Neurosurgical forum
Letters to the editor

Aneurysm Size


Abstract

Object. The goal of this study was to determine the relationship between aneurysm size and the volume of subarachnoid hemorrhage (SAH).

Methods. One hundred consecutive patients who presented with acute SAH, which was diagnosed on the basis of a computerized tomography (CT) scan within 24 hours postictus and, subsequently, confirmed to be aneurysmal in origin by catheter angiography, were included in this study. The data were collected prospectively in 32 patients and retrospectively in 68. The volume of SAH on the admission CT scan was scored in a semiquantitative manner from 0 to 30, according to a previously published method.

The mean aneurysm size was 8.3 mm (range 1–25 mm). The mean SAH volume score was 15 (range 0–30). Regression analysis revealed that a smaller aneurysm size correlated with a more extensive SAH (r² = 0.23, p < 0.0001). Other variables including patient sex and age, intraparenchymal or intraventricular hemorrhage, multiple aneurysms, history of hypertension, and aneurysm location were not statistically associated with a larger volume of SAH.

Conclusions. Smaller cerebral aneurysm size is associated with a larger volume of SAH. The pathophysiological basis for this correlation remains speculative.

Data on mean SAH volume scores for aneurysms grouped by size (as presented in Table 5 and Fig. 3 in the article) seem to be inconsistent. As shown in Table 5, an aneurysm size of 6 to 10 mm was associated with a mean SAH volume score of 10.7, whereas a mean score of about 13 is depicted in Fig. 3. Similarly, data on larger aneurysms (11–15 mm, mean SAH volume score 5.1 compared with ~10) and greater than 15 mm (mean SAH volume score 1.6 compared with ~8) are not corresponding. Given the high variability of the SAH volume scores, I wonder if the presentation of the data is erroneous.

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RESPONSE: The data presented in Table 5 and Fig. 3 were reviewed using our statistical analysis program. The means graphically depicted in Fig. 3 were correct, but the means reported in Table 5 were incorrect. The probability values remained highly significant, however. We have provided a revised version of Table 5. We apologize for the inaccuracy, and thank Dr. Hasselblatt for highlighting this error to the readership.

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Rotational Injury

To THE EDITOR: This article (Prange MT, Coats B, Duhamel AC, et al: Anthropomorphic simulations of falls, shakes, and inflicted impacts in infants. J Neurosurg 99: 143–150, July, 2003) extends the work of two of the authors (Duhamel and Margulies) published by this journal 16 years ago.1 The methodology used in the most recent paper, although more complex, seems to have produced results similar to the original work in one important aspect.

Abstract

Object. Rotational loading conditions have been shown to produce subdural hemorrhage and diffuse axonal injury. No experimental data are available with which to compare the rotational response of the head of an infant during accidental and inflicted head injuries. The authors sought to compare rotational deceleration sustained by the head among free falls, from different heights onto different surfaces, with those sustained during shaking and inflicted impact.

Methods. An anthropomorphic surrogate of a 1.5-month-old human infant was constructed and used to simulate falls from 0.3 m (1 ft), 0.9 m (3 ft), and 1.5 m (5 ft), as well as vigorous shaking and inflicted head impact. During falls, the surrogate experienced occipital contact against a concrete surface, carpet pad, or foam mattress. For shakes, investigators repeatedly shook the surrogate in an anteroposterior plane; inflicted impact was defined as the terminal portion of a vigorous shake, in which the surrogate's occiput made contact with a rigid or padded surface. Rotational velocity was recorded directly and the maximum (peak–peak) change in angular velocity (ΔΘm) and the peak angular acceleration (Θm) were calculated.

Analysis of variance revealed significant increases in the ΔΘm and Θm, associated with falls onto harder surfaces and from higher heights. During inflicted impacts against rigid surfaces, the ΔΘm and Θm were significantly greater than those measured under all other conditions.

Conclusions. Vigorous shakes of this infant model produced rotational responses similar to those resulting from minor falls, but inflicted impacts produced responses that were significantly higher than even a 1.5-m fall onto concrete. Because larger accelerations are associated with an increasing likelihood of injury, the findings indicate that inflicted impacts against hard surfaces are more likely to be associated with inertial brain injuries than falls from a height less than 1.5 m or from shaking.

One of the conclusions of the original paper is "... the shaken baby syndrome, at least in its most severe acute form, is not usually caused by shaking alone. Although..."
shaking may, in fact, be a part of the process, it is more likely that such infants suffer blunt impact." In the current work, the authors state: "In addition, there are no data showing that the $\Delta \theta_{\text{max}}$ and the $\theta_{\text{max}}$ of the head experienced during shaking and inflicted impact against encased foam is sufficient to cause SDHs [subdural hematomas] or primary transient ischemic attacks in an infant.

Given the above conclusion by the same authors who conducted the same experiments with differing methodologies, published in the same journal 16 years apart, it would seem appropriate at this point to pose the question, "Why, then, need shaking be invoked as a causative mechanism in intracranial injury in infants at all, since according to both series of experiments, it does not seem to be a factor in causing such injury?"

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RESPONSE: Whereas our recent paper has a considerably broader focus that emphasizes falls and the influence of contact surface, USCinski, Thibault, and Ommaya are correct in pointing out consistency with results reported in our earlier paper. In both papers we measure relatively small rotational velocities and/or accelerations during vigorous shaking, and low height falls are below the thresholds for severe primary brain injuries. At these levels, however, there is a paucity of data in humans, animals, and cadavers, and therefore we cannot postulate whether brain injury would be associated with these events. To summarize, new research is needed to determine if injuries can occur in the brain, cervicomedullary junction, or cervical spinal cord as a result of a single or series of head rotations at these low magnitudes, and if these injuries are primary or secondary in nature. Therefore, we cannot yet answer if shaking can cause intracranial injury in infants, and use of terminology that includes this mechanism should be avoided.

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Cerebral Metabolism


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