Intracranial Pial Arteriovenous Fistula Caused by Dural Tenting: Case Report

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Abstract

We describe a rare case where a patient developed intracranial pial arteriovenous (AV) fistula due to dural tenting. The patient was a 63-year-old woman who had undergone neck clipping for an unruptured middle cerebral artery (MCA) aneurysm. The surgery was performed without any problems and her postoperative course was uneventful. Two weeks after cerebral angiography operation revealed a pial AV fistula fed by the right MCA and drained into the vein of Trolard through the Sylvian vein which had not existed before surgery. Being diagnosed as de novo pial AV fistula, surgical repair was performed. The AV fistula was located just beneath the dural tenting. The fistulous point was confirmed with fluorescein video angiography and obliterated using a clip. Although rare, we should pay attention to the AV fistula due to dural tenting as the complications of cranial surgery.

Key words: pial arteriovenous fistula, dural tenting, cerebral aneurysm, surgical complication

Introduction

Intracranial arteriovenous (AV) fistulas are rare cerebrovascular malformations, with less than 100 reported cases since 1970. According to a series reported by Halbach et al., AV fistulas account for 1.6% of all intracranial vascular malformations. Although the pathophysiological cause of pial AV fistulas remains unclear, they usually develop in childhood and are often associated with Rendu-Osler-Weber disease, Klippel-Trenaunay-Weber disease, Ehlers-Danlos syndrome, or neurofibromatosis type 1, suggesting the importance of genetic abnormality. On the other hand, pial AV fistulas have also accompanied with cerebral vein thrombosis, and abnormal angiogenesis in cerebral ischemia, head trauma, or iatrogenic complications.

Here, we describe a case which developed intracranial pial AV fistula supposed to be caused by dural tenting during prior surgery.

Case Report

A 63-year-old woman was admitted to our institute to undergo an asymptomatic unruptured cerebral aneurysm.
Discussion

Intracranial pial AV fistulas are rare cerebrovascular lesions composed of several arterial connections to a single venous channel without any intervening nidus or capillary bed. They differ from brain AV malformations in that they lack a true nidus, and differ from dural AV fistulas in that they derive their arterial supply from pial or cortical arteries and are not located within the dura mater.

In the present case, neuroradiological examination showed a vascular anomaly on the surface of the cortex fed by the right MCA and that drained into the vein of Trolard through the Sylvian vein. There was no nidus or shunts from the external carotid artery.

Although the pathophysiologic mechanisms underlying acquired pial AV fistulas also remain to be elucidated, development has previously been attributed to venous hypertension following vein thrombosis such as dural AV fistulas. In the present case, cerebral angiography did not identify occlusion of any cerebral cortical vein or venous sinus.

Acquired pial AV fistulas also have been reported as a result of cerebral ischemia, contusion, oxidized regenerated cellulose, or ventriculostomy. It is suggested that abnormal angiogenesis and associated vascular growth
factors and cytokines caused by mechanical damage to vessels might play a role in the development of pial AV fistulas. Up to now, there have been no case report of a pial AV fistula caused by dural tenting. The lesion was located just beneath the dural tenting applied during the previous surgery. Bleeding was not obvious while dural tenting, but the vessel wall might be injured by needle. Although we usually pay attention not to have the needle penetrated into the dura matter, the direct injury of vessel wall might be associated with the development of pial AV fistula.

**Conclusion**

This is the first reported case of a pial AV fistula caused by dural tenting. The formation of a fistula can occur from trauma to cortical arteries and veins at the pial entry site. Although rare, we should pay attention to this as the surgical complications.

**Conflicts of Interest Disclosure**

The authors have no personal, financial, or institutional interest in any of the drugs, materials, or devices described in this article.

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