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ILLUSTRATIVE SURGICAL VIDEO

Microsurgical resection of cerebellar AVM

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Cerebellar arteriovenous malformations (AVMs) are complex vascular lesions of the posterior fossa of the brain that have a high risk of hemorrhage and are usually associated with significantly high morbidity and mortality. Their intricate angioarchitecture and proximity to critical brain structures require very careful management of these lesions. AVM has been managed by various methods, a few of which include microsurgical resection and endovascular treatment.

Keywords: Arteriovenous malformation, Cerebellar, MicroNeurosurgery, Resection, Vascular

Microsurgical resection

Microsurgical resection is a primary treatment modality for cerebellar AVMs, particularly those that are located within the cerebellopontine angle. The "backdoor resection" technique has had high success rates, achieving complete angiographic obliteration in 92% of the cases (1).

This technique is effective for small and compact AVMs, with a better neurological outcome in 79% of the patients (1).

For safer surgical resection, preoperative embolization is done to reduce the size and vascularity of the AVM (2).

Characteristics of cerebellar AVMs

Cerebellar AVMs account for 7–15% of all intracranial AVMs approximately and are more prone to rupture (1, 3). In a study of patients with cerebellopontine angle AVMs, around 76% of the patients had presented with hemorrhage (1). The cerebellar AVMs have a complex angioarchitecture and usually involve multiple arterial feeders and superficial venous drainage, which complicates the treatment (3).

Endovascular treatment

Endovascular treatment is another modality of treatment for AVMs, especially for AVMs with complicated angioarchitecture (3).

Endovascular treatment is a feasible technique and has shown an acceptable therapeutic outcome with a favorable Glasgow Outcome Scale score in 81.7% of the patients upon discharge (3).

Endovascular treatment has a risk of intraoperative and postoperative bleeding which can give rise to serious complications (3).

Combined treatment strategies

Usually, large or complex cerebellar AVMs require combined endovascular and surgical techniques. A multimodal approach involving the combined technique is proven to be effective by demonstrating favorable outcomes without any major complications (4).

Grading systems

Traditional systems of grading, including the Spetzler-Martin grading system, have been traditionally used to grade the risk of AVMs, while newer grading schemes have been proposed and developed that better predict outcomes for cerebellar AVMs (5).

The classification by de Oliveira introduces the size, location, and involvement of the dentate nucleus, providing a more detailed risk assessment (2).

Furthermore, a new grading system proposed by Nisson et al. includes factors such as preoperative neurological status and venous drainage that give a better prognosis compared with the older systems (5).

Classification and risk assessment

Cerebellar AVMs are categorized according to the size, location, and involvement of critical structures such as the dentate nucleus. The de Oliveira classification system is especially useful for assessing risk and guiding treatment strategies (2).

Arteriovenous malformations with mixed superficial and deep locations and those involving the dentate nucleus carry higher surgical risks and require very careful planning (2).

Whereas microsurgical resection and EVT are effective in their own right, the treatment is generally selected based on the nature of the AVM and the status of the patient concerned. Cerebellar AVMs are complex lesions and thus require an approach that is individualized based on the specific features of the malformation at hand, usually by multimodal strategies to optimize outcomes and minimize risks.

The bottom line is that cerebellar AVMs represent some of the most complex challenges with regard to treatment because of their highly demanding anatomy and elevated risk of hemorrhage. Based on a combined strategy of microsurgical resection and endovascular techniques, advanced grading systems can provide a suitable approach for optimizing patient outcomes. However, each case should be managed based on specific considerations regarding the unique features of the AVM and associated vascular lesions.

VIDEO 1 | Cerebellar AVM excision: Surgical Video
https://youtu.be/o4RzTQ5O_6o

In this video, we present an 18-year-old boy with altered sensorium. CT brain showed cerebellar hematoma, and CT angiography showed left cerebellar AVM, SM Grade 3. He underwent emergency suboccipital decompressive craniotomy and evacuation of hematoma, and after 6 weeks, he was evaluated with DSA and underwent microsurgical resection of cerebellar AVM. The patient is now recovered.

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