The Identification of a Subgroup of Children with Traumatic Subarachnoid Hemorrhage at Low Risk of Neuroworsening

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Introduction

Pediatric traumatic subarachnoid hemorrhage (tSAH) often results in intensive care unit (ICU) admission, the performance of additional diagnostic studies, and ICU-level therapeutic interventions to identify, and potentially prevent, episodes of neuroworsening (NW). Identification of a subgroup of children with tSAH at negligible risk for NW may avoid unnecessary escalation of care and potentially morbid interventions, with improvement in healthcare utilization.

Methods

Data prospectively collected in an institutionally-specific trauma registry at Rady Children's Hospital between 2006-2015 was supplemented with a retrospective chart review of children admitted with isolated tSAH. Risk of blunt cerebrovascular injury (BCVI) was calculated using the BCVI clinical prediction score. Appropriate statistical analysis was performed.

Results

317 of 10,395 total pediatric trauma patients were admitted with tSAH. 51(16%, 23 female, 28 male) children were identified with isolated tSAH without midline shift on neuroimaging and a GCS of 13-15 at presentation. Median age was 4 years (18 days -15 years). 7 had modified Fisher grade 3 SAH; the remainder were grade 1. 26 (51%) had associated skull fractures; 4 involved the petrous temporal bone and 1 the carotid canal. 39 (76.5%) were admitted to the ICU; 12 (23.5%) to a standard surgical ward. 4 had an elevated BCVI score. 8 underwent CT angiography and no vascular injuries were identified. 6 were administered hypertonic saline in the ICU. The average length of stay for ICU patients was 77% longer (2.02 vs. 1.25 days). NW was not observed in any child.

Conclusions

Children with isolated tSAH without midline shift and GCS 13-15 at presentation appear to have minimal risk of NW, despite the finding in some children of vertex and basilar skull fractures, elevated modified Fisher grade, and elevated BCVI score. In this specific subgroup of children with tSAH, ICU-level care and additional ancillary diagnostic imaging may not be warranted.

References

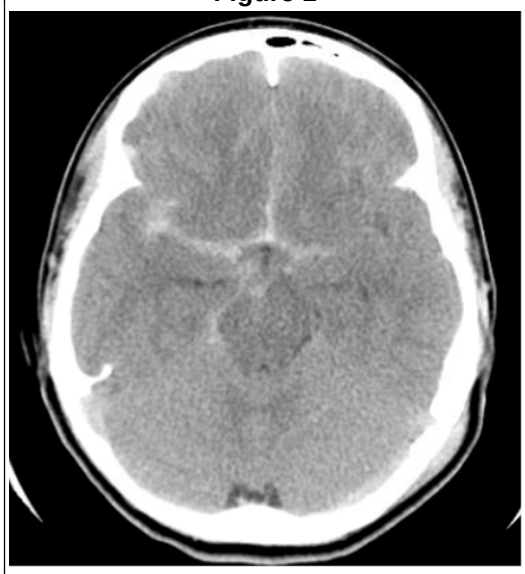
Morris GF, Juul N, Marshall SB, Benedict B, Marshall LF. Neurological deterioration as a potential alternative endpoint in human clinical trials of experimental pharmacological agents for treatment of severe traumatic brain injuries. Executive Committee of the International Selfotel Trial. Neurosurgery. Dec 1998;43(6):1369-1372; discussion 1372-1364.

Ravindra VM, Riva-Cambrin J, Sivakumar W, Metzger RR, Bollo RJ. Risk factors for traumatic blunt cerebrovascular injury diagnosed by computed tomography angiography in the pediatric population: a retrospective cohort study. J Neurosurg Pediatr. Jun 2015;15(6):599-606.

Learning Objectives

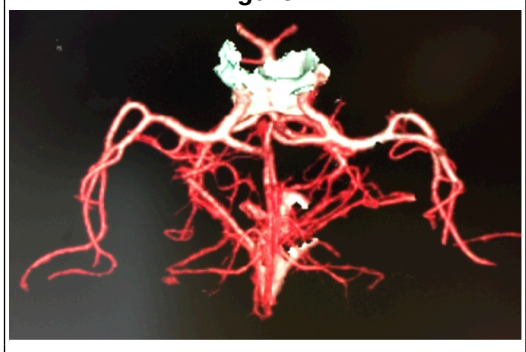
By the conclusion of this session, participants should be able to: 1) Describe the importance of appropriate triage of patients with tSAH, 2) Discuss, in small groups, various treatment paradigms for tSAH, 3) Identify an effective treatment and diagnostic strategy for children with tSAH

Figure 1



Non-contrast admission head CT demonstrates modified Fisher scale grade 3 SAH

Figure 2



CT angiogram of same patient has no evidence of traumatic arterial pathology