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Arteriovenous Fistula or Malformation with Occlusion of the Superior Sagittal Sinus Probably Due to Old Trauma: A Case Report

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上矢状洞の閉塞を伴った外傷性と考えられる 動静脈瘻（奇形）の1例

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ここに報告する症例には18年前に木刀で頭部を強打された既往がある。事件当時の詳細は不明であるが、5日間の意識消失があり、その後回復したものの、右半身の不全麻痺が残った。今回はけいれん発作を主訴に来院し、諸検査の結果、上記外傷によると考えられる動静脈瘻（奇形）と上矢状洞の限局性閉塞が確認された。動静脈瘻（奇形）は両側外頰動脈の頭皮・硬膜枝および左内頰動脈の硬膜、皮質枝によって栄養されており、多

彩な像を呈し、それらはすべて上矢状洞前半部に流入していた。また、上矢状洞中央部には限局性の閉塞があり、側副血行路として皮質、深部髄質、深部静脈系の拡張が見られた。手術や塞栓術は施行せず、抗けいれん剤の投与で経過良好である。

文献的にはこのような頭皮、硬膜、皮質枝から栄養される外傷性動静脈瘻（奇形）は今までにわずか1例の報告がみられるのみであるが、その症例は静脈洞の閉塞は伴っていなかった。

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Summary

Reported here is a case of arteriovenous fistula or malformation with associated occlusion of the superior sagittal sinus, both of which were probable sequelae of old trauma. The scalp, meningeal, and cortical branches of the external and internal carotid arteries supplied the AVF (AVM). Drainage was into the anterior portion of the superior sagittal sinus. The midportion of the superior sagittal sinus was segmentally occluded, and there was dilatation of the cortical, deep medullary, and deep cerebral veins. There are no previous reports of radiographic documentation of this abnormality.

Introduction

Traumatic arteriovenous fistula (AVF) or malformation (AVM) supplied by the scalp, meningeal, and cortical arteries is an extremely rare clinical entity¹⁾. Dural AVM with sinus occlusion is likewise rare²⁾³⁾.

This is a report of a patient who had segmental occlusion of the midportion of the superior sagittal sinus. There are no previous reports of radiographic documentation of this abnormality.

Case Report

This 45-year-old man was admitted with a history of a recent convulsion. He also had a history of having received a severe head injury 18 years previously when he was struck on the head with wooden sword. At that time he lost consciousness for 5 days and developed right hemiparesis.

Physical examination revealed an extracranial pulsating mass in the left middle parietal region, and neurological examination revealed right hemiparesis.

Skull radiography showed an irregular inner table inferior to the bregma and slight dilatation of the calvarial impressions for the anterior branches of both middle meningeal arteries.

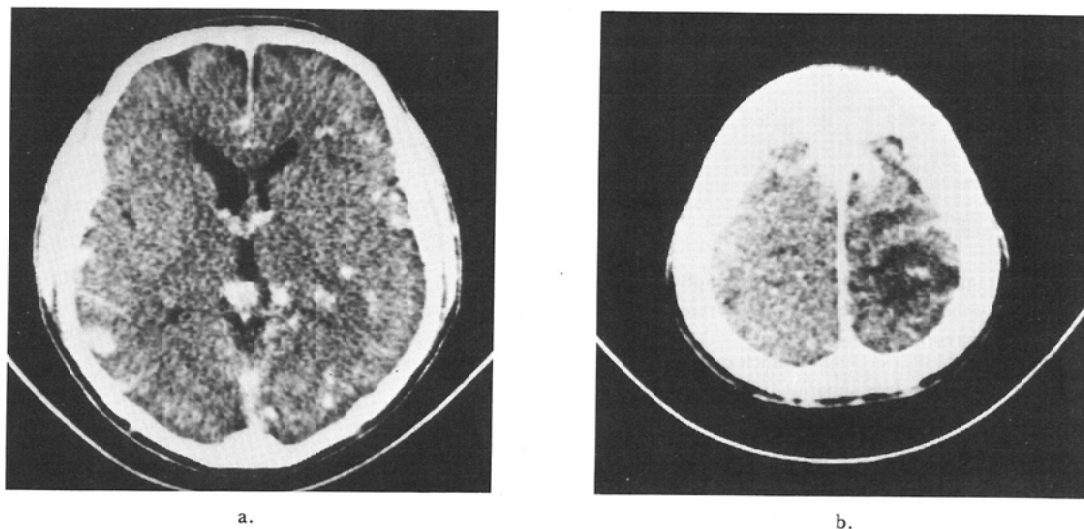


Fig. 1. Computed tomography.

