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Brainstem cavernous malformations: Natural history versus surgical management

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Abstract

While brainstem cavernous malformations were once considered inoperable, improvements in patient selection, surgical exposures, intraoperative MRI-guidance, MR tractography, and neurophysiologic monitoring have resulted in good outcomes in the majority of operated patients. In a consecutive series of 104 patients with brainstem cavernous malformations, only 14% of patients experienced cranial nerve or motor dysfunction that was worse at late follow-up, relative to their preoperative condition. Outcomes were predicted by several factors, including larger lesion size, lesions that crossed midline, the presence of a developmental venous anomaly, older age, and greater time interval from lesion hemorrhage to surgery. The 14% of patients who experienced a persistent neurological deficit as a result of surgery, while substantial from any perspective, compares favorably with the risks of observation based on a meta-analysis published by Horne et al. 2016. Curative resection is a safe and effective treatment for brainstem cavernous malformations that will prevent re-hemorrhage in symptomatic patients.

Keywords

Brainstem; Cavernoma; Cavernous malformation; Hemorrhage; Stroke; Surgery

1. Introduction

Horne et al. make a very important contribution to our knowledge of the natural history of cavernous malformations¹, providing robust evidence for long-held suspicions that brainstem location and hemorrhagic lesions portend a more aggressive clinical course. When observed together, these lesions have an estimated 5-year recurrent hemorrhage risk of 30.8%, with a 50.7% risk of developing either a recurrent hemorrhage or a new neurological deficit not related to hemorrhage. Interestingly, the risk of events in the follow-up period was not uniform, and decreased with time. In this analysis, the median age of patients presenting

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Conflicts of Interest/Disclosures

The authors declare that they have no financial or other conflicts of interest in relation to this research and its publication.

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with hemorrhage was 41, and we suspect that their cumulative risk over many decades of remaining life is higher than the 5-year estimates reported. These natural history data will undoubtedly inform management decisions. These data are especially useful when stakes are highest, with hemorrhagic lesions in the brainstem, as both the natural history and treatment risks are unique from other brain locations and presentations.

While brainstem cavernous malformations were once considered inoperable, improvements in patient selection, surgical exposures, intraoperative MRI-guidance, MR tractography, and neurophysiologic monitoring have resulted in good outcomes in the majority of operated patients.^{2–5} In our series of 104 patients with brainstem cavernous malformations, only 14% of patients experienced cranial nerve or motor dysfunction that was worse at late follow-up, relative to their preoperative condition.³ Outcomes were predicted by several factors, including larger lesion size, lesions that crossed midline, the presence of a developmental venous anomaly, older age, and greater time interval from lesion hemorrhage to surgery. It is important to note that most of the neurological deficits after brainstem cavernous malformation surgery are transient, and ultimately improve in the long term. [Figure 1] The 14% of patients who experienced a persistent neurological deficit as a result of surgery, while substantial from any perspective, compares favorably with the risks of observation based on these new data.

2. Conclusion

We anticipate that meta-analysis of patient level data from surgical series at high-volume neurovascular centers will validate curative resection as a safe and effective treatment for brainstem cavernous malformations that will prevent re-hemorrhage in symptomatic patients.

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Figure 1.

In a retrospective, single center series at the University of California San Francisco, patients undergoing surgery for brainstem cavernous malformations were examined before surgery, immediately after surgery, and at final follow-up. A greater percentage of patients experienced neurological deficits immediately postoperatively compared to preoperatively. However, the percentage decreased to the lowest levels at the time of last clinical follow-up, suggesting that any neurological worsening following surgery is temporary in most cases. Abbreviations: CN (cranial nerve), CBL (cerebellar)