



Treatment of Small Ruptured Intracranial Aneurysms: Comparison of Surgical and Endovascular Options

Nohra Chalouhi; David Penn; Stavropoula I. Tjoumakaris MD; Pascal Jabbour MD; L. Fernando Gonzalez MD; Robert M.

Starke MD MSc; Muhammad Ali MD; Robert H. Rosenwasser MD, FACS, FAHA; Aaron S. Dumont MD

Department of Neurological Surgery, Thomas Jefferson University and Jefferson Hospital for Neuroscience, Philadelphia, PA




Introduction

Small intracranial aneurysms pose significant challenges to endovascular therapy. Surgical clipping is considered by many as the preferred treatment for these lesions. We present the results of the first study comparing the two treatment modalities in small ruptured aneurysms (SRA).

Methods

Between 2004 and 2011, 151 patients with SRA (3 mm or less) were treated in our institution, 91 (60.3%) with endovascular therapy and 60 (39.7%) with surgical clipping. All procedures were performed by neurosurgeons trained in both microsurgical clipping and endovascular embolization. Elderly patients with multiple comorbidities or poor neurological grades often were preferentially offered an endovascular procedure. Perioperative adverse events and clinical outcomes were analyzed and compared. A multivariable logistic regression analysis was carried out to determine predictors of perioperative complications and patient outcome.

Posterior Communicating Artery Aneurysm



Lateral angiogram (left) showing a 2.9 x 2.0 mm posterior communicating artery aneurysm in a patient with subarachnoid hemorrhage. The aneurysm was successfully coiled (center) and maintained adequate occlusion at the 1-year follow-up (right).

Results

Of 91 patients in the endovascular group, 81 were treated with conventional coiling, 5 with stent-assisted coiling, 4 with balloon-assisted coiling, and 1 with Onyx HD 500 (eV3).

The surgical and endovascular groups were generally comparable with respect to baseline demographics with the exception of larger mean aneurysm size in the endovascular compared to surgical group (2.81 vs. 2.55mm, respectively, $p<0.001$) and a higher proportion of posterior circulation aneurysms in the endovascular group.

Endovascular treatment failed in 9.9% of patients. Procedure-related complications occurred in 23.3% of surgical patients versus 9.8% of endovascular patients ($p=0.008$). Only 3.7% of patients undergoing endovascular therapy experienced an intra-procedural aneurysm rupture. There were no procedural deaths or rehemorrhages in either group.

In multivariable logistic regression analysis, surgical treatment was the only predictor of perioperative complications (odds ratio=2.4; 95% confidence interval, 1.2–8.4; $P=0.03$).

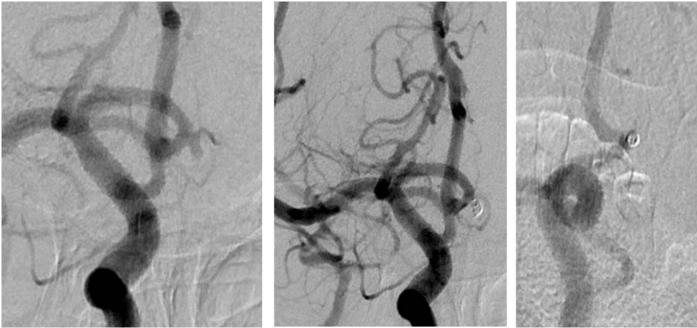
Favorable outcomes (GOS IV-V) were not statistically different between endovascular (67.1%) and surgical (56.7%, $p=0.27$) groups. In multivariable logistic regression analysis, Hunt and Hess Grades III to V (odds ratio=0.08; 95% confidence interval, 0.03–0.2; $P<0.001$) were the only significant predictor of poor clinical outcome.

The rates of aneurysm recanalization and retreatment after endovascular therapy were 18.2% and 12.7%, respectively.

Conclusions

Lower procedural complication rates were seen with endovascular therapy as compared to open surgery in SRA. Overall patient outcomes, however, were similar. Both treatment options may be effectively applied in patients harboring SRA.

Anterior Communicating Artery Aneurysm



Angiogram showing a 3 x 2 mm anterior communicating artery aneurysm in a patient with subarachnoid hemorrhage (left). The aneurysm was successfully embolized with coils (center), and remained occluded at follow-up (right).

Learning Objectives

By the conclusion of this session, participants should be able to:
Discuss the advantages and limitations of endovascular therapy and surgical clipping in SRA.