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Surgery of complex AVMs: Intracranial aneurysm geometry predicts rupture rate in very small (< 4 mm) aneurysms

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Resumen

Introduction: Prediction of rupture risk for intracranial aneurysms remains inconsistent. Our ability to identify patients at risk for subarachnoid hemorrhage relies on an imprecise set of “predictive” factors, such as aneurysm size, location, and family history. Specific geometric features of intracranial aneurysms, such as dome-to-neck ratio, have been correlated with risk of rupture in several small retrospective review series. We use this geometric approach to explore the risk factors associated with rupture of very small aneurysms (< 4 mm), which are routinely observed when found incidentally.

Methods: Patients with ruptured or unruptured intracranial aneurysms treated at Geneva University Hospital (GUH) in Switzerland and North Shore University Hospital (NSUH) in Manhasset, New York, from 2000 to 2013 were identified. Aneurysms measuring less than 4mm from neck to dome (dmax) were analyzed with a focus on aneurysm and parent vessel geometry. Measurements were conducted by two independent investigators using DSA, CTA, or MRA, and parameters were analyzed for significance using multivariate logistic regression analyses.

Results: A total of 621 aneurysms were identified, and 19 ruptured and 171 unruptured aneurysms < 4 mm were compared. A statistically significant difference in efferent to afferent parent vessel diameter ratio (EAR) was found between ruptured and unruptured aneurysms in this set (OR 3.468, $p < 0.001$). Statistically significant differences in risk of rupture for females compared to males (OR 0.5, $p = 0.0318$) and smokers compared to nonsmokers (OR 0.43, $p = 0.0059$) were also identified. No significant difference was found in previously described geometric ratios.

Conclusions: Measurement of aneurysm geometry represents a promising method for better characterizing intracranial aneurysms and stratifying their risk of rupture. This approach may be particularly useful for very small aneurysms. Patients who present with aneurysms < 4 mm with EAR < 1 may benefit from more aggressive management than those with EAR > 1.

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