7th Bi-Neurovascular Symposium
September 22-23, 2023 / SIGNIEL, Busan, Korea

Pearls of Microsurgery in AVM Treatment

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The ARUBA study, which stands as the only prospective randomized trial of brain AVMs, has very powerful impact on AVM treatment. They showed that medical conservation is superior to any type of intervention for the prevention of death or stroke in patients followed up for over 3 years. However, many criticisms have widely been raised for this study. Among those, the fact that the study design lacks any standardization of the treatment arm seems critical drawback of the ARUVA study. From the previous study for the outcome of surgery in large series, low grade, which is combining SM grade I and II showed lowest risk of surgery, and high grade, combining SM grade IV and V showed unacceptably higher risk, whereas SM grade III showed intermediate, comparable risk of surgery and conservation ranging 10 to 20% of risk. Therefore, briefly speaking, grade I or II AVMs are generally considered operable, and grade IV and V are high risk or essentially inoperable, whereas grade III AVMs require discussion on a case-by-case basis for best course of treatment.

From our experience and others, it seemed that the compactness of the nidus and degree of eloquence were the most influential components to the successful surgical extirpation of the brain AVMs. Therefore, small-sized AVMs without eloquence and deep venous drainage may be the best candidate for microsurgery. For the remaining AVMs, a multimodal approach including endovascular embolization and radiosurgery should not be underestimated. Nevertheless, the selection of safe and effective therapeutic strategies for brain AVMs appeared to need a sophisticated consideration of whole circumstances around the patients themselves, level of expertise in each treatment options, and the expected natural course of the target lesions.

Late adverse effects (LAEs) following stereotactic radiosurgery (SRS) for arteriovenous malformations (AVMs) may occur, although they are generally rare. While some radiologic features may resemble cavernous hemangiomas (CH), the clinical characteristics of these effects often raise concerns and may lead to surgical intervention. Out of the 242 patients who had undergone gamma knife surgery (GKS) for AVMs from 2008 to 2015 retrospectively reviewed, 77 patients (31.8%) experienced early radiation effects, and 44 patients (18.2%) developed LAE after the AVMs were obliterated. Among the 44 patients with various LAEs, 16 patients (6.6%) required surgical treatment. These surgical interventions included 6 cases of catheter insertion for cyst drainage and 10 cases of open craniotomy for the removal of radiation-induced organizing hematomas (RIOH). RIOHs can exhibit similar characteristics to cerebral cavernous hemangiomas (CH), such as a popcorn-like appearance and partial hemosiderin rim. However, RIOHs can be distinguished from CH by atypical features, including an unilocular cystic area with some solid components and prominent perilesional edema. Histologic findings suggest that RIOHs following stereotactic radiosurgery (SRS) are more likely to be inactive organizing hematomas rather than involving the proliferation of malformed blood vasculature. Despite their resemblance to CH, RIOHs tend to show a more rapidly progressing clinical course with extensive white matter changes. Therefore, it is highly recommended considering surgical intervention as the primary approach for managing LAEs. In the case of RIOHs, they are typically well-capsulated, firm, and cold hematomas with or without cyst formation, often requiring the use of an ultrasonic aspirator during removal. Successful removal of RIOHs can lead to rapid alleviation of perilesional white matter changes.