A Case of Dural Arteriovenous Fistula Presenting as Acute Subdural Hematoma

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Key Words
Dural arteriovenous fistula · Acute subdural hematoma · Intracerebral hematoma

Abstract
Dural arteriovenous fistula (AVF) presenting with subdural hematoma is relatively rare. We report a case of dural AVF presenting as acute subdural hematoma (ASDH) and provide a review of the literature. A 56-year-old man presented with disturbance of consciousness. Computed tomography demonstrated a right ASDH and a small right occipital subcortical hematoma. Cerebral angiography showed a dural AVF on the occipital convexity draining into the cortical veins. Emergent endovascular embolization was immediately performed and the shunt flow disappeared. Hematoma removal and external decompression were safely conducted. Combined therapy successfully recovered the patient’s consciousness level. This rare case of dural AVF presenting with ASDH was treated with combined treatments of endovascular and open surgery.

Introduction

Intracranial dural arteriovenous fistulas (AVFs) constitute 10–15% of intracranial vascular anomalies [1, 2]. AVF with retrograde cortical venous drainage has a high risk of developing an aggressive clinical course with intracranial hemorrhage [1, 3]. Hemorrhagic presentation with acute subdural hematoma (ASDH) due to dural AVF is very rare [4, 5]. We report an unusual case of dural AVF presenting as ASDH and discuss the clinical features with the aid of a literature review.
Case Report

A 56-year-old man presented with disturbance of consciousness after manifesting clouded consciousness, during which he could not open his eyes spontaneously without anisocoria. He was transported to the local neurosurgical department and diagnosed with intracerebral hematoma. He had no history of head trauma or hematological disorders. Computed tomography revealed a right ASDH of 1.5 cm in diameter and a 15-ml oval subcortical hematoma in the right occipital lobe associated with slight perifocal edema. The midline was slightly shifted to the left (fig. 1a). We planned our strategy of emergent removal of ASDH after diagnosis of the hemorrhagic source. Digital subtraction angiography was performed emergently and demonstrated a dural AVF located in the right occipital convexity. The main feeding arteries were the right middle meningeal artery, parietal branch of the superficial temporal artery and meningeal branch of the right occipital artery (fig. 1b). Shunt flow was not markedly high and drained into the superior sagittal sinus and vein of Galen via cortical veins on the occipital lobe associated with venous pouches and cortical reflux. The lesion was classified as type IV on the Cognard classification. ASDH removal was planned after obliteration of the hemorrhagic source of dural AVF by endovascular treatment because the consciousness level was not aggravated under hyperosmotic fluid administration, and endovascular embolization could be performed immediately after DSA. Transarterial embolization was performed via the right middle meningeal artery. Venous pouches were suspected ruptured points and were occluded with diluted n-butyl cyanoacrylate. Shunt flow disappeared after embolization. Craniotomy was subsequently performed and the subdural hematoma was evacuated with external decompression within 1 h after transarterial embolization. No hemorrhagic point was observed on the surface of the cortex. The shunting point on the surface of the dura mater was also removed. His consciousness level improved after surgery. The postoperative course was uneventful, and cranioplasty was performed after recovery from brain edema. He could communicate with conversation and walk with aid after 3 weeks of rehabilitation.

Discussion

We reviewed 9 cases of nontraumatic dural AVF associated with ASDH from the previous literature, including the present case (table 1) [1–5]. Four of 9 cases were associated with subcortical hematoma and 4 of 9 were pure ASDH. Four cases were classified as Cognard type III, 3 as IV and 1 as IIB. Six of 9 cases had direct venous drainage into cortical veins.

In our present case, venous ectasias might have had a fragile venous wall and was suspected of being a rupture point. The hemorrhagic pattern showed that the dominant location was subdural hematoma associated with a small amount of subcortical hematoma. The hemorrhagic point might be the subpial cortical vein draining into the superior sagittal sinus under venous high pressure due to arterial shunt flow. Rupture of the subpial vein might cause both laceration of arachnoid and cortical surfaces. A further hypothesis is that venous high pressure might aggravate cortical reflux and partial venous congestion might cause limited subcortical hemorrhage and simultaneously rupture at the fragile wall of the venous ectasias in the subdural space.

We experienced an unusual case of dural AVF presenting as ASDH. Emergent embolization and removal of the hematoma successfully recovered the patient’s consciousness level.
References

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Table 1. Clinical characteristics of 9 cases with dural AVF revealed by subdural hematoma

| Case No. | Author | Age | Sex | Presenting symptoms | Findings on clinical examination | CT findings | Cognard classification | Treatment | Outcome |
|----------|--------|-----|-----|---------------------|---------------------------------|-------------|-----------------------|-----------|---------|
| 1        | Duffau et al. [1] | 55  | m   | Headache | Monoparesis | SDH | III | End & Surg | Improved |
| 2        | Duffau et al. [1] | 64  | m   | Headache & deficit | Hemiparesis | Temporal ICH & SDH | III | End & Surg | Died |
| 3        | Duffau et al. [1] | 64  | m   | Headache & deficits | None | Frontal ICH & SDH | IV | Surg | Improved |
| 4        | Duffau et al. [1] | 56  | f   | Headache | None | SDH | III | Surg | Died |
| 5        | Komyama et al. | 60  | m   | Headache | None | SDH | IIA | End & Surg | Improved |
| 6        | Kitazono et al. [2] | 68  | m   | Headache | None | Occipital ICH & SDH | IV | Surg | Improved |
| 7        | Ogawa et al. [4] | 27  | m   | Headache | None | SDH | III | Surg | Improved |
| 8        | Kominato et al. [5] | 42  | f   | Headache | Coma | SDH | Unknown | None | Died |
| 9        | Present case | 56  | m   | Disturbance of consciousness | Coma | Occipital ICH & SDH | IV | End & Surg | Improved |

SDH = Subdural hematoma; ICH = intracerebral hematoma; End = endovascular treatment; Surg = surgery.
Fig. 1. a Computed tomography revealing a right ASDH of 1.5 cm in diameter and a 15-ml oval subcortical hematoma in the right occipital lobe associated with slight perifocal edema. The midline is slightly shifted to the left. b Right external carotid angiography demonstrating a dural AVF located in the right occipital convexity associated with venous pouches and cortical reflux and classified as type IV on the Cognard classification. Left = anteroposterior view; right = lateral view.