Neurosurgical Forum

LETTERS TO THE EDITOR

Subdural collections in infants: trauma or not trauma?

TO THE EDITOR: We are writing in reference to the study reported by Tucker et al.⁶ (Tucker J, Choudhary AK, Piatt J: Macrocephaly in infancy: benign enlargement of the subarachnoid spaces and subdural collections. *J Neurosurg Pediatr* 18:16–20, July 2016). The goal of this study was to determine the relative frequencies of benign enlargement of the subarachnoid spaces (BESS) and subdural collections in a large consecutive series of imaging studies performed for macrocephaly, and to determine the prevalence of subdural fluid collections among patients with BESS. The authors reported that the presence of BESS was associated with a greater prevalence of subdural collections, and that higher grades of BESS were associated with increasing prevalence of subdural collections. They concluded that these results support the theory that infants with BESS have a predisposition to subdural collections on an anatomical basis.

We would like to bring up several concerns regarding their conclusion.

First, no clinical data concerning the 18 children with subdural collections are provided. Although the diagnosis of BESS is based on the expansion of the subarachnoid spaces, it is also dependent on necessary, important clinical data, as follows.

- 1) The pattern of the head circumference growth curve is crucial. The head circumference must increase regularly, without rapid increase, to +2 SDs between 3 and 6 months. It then must stabilize between the ages of 1 and 2 years and move smoothly back to approximately +2 SDs afterward. So, consideration of the head circumference curve is of major importance, but no head circumference data were provided in the report.
- 2) There must be no developmental abnormalities and no neurological signs. This does not seem to be the case for all the children in this study, because the authors report that “Infants with BESS are usually well, unless they exhibit mild gross motor delays related to the size of their heads.”

Second, the subdural collections may be due to unrecognized or unreported injury.^{3,4} Tucker et al. specified that there was no alleged history of trauma prior to the study:

“Patients who were determined from review of notes to have had a history of trauma or hydrocephalus prior to the index imaging study were excluded.” But we do not know if the children had undergone thorough exploration in terms of a potential abusive head injury, especially with funduscopy and radiological bone examinations.

Third, the interrater reliability for the imaging reports was not high. This would raise the concern that there could be too much variability in the interpretation of the imaging as well as the question about clinical application of the study results.

Finally, the opinion that infants with BESS have a predisposition to subdural collections on an anatomical basis is challenged. The literature does not support the hypothesis whereby BESS favors subdural collections in children. Several studies suggest that the widening of the pericerebral space observed in this paper corresponds to the sequelae of a previous undiagnosed head injury rather than BESS.^{1,2,5}

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Disclosures

The authors report no conflict of interest.

Response

As Drs. Laurent-Vannier, Rambaud, and Levin have noticed, our study had many limitations, most of which were plainly stated in the *Methods* section or reviewed in the *Discussion*. We write now to respond to their comments.

There were not “no clinical data concerning the 18 children with subdural collections...” There were data, but they were very limited. These patients had no mention in their medical records of any history of trauma. As stated in our report, many of these collections were not recognized in the initial interpretations, and only 3 cases had investigations for abuse. We cannot say that none of these children was a victim of unrecognized abuse. Indeed, the impossibility of proving this negative is a persistent feature of the child abuse literature.

The correspondents seem to have in a mind a definition of BESS that rests on the pattern of head circumference growth. The correspondents are similarly rigid about the absence of developmental delays and neurological signs. In the literature, the use of the term BESS is not so rigid. We plainly used the term as synonymous with prominence of the subarachnoid spaces (SAS) and quantitated that prominence as described.

There were not “no head circumference data” in our report; Z-scores were available for a limited subset of our cases, and they were discussed.

The interrater reliability in our diagnosis and grading of BESS was as stated. We reported κ statistics for transparency, but their interpretation is not intuitive. The prevalence of BESS in our sample was 0.59. For the sake of discussion, agreement on the basis of chance might be expected in roughly 52% of cases ($0.59^2 + 0.41^2 = 0.52$). For the diagnosis of BESS our κ statistics were greater than 0.60, which translates into agreement in more than 80% of cases ($0.52 + [1 - 0.52] \times 0.60 = 0.81$). We encourage the correspondents to develop a better methodology and to repeat our study with it.

We acknowledge that there are a variety of opinions about the association of prominence of the SAS and subdural collections, for which reason we conducted our study. The correspondents suggest that prominence of the SAS may be the consequence of previous head injury, in which case an associated subdural collection might be viewed as a residual effect from that injury, or as a sign of a second injury. There are 3 citations offered in support of this hypothesis. The paper by Raul et al. cited in our report

is a mathematical modeling study that is irrelevant to the correspondents’ hypothesis.³ The paper by Feldman et al. stresses the importance of distinguishing prominence of the SAS from the presence of subdural fluid, but it does not consider prominence of the SAS as a sign of previous injury.² The paper by Ewing-Cobbs et al. is more to the point.¹ These authors described “atrophy” in 9 of 30 infants with abusive head injury and in none of 29 older children with injuries not believed to be the result of abuse. They did not observe encephalomalacia in either group. The average age of the abuse victims was 10.26 months, whereas the average age of the control group was 34.79 months. Prominence of the SAS, which is indistinguishable from atrophy on the basis of imaging uninformed by clinical data, is quite common in infancy and regresses steadily through early childhood. The differing prevalences of “atrophy” observed by Ewing-Cobbs et al. were probably attributable to differences in age. If this study were ever to be repeated, a control group of uninjured infants would be appropriate.

We stand by our observations that prominence of the SAS or BESS—we used the terms interchangeably—is associated with subdural collections, and that grading of BESS is associated with the prevalence of subdural collections. We believe that these observations support the conclusion that infants with BESS have a predisposition to subdural collections on an anatomical basis. BESS does not protect infants from child abuse, and our report must not be construed to discourage thorough investigation of any infant with suspected abusive injury.

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