Unusual presentation of AV malformation in presumed complicated sinusitis

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INTRODUCTION

- Cerebral arteriovenous malformations (AVMs) are common cause of intracranial hemorrhage in children & approximately 10% of AVMs can have intracranial aneurysms
- Risk of spontaneous Intracranial hemorrhage is estimated to be 2-4% per year
- AVMs can also lead to mass effects(hematoma, edema), metabolic suppression and seizure activity

CASE DESCRIPTION

- 10 yo female admitted with initial symptoms of nasal congestion, sore throat, frontal headache, photophobia. During admission, she developed profound headache, fever and vomiting. CT sinuses was ordered to rule out complicated sinusitis.
- CT of the sinuses showed unanticipated intracranial bleeding with midline shift.
- Medical therapy was initiated for increased intracranial pressure. Angiography revealed Spetzler-Martin grade 3 AVM in left frontal lobe with few major feeders.
- Craniotomy with excision of AVM was performed urgently. Patient was extubated in OR and had an uneventful postoperative course.

Cerebral circulatory changes in AVMs

- Nidus, a vascular mass directly shunts blood between arterial and venous circulation without a true capillary bed
- Rapid shunt flow leads to cerebral arterial hypotension along the path of shunt, but have adaptive changes in total cerebral vascular resistance to maintain normal tissue perfusion. This is achieved by left shift of autoregulation curve in the vascular territories adjacent to AVMs.

Spetzler-Martin Grading

- Estimates the risk of open surgery by evaluating AVM size, eloquence of brain location and pattern of venous drainage
- Eloquent of brain – Sensorimotor, visual, speech, hypothalamus, thalamus, brain stem, cerebellar nuclei or regions directly adjacent to these structures
- Higher grade – Increase morbidity and mortality

Challenges during surgery

- Unique anatomic and physiologic characteristic of AVMs and need for urgent intervention present challenges to pediatric anesthesiologist
- Location of AVMs – adjacent to vital structure, deep perforating vessels, association with aneurysms
- Intraoperative identification of artery vs vein due to arterialization of vein
- Intraoperative bleeding can be from continuous capillary oozing which is difficult to control
- Potential for massive blood transfusion
- Brain protection during temporary clip placement
- Hemodynamic goals are different intraoperatively and postoperatively
- TIVA vs Inhalation anesthetics
- Appropriate sedation and analgesia to allow neurological evaluation during emergence and extubation

Preparation

- Preoperative neurological evaluation including size and site of AVM
- Immediate blood availability and potential need for massive transfusion
- Adequate vascular access including invasive monitoring
- Intraoperative hemodynamic management
- Brain protection during temporary clip placement
- Postoperative monitoring and management

Principle of management

- Communication amongst the team member is very important in management
- Risk of AVM rupture is minimized by optimizing pressure on arterial side and preventing venous blockade
- Post resection, strategies to prevent “Normal perfusion pressure breakthrough” can help in decreasing brain swelling and hyperemia

DISCUSSION

- Surgical management of brain AVMs is challenging and perioperative management is optimal when anesthetist has familiarity with pathophysiology of AVMs and strategic goals of therapy
- High grade lesions are treated often with multidisciplinary approach including surgery, endovascular & radiosurgical techniques
- Interventional procedure to coil/glue AVMs are associated with risk of hemorrhage and ischemia
- Use of dexmedetomidine has shown to prevent hemodynamic perturbation and NPPB during emergence
- “Threat of bleeding and catastrophe is high in AVM surgery and intraoperative excitement is rarely associated with good outcomes. The neurosurgeon and anesthesiologist must make preparations to deal with the worst of complications while working continuously to avoid them”
- “Best AVM surgery is steady and meticulous for surgeon and quiet and unexciting for anesthesiologist”

BIBLIOGRAPHY