

Determining Significant Morphological and Hemodynamic Parameters to Assess the Rupture Risk of Cerebral Aneurysms

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Hemodynamics and morphology are recognized as major factors in the rupture risk of cerebral aneurysms, and exploration of their relationship is necessary to establish a method that can be employed by clinicians to assess the likelihood of rupture. In this work, morphological analysis and computational fluid dynamics were carried out to examine a database of 58 lateral cerebral aneurysms (26 ruptured and 32 unruptured) distributed among 49 patients. Eight morphological and six hemodynamic parameters were calculated and evaluated for statistical significance. It was observed that size ratio (SR), systolic wall shear stress (SWSS), diastolic wall shear stress (DWSS) and relative residence time (RRT) were statistically significant. The SR, DWSS, SWSS, and RRT were employed in multivariate logistic regression, obtaining a combined morphological-hemodynamic model, a pure morphological model, and a pure hemodynamic model to evaluate the odds ratio for rupture risk. The combined model had the highest efficiency, but no distinctive difference existed in the predictive capacity of the three models.