- a. Postcontrast CT scans showed multiple nodular and linear enhancement attributed to the dilated venous system.
- b. In other scans, a hypodense area was noted in the left cerebral hemisphere, and there was dilatation of the anterior portion of the superior sagittal sinus.

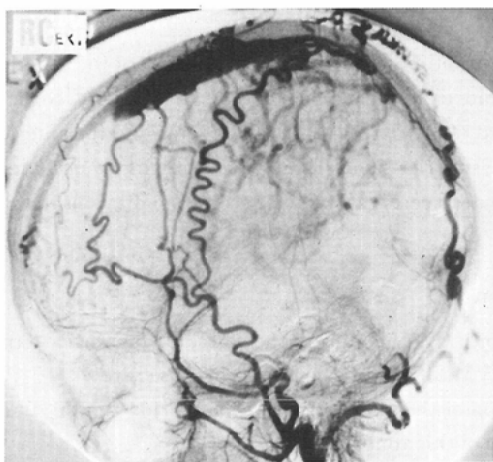


Fig. 2. Right external carotid arteriography. Dilatation of the superficial temporal, occipital, and middle meningeal arteries was seen. There was early filling of the anterior portion of the superior sagittal sinus, which was markedly dilated.

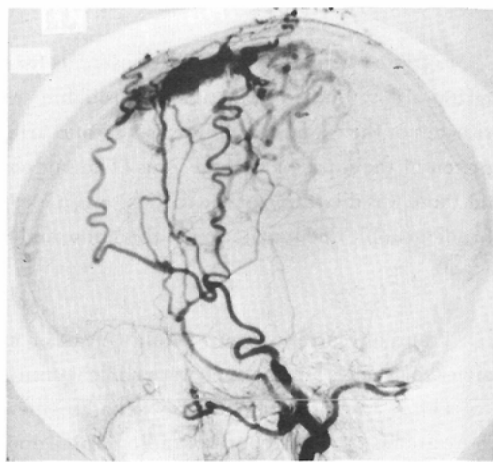


Fig. 3. Left external carotid arteriography. Dilatation of the middle meningeal and superficial temporal arteries was observed. There was early filling of the superior sagittal sinus.

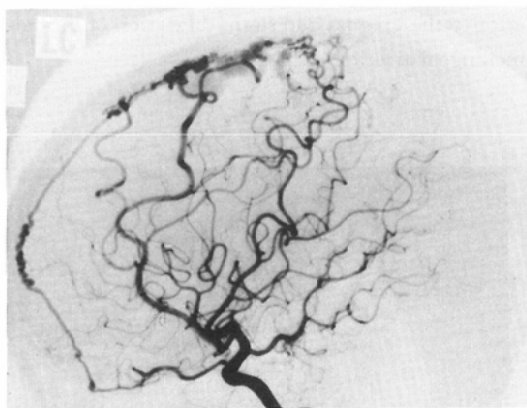


Fig. 4. Left internal carotid arteriography. Dilated anterior falx artery, internal frontal branches of the anterior cerebral artery, and a cortical branch of the middle cerebral artery, all of which drained into the anterior portion of the superior sagittal sinus.

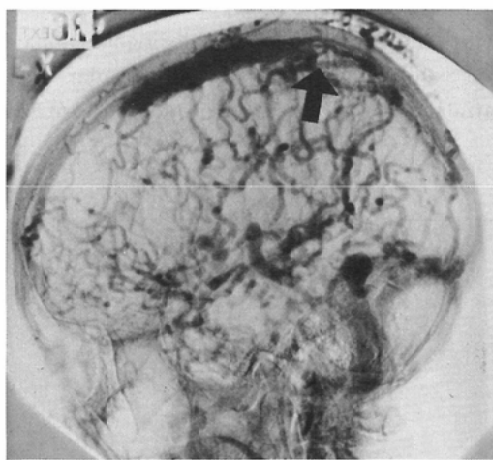


Fig. 5. Venous phase of right external carotid arteriography. Occlusion of the midportion of the superior sagittal sinus (arrow) and dilatation of the cortical and deep cerebral veins were observed.

Postcontrast CT scans showed multiple nodular and linear enhancement which was thought to be a dilated venous system (Fig. 1 a). In another "slice" a hypodense area was noted in the left cerebral hemisphere, and there was dilatation of the anterior portion of the superior sagittal sinus (Fig. 1 b).

Bilateral external carotid arteriography showed dilatation of both middle meningeal, both superficial temporal, and the right occipital arteries. The anterior portion of the superior sagittal sinus filled early and was markedly dilated (Fig. 2, 3).

