Increased Risk of Subarachnoid Space Enlargement in Infants with Chronic Upper Respiratory Infections and Increased Right Atrial Pressure

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Introduction

Benign enlargement of the subarachnoid spaces (BESS) in infancy occurs due to a transient accumulation of cerebrospinal fluid (CSF) in the frontoparietal regions (Figure 1). Buildup of CSF can be caused by many factors, including insufficient reabsorption due to impaired venous outflow from the head. Reabsorption of CSF is primarily achieved via the dural venous sinuses where it feeds back into systemic circulation. Despite the commonality of BESS during infancy, its exact etiologies remain to be determined. BESS has generally been described as a variation of normal neurodevelopment and clinically presents as macrocephaly, with normal intracranial pressure. However, it carries an increased risk of subdural hemorrhage, arachnoid cyst formation, and hydrocephaly. The bridging veins span the subdural space and can be stretched by BESS, which can lead to subdural hemorrhages following minor head trauma.

Learning Objectives

By the conclusion of this session, participants should be able to:
1) Describe BESS and the pathophysiology behind impaired venous outflow from the head,
2) Discuss, in small groups, the implications and potential outcomes of BESS, and
3) Identify potential preventions and interventions.

Hypothesis

We hypothesized that chronic URIs and increased RAP, which hinder venous drainage from the head, could be possible causes for BESS in pediatric patients under the age of 2.

MRI of BESS in a 6.5-Month-Old Boy

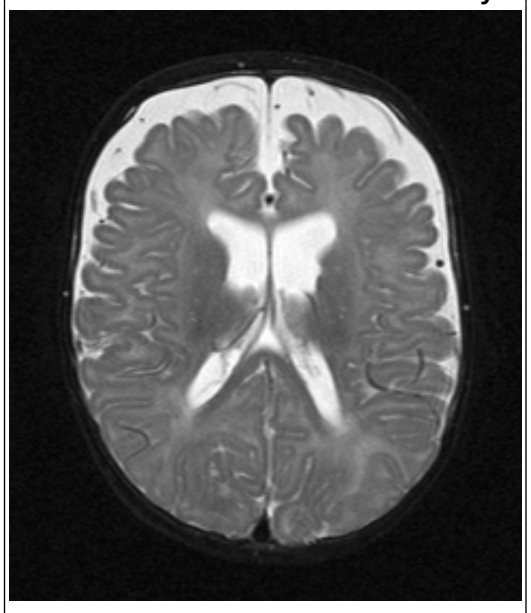

Figure 1. The frontal subarachnoid space is enlarged. Traversing vessels can be seen in the subarachnoid space. (Zahl et al.)

Methods

We conducted a retrospective review of patients diagnosed with macrocephaly or BESS before the age of 2, within a 125-mile radius of Lubbock, Texas, from 2010 to 2015. The patients were of varying ethnicities, with an emphasis on Hispanic and Caucasian. We used the ICD-9 and ICD-10 codes for macrocephaly to search the billing database for potential patients. All patients with confounding diagnoses and syndromes or prior illnesses that would predispose to BESS or macrocephaly were removed from the study. We determined the prior incidences of chronic URIs and increased RAP in our specified population and conducted a chi-square goodness of fit test to analyze the statistically significant difference from that of the general population.

Results

During the study period, 29 patients with macrocephaly or BESS were identified that fit the criteria. In these patients, the prior incidences of chronic URIs and elevated RAP were 37.9% and 10.3%, respectively—compared to 19.6% and 0.001% in the general population. The incidences of chronic URIs and elevated RAP were significantly higher in the BESS population.

Conclusions

Our results led us to reject the null hypothesis and conclude that there was an increased incidence of BESS in children with chronic URI and increase RAP. While the etiologies of BESS are unknown, our study presents potential factors leading to the development of BESS. While it is generally considered a transient condition during normal neurodevelopment, it could also be a result of pathological processes in some children. Our results have implications across a broad range of healthcare practices. Non-accidental trauma is typically considered when a young child has a spiral fracture or a subdural hemorrhage—the latter having a higher incidence in patients with a history of BESS. With further research, BESS could be a necessary addition to the differential. Pediatricians should, therefore, advise the parents of such patients about the increased risk of BESS and subsequent subdural hemorrhage, among other indicated complications.

References

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