

Transient Global Amnesia and Dural Arteriovenous Fistula of the Anterior Cranial Fossa

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Summary: Dural arteriovenous fistula (AVF) of the anterior cranial fossa is associated usually with cerebral hemorrhage or subarachnoid hemorrhage, while an association with transient global amnesia has not been reported previously. A case presenting the latter unusual symptom is described and the surgical treatment of AVF is discussed. A 64-year-old woman was hospitalized complaining of transient memory impairment. Magnetic resonance (MR) imaging demonstrated a flow void in the left frontal lobe and temporal pole. Cerebral angiography revealed an AVF in the anterior cranial fossa, which was fed bilaterally by the ethmoidal arteries and by branches of the external carotid arteries. The AVF drained into the superior sagittal sinus and the superficial sylvian vein via large varices. Following transfemoral embolization, surgical treatment was carried out. Postoperative angiography revealed complete obliteration of the anomaly. There were no further episodes of amnesia. In our presented case, there is an association between the presenting symptoms and the AVF. The combination of ischemia and congestion in the frontal and temporal lobes may have caused transient memory impairment. From our surgical experience, the excision of the vascular connection between the dura and the frontal lobe following the coagulation of the dura mater of the anterior part of the base of the skull without extensive excision seems to be recommended.

Key words transient global amnesia, dural arteriovenous fistula, anterior cranial fossa, anterior ethmoidal artery, magnetic resonance imaging

Introduction

A dural arteriovenous fistula (AVF) of the anterior cranial fossa is a rare condition, which was initially reported by Lepoire (Lepoire et al. 1963). AVF of the anterior cranial fossa is associated with a high incidence of cerebral hemor-

rhage and subarachnoid hemorrhage (Handa and Shimizu, 1973; Waga et al. 1977; Dardenne, 1978; Bitoh et al. 1981; Kidooka et al. 1982; Ito et al. 1983; Malik et al. 1984; Terada et al. 1984; Abumiya et al. 1987; Kobayashi et al. 1988; Yamada et al. 1993). But there have also been a few reports on incidental or

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unruptured dural AVF of the anterior fossa (Driesen and Ellie, 1973; Ishimatsu et al. 1986; Martin et al. 1990). The clinical symptoms of unruptured AVF include exophthalmos, headache, tinnitus, and retro-orbital pain (Driesen and Ellie, 1973). However, transient global amnesia (TGA) has never previously been reported as a symptom of unruptured anterior fossa dural AVF. In this report, we describe the association of TGA and dural AVF.

Case Report

A 64-year-old woman with no relevant past medical history experienced the sudden onset of amnesia when dining with her friends on October 14, 1994. Her friends stated that she became confused and repeated the same questions about the meal or their names.

Her symptoms resolved within a few hours, but she completely lost her memory of the whole day. On admission, neurological examination revealed no abnormal findings. However, enhanced computed tomography (CT) scanning showed a well-enhanced nodular lesion in the left frontal lobe and temporal pole. Magnetic resonance (MR) imaging demonstrated a flow void in the same area (Fig. 1). Internal and external carotid angiography was then performed and the diagnosis of dural AVF was confirmed. The primary arterial feeding vessel was the ipsilateral anterior ethmoidal artery arising from the ophthalmic artery.

Contralateral internal carotid angiography showed communication with the ethmoidal arterial branches. Blood supply also came from the external carotid artery via the internal maxillary artery, which anastomosed with distal branches of the ophthalmic artery, the middle

