

The Natural History of Coiled Cerebral Aneurysms Stratified by Modified Raymond Roy Occlusion Classification

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Introduction

The natural history and long-term durability of Guglielmi detachable coil (GDC) embolization is still unknown. We hypothesize a stepwise decrease in durability of first time GDC embolized cerebral aneurysms as stratified by the modified Raymond Roy Classification (MRRC).

Methods

All first time GDC embolized cerebral aneurysms were retrospectively reviewed at a single institution from 2004-2015. GDC embolization durability was defined by long-term aneurysm stability on followup radiographic evaluation. Loss of durability (LOD) was defined by change in aneurysm size or patency seen on serial radiographic follow-up. Kaplan-Meier survival analysis was performed to evaluate embolization durability. Multivariate Cox Regression Modeling was used to assess baseline aneurysm and patient characteristics for their effect on LOD.

Learning Objectives

By conclusion of this session, participants should be able to: 1) understand the Modified Raymond Roy Occlusion Classification System (MRRC), 2) Understand the limitations of the MRRC, 3) identify factors associated with aneurysm recurrence, rupture, or regrowth after endovascular coiling found in our study.

Results

Four-hundred and twenty-seven patients with 443 aneurysms met inclusion criteria. Overall, 89 (21%) aneurysms met LOD criteria. Grade 1 aneurysms were found to have statistically significantly greater durability than all other MRRC grades. Grade 3b aneurysms had significantly worse durability than all other aneurysm grades. There was no difference in durability between grade 2 and 3a aneurysms. Of aneurysms with LOD, 26 (29%) experienced worsening of MRRC grade. In our multivariate analysis, only initial MRRC grade was statistically significantly associated with treatment durability (p<0.001).

Conclusions

MRRC grade is independently associated with first time GDC embolized cerebral aneurysm durability. Achieving MRRC grade 1 occlusion outcome is significantly associated with greater long-term GDC durability. The opposite is true for MRRC grade 3b occlusion. Although few aneurysms experience further growth and/or recanalization, it appears that a majority of incompletely obliterated aneurysms tend to remain stable and/or occlude over time. Grading scales such as the MRRC are useful for characterizing aneurysm occlusion but appear to lack sensitivity and specificity for characterizing changes in aneurysm morphology over time.

References

see attached manuscript.



FIGURE 1 – Immediate Post-Treatment MRRC grade (Black) versus Last Followup MRRC Grade or MRRC Grade at Loss of Durability (Grey).



FIGURE 2 – Immediate Post-Treatment MRRC grade (Black) for Aneurysms Experiencing LOD versus Grade at Loss of Durability (Grey).



FIGURE 3 – Kaplan Meier Time to Loss of Durability Curve Stratified by Modified Raymond Roy Classification Grading.



FIGURE 4 – A) Initial Angiogram Demonstrating a 12mm Anterior Communicating Artery Aneurysm on Right Internal Carotid Artery Injection, B) Postcoiling Angiogram Demonstrating MRRC Grade 2 Remnant, C) 6-month Posttreatment MRA Demonstrating Enlargement of Base Remnant, D) Followup Angiogram After MRA Evidence of Base Recanalization Demonstrating Clear Evidence of Coil Compaction with Base Enlargement but Grade Remains MRRC 2, E) Retreatment of Base Recurrence, F) Final Outcome After Retreatment Demonstrating MRRC Grade 3a.