# **Cerebellar Arteriovenous Malformation Classification**

## Yasargil

Yasargil categorized 58 cerebellar AVMs into 7 types:

Superior hemispheric cerebellar arteriovenous malformation

Inferior hemispheric cerebellar arteriovenous malformation(superior and inferior, divided by the horizontal fissure)

Superior vermian cerebellar arteriovenous malformation

Inferior vermian cerebellar arteriovenous malformation

(superior and inferior, divided by the horizontal fissure)

Cerebellopontine Arteriovenous Malformation

Giant cerebellar Arteriovenous Malformation

Fistula 1)

## Spetzler

see Cerebellar Arteriovenous Malformation Grading.

## de Oliveira

The Spetzler and Martin classification was modified to include subgroups IIIA (large size grade III AVMs) and IIIB (small grade III AVMs in eloquent areas) to assist the surgical resection criteria. The treatment strategy followed was surgery for grades I and II, embolization plus surgery for grade IIIA, radiosurgery for grade IIIB, and conservative for grades IV and V. According to the new proposed classification 45 (13%) patients were grade I, 96 (28%) were grade II, 44 (13%) grade IIIA, 97 (28%) grade IIIB, 45 (13%) grade IV, and 17 (5%) were grade V<sup>2</sup>

While Yaşargil has classified cerebellar AVMs into seven subtypes according to their location, de Oliveira et al. have classified them using a more impactful grading system based on the size, location, and involvement of the dentate nucleus with the highest risk being III (size over 4 cm) C (mixed superficial and deep location) \* (dentate involvement)<sup>3)</sup>.

Rhoton and colleagues described 3 cerebellar surfaces (suboccipital, tentorial, and petrosal) in their anatomical studies, but did not apply this to AVMs specifically <sup>4)</sup>.

## **Rodriguez-Hernandez**

Rodriguez-Hernandez et al. adapted these efforts to define 5 distinct subtypes of cerebellar AVMs: suboccipital, vermian, tonsillar, tentorial, and petrosal. They found these subtypes offer an intuitive appreciation of their anatomy and surgical management and are useful in describing surgical results. A focused analysis of outcomes after cerebellar AVM resection enables assessment of a patient selection <sup>5)</sup>.

Suboccipital AVMs are based on the posterior cerebellar surface facing the occipital bone, located below and between the transverse and sigmoid sinuses. The hemispheric portion of the suboccipital surface is comprised of the superior semilunar, inferior semilunar, and biventral lobules. The suboccipital surface is divided into superior and inferior parts by its major fissure, the suboccipital fissure. Minor fissures on the suboccipital surface include the petrosal or horizontal fissure (between superior and inferior semilunar lobules), the prebiventral fissure (between inferior semilunar and biventral lobules), and the tonsillobiventral fissure. AVMs based on the vermian portion of the suboccipital surface are categorized as vermian.

Tentorial AVMs are based on the tentorial surface. The hemispheric part of the tentorial surface is comprised of the quadrangular, simple, and superior semilunar lobules. The tentorial surface is divided into anterior and posterior parts by its major fissure, the tentorial or primary fissure. This fissure separates the quadrangular and simple lobules on the hemisphere, and the culmen and declive on the vermis. The postclival fissure separates the simple and superior semilunar lobules. AVMs based on the vermian portion of the tentorial surface are categorized as vermian.

Petrosal AVMs are based on the petrosal surface, the anterior cerebellum that faces the posterior petrous bone. The cerebellopontine angle is the V-shaped cerebellopontine fissure formed where the hemispheric lobules wrap around the pons and middle cerebellar peduncle. The petrosal surface is divided into superior and inferior parts by the petrosal or horizontal fissure, which extends onto the suboccipital surface between the superior and inferior semilunar lobules. The superior and inferior limbs of the cerebellopontine fissure meet laterally at the apex of the CP angle, at the anterior end of the petrosal fissure. The petrosal surface is formed by the anterior surfaces of the quadrangular, simple, semilunar, and biventral lobules, and the flocculi.

## **Vermian Arteriovenous Malformation**

see Vermian Arteriovenous Malformation.

## Tonsillar AVMs

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Tonsillar AVMs lie in the tonsils, which are ovoid structures on the inferomedial aspect of the cerebellar hemispheres that attach to cerebellum superolaterally through the tonsillar peduncles. The other tonsillar surfaces are free, with the inferior pole and posterior surfaces in the cisterna magna. The anterior tonsil faces the posterior medulla and is separated by the cerebellomedullary fissure. The medial tonsils face each other and are separated by the vallecula, a cleft that leads into the fourth ventricle. The ventral aspect of the superior tonsil faces the lower half of the roof of the fourth ventricle, which is formed by the tela choroidea, inferior medullary velum, and nodule. The lateral tonsil is separated from the hemisphere by the tonsillobiventral fissure.

Anatomic diversity among cerebellar arteriovenous malformations (AVMs) calls for a classification that is intuitive and surgically informative. Selection tools like the Spetzler-Martin grading system are designed to work best with cerebral AVMs but have shortcomings with cerebellar AVMs <sup>6</sup>.

#### References

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