

Delayed Cerebral Vasospasm Following Elective Clipping of an Unruptured Intracranial Aneurysm: Case

Report and Literature Review.

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Introduction

Delayed cerebral vasospasm with subsequent ischemic neurological deficit is a rare complication of elective clipping of unruptured intracranial aneurysms. Multiple pathophysiologic mechanisms have been postulated including endothelial dysfunction, intra-operative use of temporary clips and retractors, vasospastic mediators from hemolytic products or direct diffusion from the aneurysmal sac, hypothalamic injury, and the trigemino-cerebrovascular reflex. However, these mechanisms remain poorly understood especially with uncomplicated surgery with delayed onset of vasospasm and no evidence of post-operative subarachnoid hemorrhage.

Methods

We reviewed the clinical data and imaging from the index case and conducted a systematic review of the medical literature using PUBMED and keywords. We reviewed the bibliographies of each result to identify additional papers and continued this iterative method of review until the process exhausted. Publications pre-dating the CT era or those that could not exclude peri-operative subarachnoid hemorrhage were excluded.

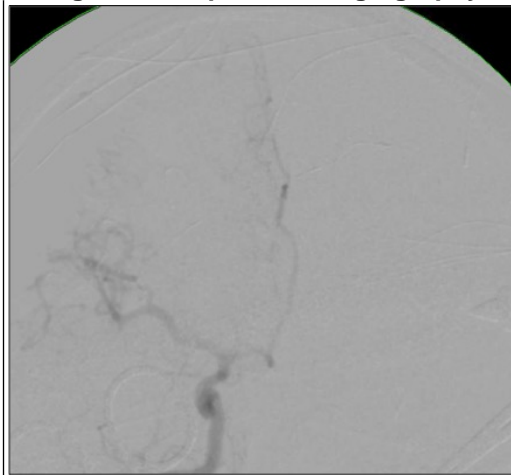
Case Report

Our case regards the clinical course of a 30yo male with unremarkable PMH after elective clipping of an 8x6x6mm unruptured R ICA bifurcation aneurysm (Fig 1). Successful R pterional craniotomy was performed with use of 1 permanent clip and no evidence of SAH or vasospasm on intra-operative angiography (Fig 2).

Fig.1: Pre-operative Angiography

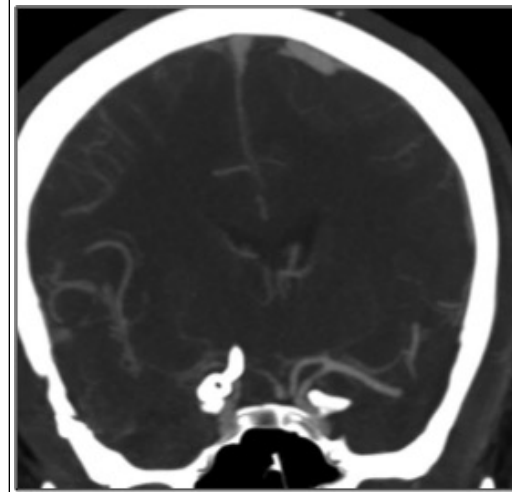


Fig.2: Intra-operative Angiography



On POD 11, patient experienced seizures, LLE paresis grade 3/5, and eventual progression of symptoms to include acalculia and apraxia. NIH Stroke Scale 7. Coronal CTA on POD 13 showed evidence of diffuse vasospasm in the supraclinoid ICA, R A1, and R M2 (Fig 3).

Fig.3: POD 13 Coronal CTA



Treatment involved Triple H therapy with discharge on POD 29 and full recovery back to neurological baseline 4 weeks later.

Results - Literature Review

Temporary Clips Used	Yes (50%); No (20%); Unknown (30%)
# Permanent Clips	[1-3]; 50% used multiple clips
Intra-operative Complications	No complications (66.67%) Aneurysmal dome rupture (2) Transient frontal branch occlusion (1) Cavernous sinus bleed (1)
Post-operative CT Findings	Normal post-operative changes (80%) Frontotemporal ICH (1) Mild epidural hematoma (1)
Treatments Used	Triple H therapy (40%); Hydration only (50%) Chemical Angioplasty (60%) Antiplatelet therapy (40%); Steroid (10%)
Recovery	Full (58.3%); Min. neurologic deficit (41.67%)

Conclusions

Early recognition of delayed cerebral vasospasm is crucial to reversal of ischemic neurologic deficit after elective aneurysm repairs. No single etiologic factor has been identified although the ICA/MCA are the most common locations. Further research into vasospasm is needed to understand the mechanism.

Characteristics of Delayed Vasospasm Case Reports, 1980-2017

Sex	9F/1M (90% Female)
Age	[21-63]; mean = 52.7 years
Aneurysm Location	All anterior circulation 60% ICA, 40% MCA
Size	Not reported in 3 patients. [4-8mm]; mean = 4.9 mm
Vasospasm Presentation	Paresis (80%) & Aphasia (60%) Headache, Gerstmann, AMS, Seizure
Onset	[POD 1-28 days]; mean = 11.9 days

Learning Objectives

- Recognize the symptoms of vasospasm following elective clipping of unruptured intracranial aneurysms and select confirmatory test modalities.
- Describe the known etiological risk factors for vasospasm following clipping of unruptured intracranial aneurysms.
- Implement treatment to reverse the effects of vasospasm following clipping of unruptured intracranial aneurysms.

References

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