Barbiturate Coma in the Management of Intracranial Hypertension Associated With Spontaneous Rupture of Cerebral Arteriovenous Malformations in Children

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Introduction

Optimal definitive management of a ruptured AVM, by either surgical, radiosurgical and/or endovascular techniques, is best achieved after resorption of the hematoma and its attendant inflammation. Dangerously elevated intracranial pressure, however, may necessitate treatment, often temporizing, prior to hematoma resolution. Emergent surgical evacuation may be complicated by further damage to the edematous brain and/or bleeding from a poorly defined AVM.

The use of barbiturates to control elevated intracranial pressure in children with traumatic brain injury is well established. In the setting of a ruptured AVM, however, the use of barbiturates is less well described. We investigated the results of barbituate coma to control elevated ICP in patients with acute ICH secondary ruptured AVM.

Methods

A retrospective chart review of pediatric patients with intracranial hemorrhage and hypertension from a ruptured AVM who received barbiturate therapy from 1997 to 2015 was performed. Data regarding efficacy, complications and outcome were collected.

Results

Twenty-two pediatric patients (M:F 15:7; ages 4 - 17 years) with intracranial hypertension secondary to AVM hemorrhage were identified. Two patients experienced early intractable intracranial hypertension and progressed rapidly to brain death. One of these patients experienced early re-hemorrhage and the other suffered massive ischemic infarction after the initial hemorrhage.

In the survivors, mean pentobarbital infusion duration, ICU duration and hospital stay were 6.3 days, 21.7 days and 27.6 days, respectively. One patient exhibited poorly controlled intracranial pressure and underwent hematoma evacuation and decompressive craniectomy on post-hemorrhage day 4. Eighteen of 20 survivors required vasopressor support for barbiturate induced hypotension. Complications observed during their ICU stays included pneumonia (40.9%), sepsis (27.2%), pancreatitis (22.7%) and urinary tract infections (18.1%).

Various outcome scores (Glascow Outcome Score, Pediatric Cerebral Performance Category and Pediatric Overall Performance Catgory) revealed favorable neurologic outcomes amongst survivors with none appearing to have deteriorated neurologically during the period of medical ICP treatment. All patients subsequently underwent succesful definitive AVM treatment (microsurgery, radiosurgery, endovascular or combined).

Conclusions

Barbiturate therapy appears effective in controlling intracranial hypertension and may avoid the need for emergent craniotomy in the setting of a ruptured AVM in pediatric patients. Further investigation is necessary in order to compare barbituate treatment of intracranial hypertension to standard medical treatment and early surgical decompression. In general, children with ruptured AVMs have better outcomes than adults - even with poor initial neurological status. Complications of barbituate treatment related to systemic hypotension and infections are common and should be anticipated.

Learning Objectives

By the conclusion of this session participates will consider barbiturate therapy in their patients with ruptured AVMs and be aware of the potential advantages and complications associated with this modality.

References

1) *Meyer PG, et al.* Emergent management of deeply comatose children with acute rupture of cerebral arteriovenous malformations. **Can J Anesth** 2000; 47:8 102-106
2) *Singhai A, et al.* Pediatric patients with poor neurological status and arteriovenous malformation hemorrhage:an outcome analysis. **J Neurosurg Pediatrics** 2011; 7:462-467
3) *Beslow LA, et al.* Pediatric Intracerebral Hemorrhage Score. **Stroke** 2014; 45:66-70