM patients."

Analyzed were sixty-five patients with potentially operable AVM's over a four year period who declined surgical resection and instead underwent stereotactic radiosurgery.

Patients received single fraction stereotactic radiosurgery. Medicines were given to prevent seizures after radiosurgery. The mean volume of AVM's treated was 3.1 cubic centimeters although the range was 0.1 to 10.5 cubic centimeters.

After radiosurgery, MRI's (Magnetic Resonance Imaging) were done at six month intervals for the first two years. CT scans were done if MRI's were not feasible.

Of sixty-five patients, 60 or 92% returned to previous employment or activity after radiosurgery. Seventy-two percent of patients returned to normal activities within the week following radiosurgery. Thirteen patients who had a hemorrhage due to the AVM before radiosurgery returned to work within twelve months of treatment. Five percent (3 patients) were unable to return to work because of physical deficits or psychiatric disorders that were present prior to treatment. Two patients died from AVM hemorrhaging.

Prior to treatment, 30 patients had headaches and 31 had seizures. Half the patients were noted to have an improvement in seizure control after radiosurgery or "cessation of seizures after radiosurgery." It was noted that six patients stopped their anti-seizure

medication successfully while 15 patients had no change in seizures after radiosurgery. Further noted was that "no patient developed a new seizure disorder after radiosurgery."

There was complete obliteration in 27 of 32 patients or 84% of that group studied with angiography. Angiography is an x-ray test in which contrast material is injected directly into the blood vessels to best visualize the AVM. Five patients had partial obliteration. Similarly, MRI's performed showed improvement in 86% of patients.

It was noted that not all patients accept surgical removal of AVM when offered due to the risks of surgical intervention. These risks include the size and shape of the AVM as well as the blood flow and experience of the neurosurgeon.

In the past, radiosurgery was only suggested for AVM's felt not to be operable. This new study suggests that successful outcome occurs in operable lesions as well. It was noted, "both radiosurgery and microsurgery are associated with treatment risks. With microsurgery, the patient takes the immediate risk of craniotomy and removal (and the possibility of incomplete resection), whereas with radiosurgery the patient remains at risk for an intracranial hemorrhage during the latency interval until AVM obliteration occurs. Overall, angiographic obliteration rates for patients with AVM's undergoing radiosurgery indicate that approximately 80% of AVM have been obliterated two years after radiosurgery. After radiosurgery, neuro-diagnostic imaging studies may detect altered signal in the brain adjacent to the treatment volume. Such findings are rarely associated with clinical symptoms if the AVM is in a relatively non-critical location."

It was noted "improvement in clinical symptoms is frequent after AVM radiosurgery." This was manifest by improvement in seizure control and reduction in headaches.

While radiosurgery takes time to obliterate the AVM, in accompanying remarks Loeffler & Alexander noted "this delay period before risk reduction is clearly superior to the alternative of observation without treatment for those patients who are either medically inoperable or who refuse microneurosurgical resection. These patients have a continuous risk of hemorrhage over their lifetime. In our opinion, this report substantiates the role of radiosurgery versus observation alone in this rare patient population."

Treatment of arteriovenous malformations was the mainstay of radiosurgery in the past. It is an area where single fraction radiosurgery is appropriate and when properly used, highly successful. The vast majority of patients thus treated by our group have obliteration of their AVM while avoiding open surgery and all that it implies.