Editorial

Lumbar drainage for increased intracranial pressure

M. SEAN GRADY, M.D.

Department of Neurosurgery, Hospital of the University of Pennsylvania, Philadelphia, Pennsylvania

The study by Tuettenberg et al. is very controversial. Performing lumbar drainage to treat elevated intracranial pressure (ICP) caused by brain injury seems ill advised, at best. The authors tested the hypothesis that lumbar drainage can be used to treat refractory increased ICP due to brain trauma or subarachnoid hemorrhage (SAH) without significant risk of induced brain herniation. This study was approved by the ethics committee at the University of Heidelberg, where the research was conducted, and is an extension of these authors’ prior work in 23 patients. One hundred patients were enrolled based on persistent increased ICP despite aggressive management including CSF drainage, osmotherapy, moderate hyperventilation, and other modalities based on guidelines developed by the American Association of Neurological Surgeons and the Brain Trauma Foundation. Intracranial pressure elevation was caused by trauma in 55% of patients and by aneurysmal SAH in the remainder. In this latter group the cause of the increased ICP was multiple cerebral infarctions caused by vasospasm leading to significant cerebral edema, as opposed to the commonly seen hydrocephalus following SAH. As would be anticipated, the majority of patients responded to lumbar drainage showing reduced ICP. A unilateral fixed pupil developed in 12 patients (12%) after the institution of lumbar drainage; 6 subsequently died. However, 3 of these 6 patients had shown a transient herniation syndrome prior to the institution of lumbar drainage therapy. Using a dichotomized Glasgow Outcome Scale, ~50% of patients with traumatic brain injury had a good outcome or moderate disability, and ~25% of patients with SAH had a similar result.

Did the authors satisfactorily prove their hypothesis? Clearly, lumbar drainage definitively decreased and maintained ICP in the normal range. Did the lumbar drainage procedure result in a better outcome in this very severely injured group of patients? This question cannot be resolved by their study because of the small number of patients. What is the rate of cerebral herniation attributable to lumbar drainage in patients with increased ICP? There does seem to be an answer here—a rate of 12%. Leaving out the patients who showed signs of herniation prior to the initiation of therapy still leaves a rate of 9%. What alternatives were available? The authors indicate that moderate hyperventilation was used; however, a mean PaCO2 value of 36.6 mm Hg seems relatively high, and more profound hyperventilation could be safely utilized by measuring brain tissue oxygenation to avoid ischemia caused by hyperventilation. External ventricular drainage could not be performed in 16 patients because of absent ventricles and massive edema. Whether these patients would have fit into a category in which decompressive craniectomy could have been performed cannot be discerned from the data. Pharmacological coma was not utilized as a treatment strategy. These measures—hyperventilation, decompressive craniectomy, and pharmacological coma—all have recognized and quantitated risks at a higher confidence level than lumbar drainage under the conditions presented in their study.

Based on the included CT data, lumbar drainage leads to a loss of basilar cisterns (from being present in 98% of cases before drainage to 82% afterward). Furthermore, the authors state that the loss of cisterns was significantly associated with reduced rates of neurological recovery and increased rates of mortality. One could conclude that lumbar drainage causes a loss of cisterns—certainly a plausible conclusion based on the concept that the withdrawal of CSF from the lumbar subarachnoid space would cause a downward herniation—and this loss of cisterns implies brainstem compression. In the face of these results, we are left to speculate on the role that such treatment might play in the future. The patients in the study group could be fairly characterized as the most critically ill. Novel or unconventional treatments are commonly applied in such circumstances, and other authors have published the results of lumbar drainage for the treatment of refractory increased ICP. Neurosurgeons widely recognize the enormous physiological capacity of the human brain to circumvent insult, whether it is disease related or iatrogenic, and so it is perhaps not surprising that the rate of herniation is as low as it is in their study.

The problem is whether the benefit outweighs the risk. One of the most cherished doctrines of medicine is primum non nocere. I am left pondering whether a cerebral herniation rate of 12% due to lumbar drainage in circumstances of increased ICP is low enough to merit its consideration.

References

2. Tuettenberg J, Czabanka M, Horn P, Woitzik J, Barth M,
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Response

J. Tuetttenberg, M.D.
P. Schmiedek, M.D.
E. Munch, M.D.

University Hospital Mannheim, Faculty of Medicine Mannheim, University of Heidelberg, Germany

We are certainly not pleased with Dr. Grady’s editorial. However, it is not unexpected, because we are aware that our study is provocative and very controversial. All points raised by Dr. Grady are valid and well taken. In fact, most of them have been addressed in the Discussion of our paper and therefore do not need to be commented on here again.

His concern, however, that a cerebral herniation rate of 12% with a 6% mortality rate is unacceptably high should be weighed against the common clinical experience; that is, these patients would have faced a much higher mortality rate without lumbar CSF drainage. Therefore, this study should be considered as a starting point. Only after more clinical and experimental evidence has been gained will we know whether performing lumbar drainage to treat increased ICP caused by brain injury seems ill advised at best or whether, in fact, it may become a useful management option in selected patients.

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