Size Ratio Is a Poor Discriminant of Rupture Status Prone to Aneurysm-Type Distribution Bias

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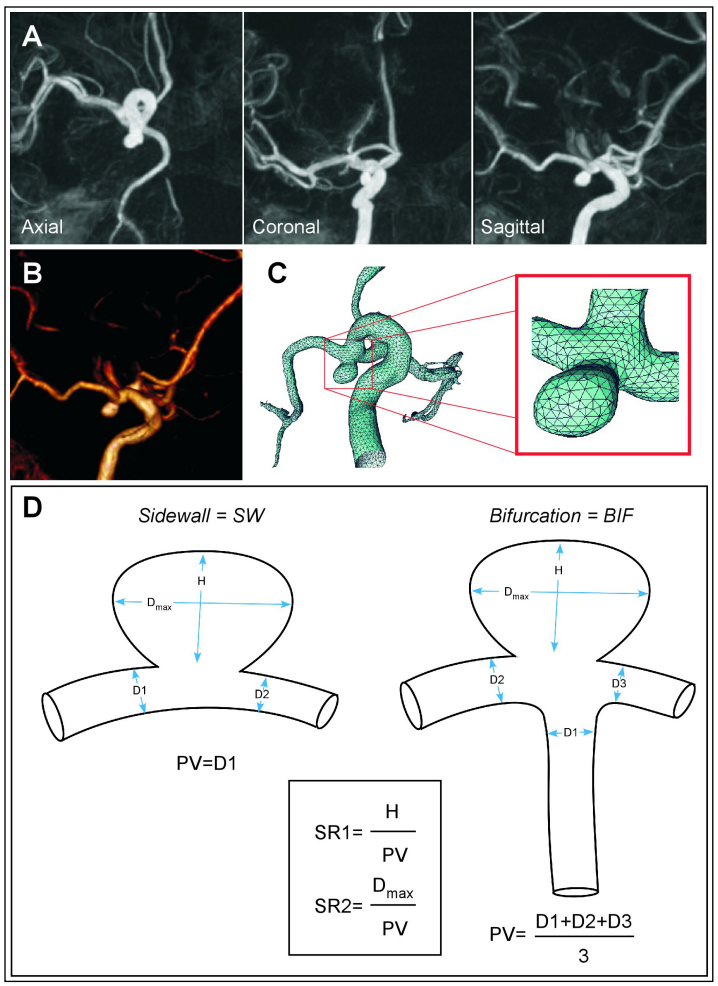
Introduction

Aneurysm size ratio (SR), variably defined as the ratio of dome height (H) or maximal dimension (Dmax) over parent vessel (PV) diameter, has been proposed as an aneurysm rupture status predictor.

We sought to evaluate the incremental contribution of SR to rupture status determination in a large high-resolution aneurysm database.



Methods

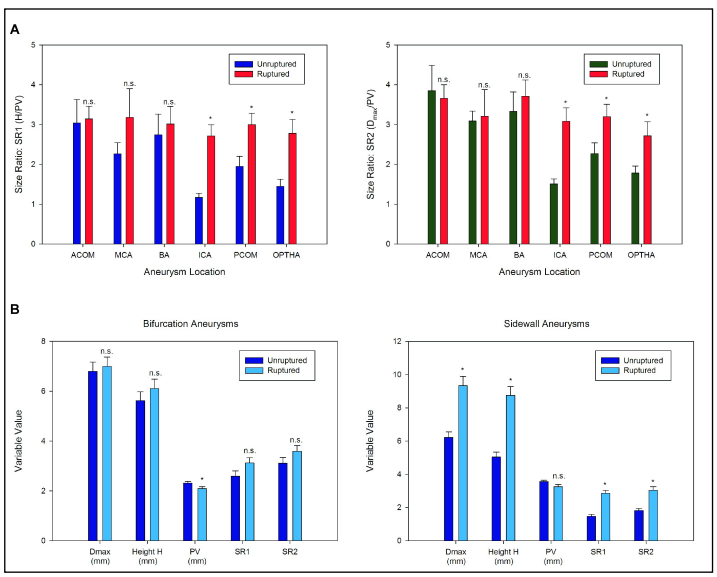
Measurements were performed on catheter 3D-rotational angiographic volumetric datasets for 267 aneurysms (98 ruptured). SR was computed both as H/PV (SR1) and as Dmax/PV (SR2) and its discriminant performance evaluated on the whole dataset, on aneurysm-type subsets (bifurcation (BIF) vs. sidewall (SW)), and at specific aneurysm locations. Univariate and multivariate statistical analyses were performed using area under the curve (AUC) of the receiver-operating characteristics.

Results

Neither SR1 nor SR2 were statistically correlated to rupture status in the BIF group where only PV (AUC=0.61) achieved significance. All parameters were statistically significant in the combined group, but with modest performance (AUC range 0.62-0.74).

SR1 (AUC=0.84) and SR2 (AUC=0.78) were strong predictors in the SW group, similar to H (AUC=0.83) and Dmax (AUC=0.77).

Multivariate statistics failed to support SR as an incremental independent parameter from PV, Dmax and H.



Conclusions

SR provides an uneven performance that depends strongly on the BIF/SW distribution of the data and is not useful for bifurcation lesions. In the SW subset, the incremental contribution of the SR over its H or Dmax individual component measurements could not be validated, suggesting prior findings of its utility to be the result of aneurysm-type selection bias.

Learning Objectives

1-Identify importance of aneurysm shape parameters and their association with aneurysm rupture status

2-Determine the relative value of aneurysm size ratio and other morphological parameters among aneurysm sub-classes

References

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