EFFECT OF PRE-OPERATIVE EMBOLIZATION ON AVM BLOOD FLOW

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Introduction

Prior to surgical resection of arteriovenous malformations (AVMs), pre-operative embolization is primarily used to sequentially and gradually reduce flow in the AVM; the success in achieving this goal is primarily subjective through assessment of the angiographic runs pre and post embolization. We sought to directly measure the effects of embolization on AVM flow using Quantitative Magnetic Resonance Angiography (QMRA).

Methods

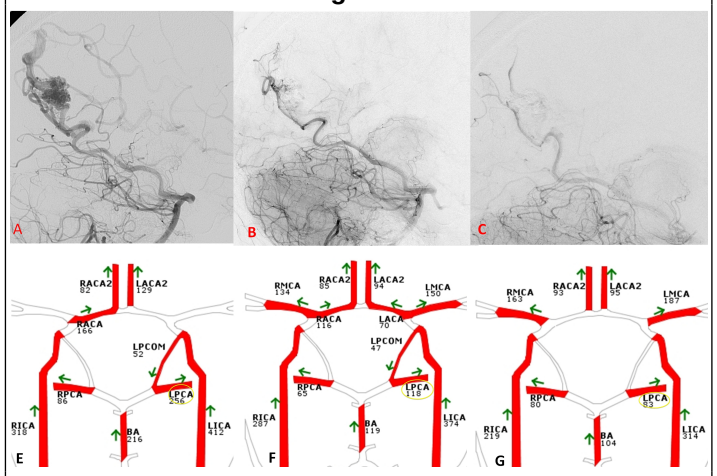
Medical charts, cerebral angiograms, and flow measurements were reviewed in patients with QMRA measurements of AVM flow pre and post embolization. Total AVM flow was calculated based on aggregate flow within the primary arterial feeders, or within draining veins. AVM flows were compared pre and post embolization. All sessions of embolization were performed with N-BCA glue except three sessions where Onyx was used.

Results

51 AVM patients were evaluated with QMRA. Among those, 17 patients had flow measurements pre and post embolization:

- Total of 42 sessions (range 1 to 6 per patient).
- Average AVM flow prior to treatment: 439cc/min (range 129 to 952 cc/min)
- Median AVM size: 6.4 cc (range 2.3-32.0 cc)
- Median # of pedicles embolized per session: 3, (range 1-5)
- Mean flow drop per session: 133 cc/min (range 14-410cc/min), representing an average 40% flow decline per session relative to flows immediately prior to the embolization.

Figure 1

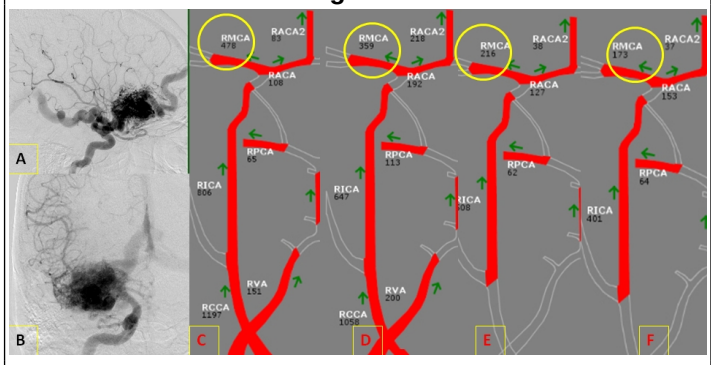


A. Baseline and sequential angiograms (B, C) post partial embolization of occipital AVM with glue. Corresponding Q-MRA flow maps at baseline (D). Post embolization arterial maps (E,F) showing sequential drop in flow within the AVM feeder artery of the left PCA.

Results (Cont)

In larger AVMs, overall flow changes were sometimes not evident until the second or third sessions of embolization, suggesting re-channeling of flow through remaining compartments of the nidus. As compared to the baseline, there was an overall 67% (range 27-99%) reduction in AVM flow at the end of multiple sessions of embolization, with mean AVM flow dropping to 103 cc/min (range 5-300 cc/min) before the surgery. Interestingly, the number of pedicles embolized per session did not correlate with the flow drop, which also correlated poorly with with subjective determinations of the extent of embolization at time of angiography.

Figure 2



Baseline Lateral (A) and AP (B) cerebral angiogram showing an AVM feeding from right MCA. (C) Baseline Q-MRA flow maps, and post sequential (D, E, F) embolization using glue showing drop in the flow within the AVM feeder of the right MCA.

Conclusions

Flow alterations induced by embolization can be quantified, and may provide a robust strategy to determine the number and efficacy of preoperative embolization sessions.

Learning Objectives

By the conculsion of this session, participants whould be able to:

1)-Learn the role of flow measurments in AVM treatment.

2)- Learn to quantitate AVM flow drop in AVM embolization