Title: Combined Surgical and Endovascular Treatment of Cerebral Arteriovenous Malformations in the Hybrid Operating Room

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Introduction

Microsurgical resection, endovascular means and stereotactic radiotherapy are the major treatments of cerebral arteriovenous malformations (AVM) and each method has its own limitations. Preoperative fractionation embolization can reduce bleeding and surgical risk, however, patients have to experience repeated pain due to the repeated treatments, and face the risk of rupture of AVM during treatment. The purpose of this study is to evaluate the advantages and safety of combined surgical and endovascular procedures in hybrid operating room in the treatment of cerebral AVM.
Methods

Data of 195 cases of cerebral AVM underwent combined surgical and endovascular procedures were reviewed retrospectively. Digital angiography machine was PHILIPS Allura Xper FD20C. The advantages and work flow of multi-modality imaging during combined surgical and endovascular procedures were also analyzed.
Results

One hundred and ninety-five patients were successfully completed with combination of endovascular therapy and craniotomy in the hybrid operating room from February 2016 to July 2017 in Beijing Tiantan Hospital. There were 126 male (64.62%) and 69 female (35.38%). The mean age was 27.0±14.4 year (5-70 years), with a median Spezler-Martin grade 2.54±0.98 (range 1-5). The average time of operation was 7.0±0.8h (range 1-12.5h). The median time spend on changeover of endovascular therapy and surgical resection was 0.98±0.07h (range 0.2h-3h). There was no operative death. We get our initial experience of combined surgical and endovascular procedures in hybrid operating room (OR) in the treatment of cerebral AVM.
Discussion

The optimal treatment regimen for each individual AVM patient can be difficult to determine. Currently there is no consensus on AVM treatment, especially for the Spetzler-Martin (SM) grade III to V patients. The treatment guideline from AHA is surgery for low SM grade lesions unless the lesion location or draining vein characteristics precluded safe resection, whereas radiosurgery may be more appropriate. For high-grade (SM IV or V) lesions, surgery is typically not recommended as a monotherapy, but a combined approach may be beneficial in selected cases. For intermediate (SM III) lesions, multimodality treatment was suggested.
Summary Points

It is successful to complete combined microsurgical and endovascular conducted in a hybrid OR. Hybrid operation can improve the ratio of total resection and efficacy of surgery of cerebral AVM, and reduce post-operative complications, medical costs and the repeated pain due to the repeated DSA examinations.
Figure: the Hybrid Operating Room