Shunt dependency following aSAH

TO THE EDITOR: We read with great interest the article by Winkler et al. (Winkler EA, Burkhardt JK, Rutledge WC, et al: Reduction of shunt dependency rates following aneurysmal subarachnoid hemorrhage by tandem fenestration of the lamina terminalis and membrane of Liliequist during microsurgical aneurysm repair. J Neurosurg [epub ahead of print December 15, 2017. DOI: 10.3171/2017.5.JNS163271]). Hydrocephalus following subarachnoid hemorrhage (SAH) is still a significant problem. In their article, Winkler and colleagues report the results of a retrospective review of 663 consecutive cases of aneurysmal SAH (aSAH) in which patients were treated by open microsurgery. They found that tandem fenestration of the lamina terminalis (LT) and membrane of Liliequist (MoL) at the time of open microsurgical clipping and/or bypass to secure ruptured anterior and posterior circulation aneurysms was associated with reductions in shunt-dependent hydrocephalus following aSAH.

We have some concerns about their results. In SAH, it is assumed that aSAH changes CSF dynamics through 2 major pathways: 1) anatomic obstruction in ventricles and/or cisterns blocked by blood products and 2) reduced absorption from impaired arachnoid granulations. The authors demonstrated a marked and statistically significant 82% reduction in shunt dependency with application of this tandem fenestration technique. The study, however, is a retrospective analysis of a case series. In such studies, it is impossible to completely clarify the exact morphological pathogenetic mechanism of shunt-dependent hydrocephalus following SAH, and the histopathological data from human studies are still limited, because it is not possible to detect histopathological changes of post-SAH hydrocephalus in patients in vivo or through autopsy.

In the last 5 years, several studies have shown the histopathological basis of post-SAH hydrocephalus. Two of these studies demonstrated the water-filled vesicles as a cause of hypersecretion of CSF from choroid plexus. In the third study, it was shown that choroidal artery vasospasm–related aqueductal stenosis and the caliber of the cerebral aqueduct differ in early, middle, and late phases of hydrocephalus depending on the vasospasm of the choroidal artery. These histopathological studies have enhanced the neurologist’s and neurosurgeon’s view of SAH.

Recent advances in endovascular approaches have resulted in good outcomes with low rates of mortality and morbidity, so it has been suggested that coiling should be considered a first-line treatment in aSAH. However, in patients with SAH, clot removal, which can be accomplished only by conventional microsurgery, may be important for preventing post-SAH hydrocephalus. In a single-center clinical trial, Erixon et al. found that patients undergoing endovascular treatment were more likely to receive shunts than were patients undergoing surgical aneurysm repair. In another prospective study, however, Dehdashti et al. found no statistically significant benefit in terms of reduction of shunt-dependent hydrocephalus for microsurgical aneurysm treatment alone compared with endovascular treatment. In a recent review, it was reported that there is no association between fenestration of the LT and reduced incidence of post-aSAH shunt-dependent hydrocephalus.

In summary, there are conflicting results of studies on this subject, and more research is warranted.

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References
Recent work identified that posthemorrhagic inflammation may play a role in the development of hydrocephalus through activation of toll-like receptors on the choroid plexus epithelium in experimental models. A reduction in clot burden with tandem fenestration may reduce inflammation and oxidative stress induced by subarachnoid blood products, such as fibrin, thrombin, and hemoglobin. As we and others have described, the MoL often becomes thickened and inflamed following aSAH, leading to localization of CSF in the prepontine and interpeduncular cisterns, which we informally refer to as the “fifth ventricle.” Restoration of CSF flow through tandem fenestration may therefore further promote clearance of subarachnoid blood products by reopening the natural circulatory pathway of CSF and improving reabsorption of CSF by the arachnoid granulations along the brain’s convexities.

As noted by Dr. Kanat, tandem fenestration of the LT and MoL requires arachnoid dissection and subarachnoid clot removal that is only possible with open surgery. Clinical experience with surgical techniques to alter CSF hydrodynamics following aSAH has been mixed. Isolated fenestration of the LT is one such technique, but this alters CSF flow exclusively within the supratentorial compartment and does not re-establish the complete CSF circulation. We view our results as compelling but acknowledge that our analysis was both retrospective and limited to a single surgeon’s experience. We were encouraged by the magnitude of benefit observed and by the low morbidity associated with these extra maneuvers, with no complications in this series. We hope that others will consider validating our findings with future prospective multi-institutional trials.

References


“Burned out” at work but satisfied with one’s job: anatomy of a false paradox

**TO THE EDITOR:** In a recent study of 346 US neurosurgery residents, Attenello et al. reported that 67% of their participants suffered from burnout (Attenello FJ, Buchanan IA, Wen T, et al: Factors associated with burnout among US neurosurgery residents: a nationwide survey. *J Neurosurg* [epub ahead of print February 9, 2018. DOI: 10.3171/2017.9.JNS17996]). The authors also found that...