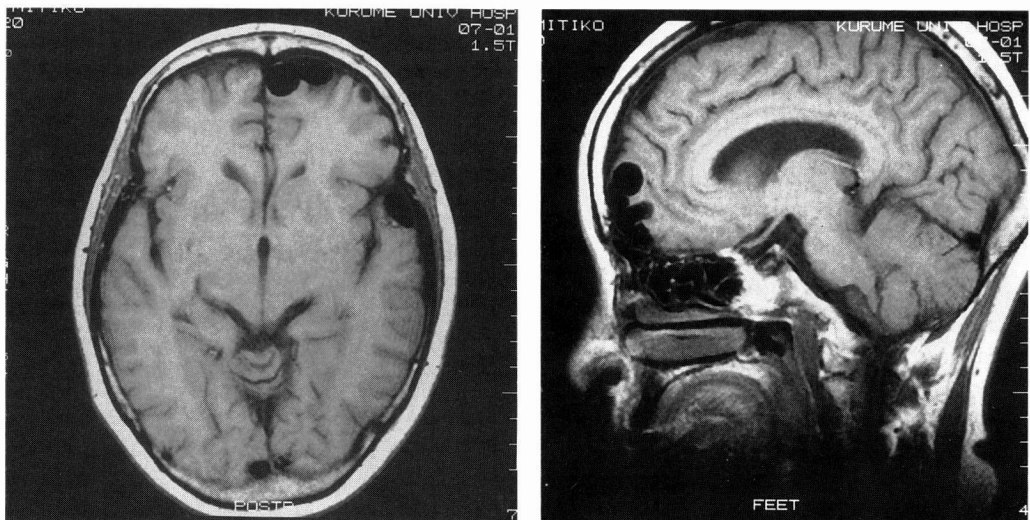


Fig. 1. T1-weighted axial (left) and sagittal (right) magnetic resonance (MR) images demonstrating a flow void in the frontal lobe and the temporal pole.

meningeal arteries bilaterally, and the superficial temporal arteries bilaterally (Fig. 2).

The dural AVF drained into tortuous cortical veins passing medially to the

superior sagittal sinus. These cortical veins also drained posteriorly towards the superficial sylvian vein.

The draining veins were large and featured varicose dilatations (Fig. 3).

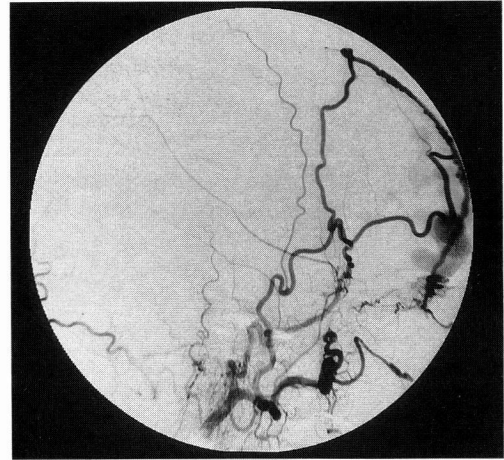
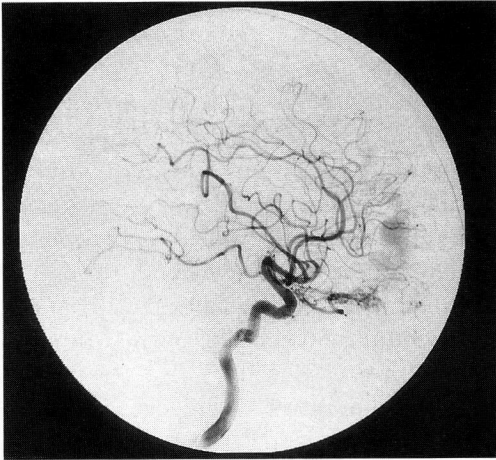


Fig. 2. Right internal (left) and external (right) carotid angiograms in the lateral view. The ethmoidal artery, the middle meningeal artery, and the superficial temporal artery all supply the arteriovenous fistula (AVF).

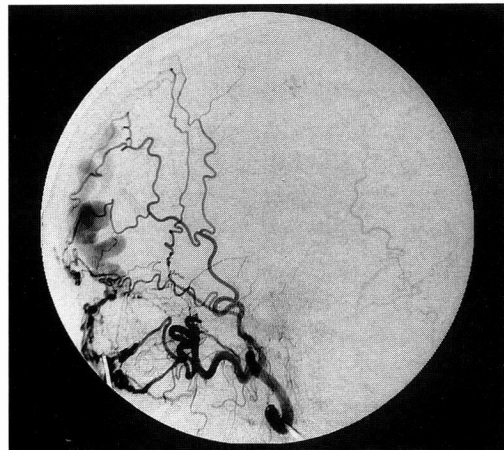
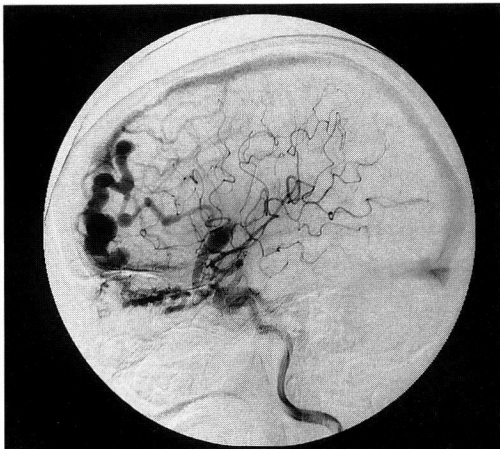


