



Treatment of Complex and Wide-Necked Intracranial Aneurysms in the Setting of Acute Subarachnoid Hemorrhage: Comparison of Stent-Assisted Coiling and Balloon Remodeling

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Introduction

Stent-assisted coiling (SAC) and balloon-assisted coiling (BAC) are two well-established techniques for the treatment of complex and wide-necked intracranial aneurysms. Most clinicians are reluctant to perform SAC in the setting of subarachnoid hemorrhage (SAH) because of the need for dual antiplatelet therapy. We present the results of the first study comparing the safety and efficacy of SAC and BAC in acutely ruptured complex and wide-necked aneurysms.

Methods

Between 2008 and 2012, 44 patients underwent SAC and 40 underwent BAC for complex and wide-necked aneurysms in the setting of SAH. Patients treated with SAC received 600 mg of clopidogrel intra-operatively and were maintained on daily doses of clopidogrel (75 mg) and aspirin (81 mg). Peri-operative adverse events and clinical outcomes were analyzed and compared.

Balloon-Assisted Coiling

3D reconstruction of angiography showing a 6 x 4 mm superior cerebellar artery aneurysm in a patient with a Hunt and Hess Grade III subarachnoid hemorrhage (left). Angiogram after treatment with balloon-assisted coil technique (center). (c) Six month follow-up angiogram demonstrating persistence of occlusion with patency of branching vessel (right).

Results

The two groups were statistically comparable with respect to all baseline characteristics except for older age in SAC patients (65.6 versus 56.5 years, $p=0.009$). A higher proportion of SAC patients had also poor Hunt and Hess grades (III-V) compared to BAC patients (70.5% versus 55%, $p=0.14$).

Hemorrhagic, thrombo-embolic, and overall procedural complications occurred respectively in 6.8%, 11.4%, and 18.2% of the SAC group versus 2.5%, 7.5%, and 10% of the BAC group ($p=0.5$, $p=0.64$, $p=0.35$, respectively). In multivariable analysis, after controlling for potential confounding factors, there was no association between the type of treatment and perioperative complications. Older age was the only significant predictor of complication ($p=0.01$).

Clinical follow-up was available in 95.3% of patients at an average of 7.4 months. Favorable outcomes (Modified Rankin Scale 0-3) were seen in 73.2% of the SAC group versus 79.4% of the BAC group ($p=0.5$). In multivariable analysis, after controlling for differences in baseline characteristics, the type of treatment was not a predictor of favorable long term clinical outcome (Modified Rankin Scale 0-3). Lower Hunt and Hess grade ($p<0.001$) and success with initial occlusion ($p=0.01$) were predictors of favorable long term outcome.

Recurrences requiring retreatment occurred in 4.2% and 7.7% of SAC and BAC patients, respectively ($p=0.5$). In multivariable analysis, aneurysm size was the only predictor of occlusion at follow-up irrespective of treatment technique.

Conclusions

BAC may have a lower complication rate compared to SAC in ruptured aneurysms, but overall patient outcome is similar. Both techniques are feasible and effective and can be safely applied in clinical practice.

Stent-Assisted Coiling

Angiogram demonstrating an irregularly shaped ruptured right posterior communicating artery aneurysm with a second, smaller proximal aneurysm (left). Initial (center) and follow-up (right) angiograms showing durable aneurysm obliteration with stent-assisted coiling.

Learning Objectives

By the conclusion of this session, participants should be able to: 1) Discuss the advantages and limitations of SAC and BAC in acutely ruptured intracranial aneurysms.