Cerebellar Arteriovenous Malformation Grading



The objective of a study from the Department of Neurosurgery, University of California, San Francisco, Banner-University Medical Center Tucson, Arizona and Barrow Neurological Institute, Phoenix, was to evaluate the existing Supplementary Spetzler-Martin AVM grading scale (SM), Spetzler Ponce classification (SP), and Lawton-Young Grading System (LY) for cerebellar arteriovenous malformations (AVMs) and to propose a new grading system to estimate the risks associated with these lesions.

Data for patients with cerebellar AVMs treated microsurgically in two tertiary care centers were retrospectively reviewed. Data from patients at institution 1 were collected from September 1999 to February 2013, and at institution 2 from October 2008 to October 2015. Patient outcomes were classified as favorable (modified Rankin Scale [mRS] score 0-2) or poor (mRS score 3-6) at the time of discharge. Using chi-square and logistic regression analysis, variables associated with poor outcomes were assigned risk points to design the proposed grading system. The proposed system included neurological status prior to treatment (poor, +2 points), emergency surgery (+1 point), age > 60 years (+1 point), and deep venous drainage (deep, +1 point). Risk point totals of 0-1 comprised grade 1, 2-3 grade 2, and 4-5 grade 3.

A total of 125 cerebellar AVMs of 1328 brain AVMs were reviewed in 125 patients, 120 of which were treated microsurgically and included in the study. With our proposed grading system, we found poor outcomes differed significantly between each grade (p < 0.001), while with the SM, SP, and LY grading systems they did not (p = 0.22, p = 0.25, and p = 1, respectively). Logistic regression revealed grade 2 had 3.3 times the risk of experiencing a poor outcome (p = 0.008), while grade 3 had 9.9 times the risk (p < 0.001). The proposed grading system demonstrated a superior level of predictive accuracy (area under the receiver operating characteristic curve [AUROC] of 0.72) compared with the SM, SP, and LY grading systems (AUROC of 0.61, 0.57, and 0.51, respectively).

			% at Risk	Mortality Risk†	
Risk Grade	Points*	Risk Assessment	for Poor Outcome (no.)	Periop	Overall
1	0–1	Low	33% (16/49)	0% (0/49)	0% (0/49)
2	2–3	Moderate	62% (24/39)	3% (1/39)	8% (3/39)
3	4–5	High	83% (24/29)	7% (2/29)	17% (5/29)

* Points assigned according to the following risk factors: neurological status prior to treatment (yes = 2 points, no = 0), emergency surgery (yes = 1 point, no = 0), deep venous drainage (yes = 1 point, no = 0), and age \geq 60 years (yes = 1 point, no = 0).

† Perioperative mortality risk included any deaths that occurred within 30 days after the surgery; overall mortality risk included any deaths that occurred at the time of recent follow-up.

Nisson et al proposed a novel grading system for cerebellar AVMs based on emergency surgery, venous drainage, preoperative neurological status, and age that provides a superior prognostication power than the formerly proposed SM, SP, and LY grading systems. This grading system is clinically predictive of patient outcomes and can be used to better guide vascular neurosurgeons in clinical decision-making ¹⁾.

Rodriguez-Hernandez et al. in 2012 hypothesized that the predictive capability of the Supplementary Spetzler-Martin AVM grading scale was superior to that of the Spetzler Martin grading scale for assessment of outcomes following microsurgical resection of cerebellar AVMs².

Deep venous drainage is a better indicator of the depth of the nidus for cerebral AVMs than for cerebellar AVMs. Cerebellar anatomy is altered by AVMs in a different manner than cerebral anatomy such that the supplementary grading scale may be better than the Spetzler-Martin grade for prediction of surgical outcomes. In comparison with ruptured cerebral AVMs, which may be managed conservatively followed by radiosurgery for achievement of obliteration, ruptured cerebellar AVMs may be better treated by surgical resection, especially when the associated hemorrhage results in symptomatic compression of surrounding neural structures.

In conclusion, the surgical risk for cerebellar AVMs may be predicted by either the Spetzler-Martin or supplementary grading scales, although the supplementary scale may show better correlation with outcomes ^{3) 4) 5)}. However, neither grading system can substitute for experienced clinical and surgical judgment ⁶⁾.

References

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