Fig. 3. Left internal (left) and external (right) carotid angiograms in the lateral view. The AVF is supplied by the enlarged ethmoidal artery, the internal maxillary artery, the middle meningeal artery, and the superficial temporal artery. Venous drainage occurs via varicosities into the superior sagittal sinus and the superficial sylvian vein.

^{123}I -IMP single-photon emission computed tomography (^{123}I -IMP SPECT) showed no abnormalities such as reduced local cerebral blood flow. Electroencephalography demonstrated no paroxysmal discharges. Transfemoral embolization with polyvinyl alcohol was performed in November 1994 prior to radical surgery. The feeding arteries from the bilateral external carotid arteries were success-

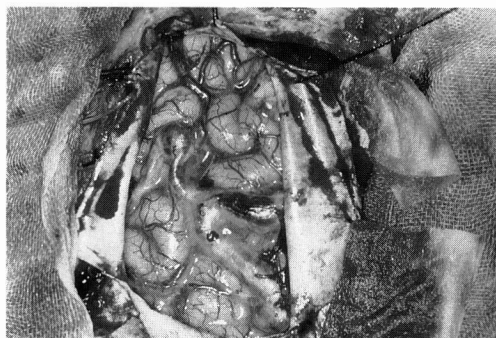


Fig. 4. Operative photograph showing dilated cortical veins with varicosities.

fully embolized. On the following day, left frontal craniotomy was performed after spinal drainage. Many tortuous abnormal vessels were found on the inner surface of the dura in the anterior cranial fossa when the left frontal lobe was retracted. Following dissection of these vessels, the fistulas penetrating the dura mater at the cribriform plate and olfactory groove were successfully coagulated. The dilated cortical veins with varicosities on the surface of the frontal lobe then showed complete collapse (*Fig. 4*). The postoperative course was uneventful. Postoperative angiography at 2 weeks after surgery revealed no residual dural AVF and the ophthalmic artery was normal in caliber (*Fig. 5*).

Postoperative neurological examination revealed left-sided anosmia. The patient was discharged on December 24, 1994 without any further episodes of amnesia.

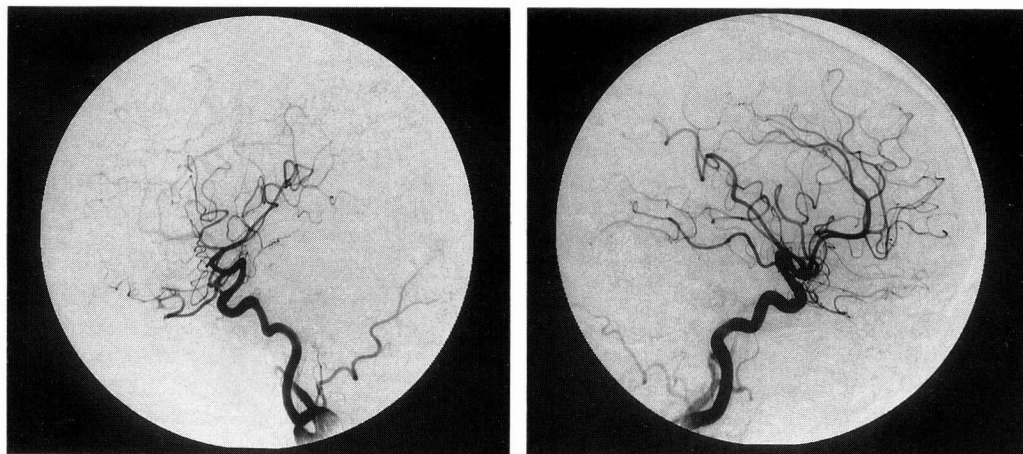


Fig. 5. Postoperative angiograms in the lateral view. There is no opacification of the AVF. Left carotid angiogram (left). Right carotid angiogram (right).