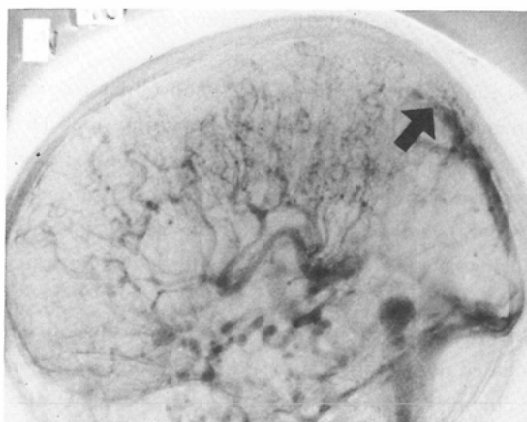


Fig. 6. Venous phase of right internal carotid arteriography. The cortical veins and the anterior two third portion of the superior sagittal sinus were poorly visualized. The deep medullary and deep cerebral veins were dilated. There was normal visualization of the posterior portion of the superior sagittal sinus (arrow).

Left internal carotid arteriography revealed dilatation of the anterior falx artery, two branches of the anterior cerebral artery, and a branch of the middle cerebral artery. All of these drained into the dilated anterior portion of the superior sagittal sinus (Fig. 4).

The right internal carotid artery and the vertebral artery did not participate in the AVM.

The venous phase of right external carotid arteriography demonstrated occlusion of the midportion of the superior sagittal sinus and dilatation of the cortical and deep cerebral veins as rerouting channels (Fig. 5).

The venous phase of right internal carotid arteriography showed a normal posterior portion of the superior sagittal sinus, no visualization of the cortical veins, and dilatation of the deep medullary and deep cerebral veins (Fig. 6).

No surgery was performed, and the patient was discharged under good control by anticonvulsants.

Discussion

Although dural AVM or sinus occlusion is relatively common, the combination of these two entities is rare²⁾⁹⁾. Our review of the literature failed to disclose a case of superior sagittal sinus occlusion associated with an AVM supplied by the scalp, meningeal, and cortical arteries.

Newton and Cronqvist⁴⁾ reported that 12 per cent of intracranial AVMs were purely dural, and that 60 per cent of dural AVMs were infratentorial. Dural AVMs involving the superior sagittal sinus are rarely reported in the literature^{5)~7)}. Trauma is widely recognized as a cause of dural AVMs¹⁾⁸⁾. With the history of a severe head injury 18 years previously, trauma was the most likely cause of the AVM in our patient. His was an extensive AVM involving the superior sagittal sinus which was supplied by the scalp, meningeal, and cortical arteries. This has rarely been documented in the literature¹⁾.

Meningitis, trauma, delivery, ingestion of contraceptives, leukemia, and idiopathic thrombocytosis are known to cause sinus occlusion^{9)~11)}. Hasso et al.¹²⁾ reported that sinus injury, followed by a release of intrinsic tissue factors from the traumatized sinus wall may predispose to sinus thrombosis. They also mentioned that de-

hydration, which is accepted therapy for cerebral edema, may promote thrombosis of cortical veins and dural sinuses.

Miyasaka et al.¹³⁾ reported that, with CT, dural AVMs show dilatation of the major venous system as a vermiform or patchy enhancement following intravenous contrast infusion. These findings were also observed in our patient. The CT manifestations of sinus thrombosis were previously reported as a low density within the dural sinus, and dilatation of the transcerebral medullary veins were regarded pathognomonic^{14)–16)}. Marked, widespread dilatation of the cerebral veins and dilatation of the anterior portion of the superior sagittal sinus were observed in our patient. However, no filling defect could be demonstrated within the superior sagittal sinus using CT.

Vines and Davis¹⁷⁾ described the angiographic findings of sinus occlusion. They concluded that the significant angiographic findings included nonvisualization of the dural sinuses, prolonged arteriovenous circulation time, dilated venous collateral channels, and reversal of collateral flow. They also underscored the usefulness of retrograde jugular venography. In our patient, the circulating blood volume increased because of the AVM, and the sites of occlusion at the midportion of the superior sagittal sinus and venous collateral channels were well demonstrated by arteriography. Therefore, jugular venography was not performed.

The preferred treatment of dural AVMs consists of ligating the feeding arteries and extirpating the AVM. However, transcatheter embolization therapy is now accepted therapy¹⁸⁾. Surgery for sinus thrombosis may be the treatment of choice in acute cases. Surgery was not performed for our patient because his thrombosis was old and his condition was well controlled by anticonvulsants.

Takaku et al.¹⁹⁾ reported that most cases with extensive dural AVMs tend to have progressive dementia. Therefore, our patient must continue to be under strict observation, and embolization of his external carotid arteries may be necessary in the future.

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