Micro arteriovenous malformation

Gazi Yasargil differentiated cerebral micro arteriovenous malformations (micro-AVMs) from such angiographically occult arteriovenous malformations (AVMs) and defined them as AVMs with a nidus of 1 cm or smaller [1].

Clinical Features

Despite their small size, micro-AVM can cause large hematomas, leading to serious neurological impairments.

Diagnosis

Some micro arteriovenous malformations (AVMs) located in deep brain are undetectable. How to choose a proper timing to detect these AVMs remains unclear.

The clinical characteristics, namely, (i) significant neurological deficits despite the small lesion size, (ii) frequent incidence in young and previously healthy individuals, and (iii) difficulty in diagnosis,and treatment strategies for angiographically occult arteriovenous malformations AVMs and micro-AVMs are rather similar.

With regard to diagnosis, visualization of these small lesions partly depends on the quality of imaging, and the lesions may be transiently invisible under the influence of temporary local conditions around hematomas, such as compression or thrombosis.

Therefore, a second angiography is important for seemingly common subcortical hemorrhage in order to identify occult vascular malformations undetected in the initial angiography.

Superselective angiography has also been reported to be useful in the detection of micro-AVMs that cannot be discerned on conventional angiography.

With recent innovations in imaging modalities, time-of-flight MR angiography or cone-beam CT angiography has also been reported to have equivalent or even better detection rates of micro-AVMs than conventional angiography.

These problems can lead to difficulties in intraoperative confirmation of arteriovenous (AV) shunt obliteration. Although intraoperative angiography has been recommended for AVM resection in general, its usefulness for micro-AVMs has not been discussed in the literature. Indocyanine green-based videoangiography (ICG–VA) has been recently used widely as a safe and simple method to intraoperatively evaluate vascular flow in situ, and its use in AVM surgery has been reported.

Oya et al. have been using intraoperative ICG–VA to identify the early filling vein in the case of micro-AVMs. ICG–VA will be particularly useful during micro-AVM surgery [2].

Despite technical limitations associated with ICG-VA in post-hemorrhage AVMs, a case together with the intraoperative video, demonstrates the useful role of ICG-VA in identifying small AVMs with peculiar features [3].

Treatment

Surgical resection is critical to treat ruptured micro-AVMs.

Case reports

A 21-year-old male patient with intraventricular hematoma. Digital subtraction angiography (DSAs) were performed one week and one month respectively after his haemorrhage, but no positive results were obtained. The patient was hospitalized for re-haemorrhage six years later. A micro AVM with two diffused niduses was detected and embolised three months after his re-haemorrhage. The patient recovered without any neurological deficit.

Compressive effects of haematoma and spontaneous obliteration of AVMs might play pivotal roles in negative DSA results.

Strategic and timely use of DSA could identify some dormant re-haemorrhagic AVMs [4].

1)
Yaşargil MG. New York: Thieme; 1987. Microneurosurgery. Volume IIIA. AVM of the Brain, History, Embryology, Pathological Considerations, Hemodynamics, Diagnostic Studies, Microsurgical Anatomy.
2)
Oya S, Nejo T, Fujisawa N, Tsuchiya T, Indo M, Nakamura T, Matsui T. Usefulness of repetitive intraoperative indocyanine green-based videoangiography to confirm complete obliteration of micro-arteriovenous malformations. Surg Neurol Int. 2015 May 21;6:85. doi: 10.4103/2152-7806.157445. eCollection 2015. PubMed PMID: 26015873; PubMed Central PMCID: PMC4443402.
3)
Barbagallo GM, Certo F, Caltabiano R, Chiaramonte I, Albanese V, Visocchi M. Role of intraoperative indocyanine green video-angiography to identify small, posterior fossa arteriovenous malformations mimicking cavernous angiomas. Technical report and review of the literature on common features of these cerebral vascular malformations. Clin Neurol Neurosurg. 2015 Jul 26;138:45-51. doi: 10.1016/j.clineuro.2015.07.016. [Epub ahead of print] Review. PubMed PMID: 26276727.
4)
Cai J, Lin H, Li S, Zou Z, Zhang Y, Liu S, Chen X, Bai X. Dormant micro arteriovenous malformations lead to recurrent cerebral haemorrhage. Springerplus. 2016 Jul 11;5(1):1054. doi: 10.1186/s40064-016-2615-5. eCollection 2016. PubMed PMID: 27462502.