Discussion

Some dozens of cases with dural AVF of the anterior cranial fossa have been reported. The most common symptom of dural AVF was cerebral hemorrhage, with a prevalence of 82% in the series of Kaku and Katayama (Kaku et al. 1995). In addition, some patients complain of tinnitus, retroorbital pain, and headache (Driesen and Ellie, 1973). Ishimitsu et al. (1986) reported a patient with an episode of loss of consciousness, which was thought to represent a seizure, based on the operative and electroencephalographic findings.

However, incidental cases of dural AVF are very rare (Martin et al. 1990; Kaku et al. 1995). TGA was originally defined as a prolonged episode of memory impairment without any other neurological deficits (Shuttleworth et al. 1966; Fisher, 1982; Olesen and Jorgensen, 1986). Epileptic phenomena or transient ischemic attacks affecting the hippocampal system have been proposed as the cause (Mazzuchi et al. 1980), but the exact mechanism remains unclear. However, there is a well-established clinical picture. TGA usually develops after the age of 50, with infrequent recurrence, and the amnesia commonly lasts for about 4-8 hs (Fisher, 1982).

Many causes of TGA have been reported, including cerebral hemorrhage, cerebral infarction, brain tumor, migraine, head trauma and hypoglycemia (Shuping et al. 1980; Fisher, 1982; Araga et al. 1989). In our patient, the findings of the preoperative angiography suggested that blood from the carotid systems was stolen bilaterally by the AVF. Therefore, transient ischemia may have been

induced in the temporal lobes bilaterally, although SPECT demonstrated no abnormalities of regional cerebral blood flow after admission. Many patients with the TGA syndrome show no CT or EEG abnormalities (Mazzuchi et al. 1980). The SPECT findings in our patient do not rule out the possibility that ischemia occurred in the temporal lobe at the time of her TGA episode.

Another factor may have been venous congestion in the frontal and temporal lobes. The main drainage system of a dural AVF in the anterior fossa is generally a single venous route such as the superior sagittal sinus (Kaku et al. 1995). Bleeding from an AVF has also been reported to arise from varicose dilatations (Tiyawowrabun et al. 1986). Our patient had two drainage systems with varicose dilatations leading to the superior sagittal sinus and the superficial sylvian veins. Therefore, blood flow in the temporal lobe might have been impaired by the increased pressure in the superficial sylvian veins. Thus, the combination of ischemia and congestion may have caused TGA in this patient.

Previous reports of dural AVF of the anterior fossa have recommended surgical treatment as the best choice and have indicated a high rate of complete obliteration (Handa and Shimizu, 1973; Waga et al. 1977; Dardenne, 1978; Bitoh et al. 1981; Kidooka et al. 1982; Ito et al. 1983; Malik et al. 1984; Terada et al. 1984; Abumiya et al. 1987; Kobayashi et al. 1988). However, almost all of the reported patients had ruptured dural AVF associated with cerebral hemorrhage. Preoperative endovascular therapy such as transfemoral embolization was only performed in a few patients

(Yamada et al. 1993). Dural AVF of the anterior fossa commonly involves the dura in the region of the cribiform plate. Embolization of the feeding artery from the external carotid system can significantly reduce operative blood loss, but embolization of the ethmoidal arteries bilaterally carries the risk of visual impairment because of the need to catheterize the ophthalmic artery. Further advances in the technique of superselective catheterization are needed for more successful embolization of AVFs in this region. Martin et al. described eight patients with dural AVF of the anterior cranial fossa. None of their patients had extensive excision of the dura mater of the anterior skull base and excision of the venous aneurysm (Martin et al. 1990). From our experience, it seems sufficient to excise the vascular connection between the dura and the frontal lobe, followed by careful coagulation of the dura mater of the anterior skull base without extensive excision.

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