

Palliative Treatment of Chronic Carotid-cavernous Fistula: A Case Report

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Abstract- We presented a case of direct type carotid-cavernous fistula (CCF) without embolization or further operation after head injury in 1988. The patient received a conservative treatment for facial involuntary movement in the past years. Abducens nerve palsy and an ectatic vessel on the left eye were seen. Doppler studies showed stable hemodynamics during the follow-up. Magnetic resonance angiography demonstrated an increase of the outflow drain in the inferior petrous and sigmoid sinuses. From the literature, non-surgical management of direct type CCF is extremely rare and surgical therapies with a detachable balloon or remobilization are favored. However, conservative treatment may be also important in some patients. Collateralization and other drainage paths may play a role in ameliorating the symptoms of exophthalmos and chemosis. Doppler monitoring may be helpful in the long-term follow-up and decision making of surgical operation in the CCF.

Key Words: Carotid-cavernous Fistula, Carotid Doppler, Palliative Treatment, Therapy

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INTRODUCTION

Posttraumatic carotid-cavernous sinus fistula (CCF) is a rare complication of head injury. Motor vehicle accidents, falls and other crush injuries may contribute to the incidence of skull base fracture and form the fistula⁽¹⁻⁵⁾. Exophthalmos, chemosis or proptosis usually occurs in days or weeks⁽⁶⁻⁹⁾. Painful abducens nerve palsy may occur infrequently⁽¹⁰⁾. The diagnosis of CCF may not be difficult by ocular bruits and/or above symptoms. Balloon occlusion or endovascular embolization may decline the shunting flow and restore the stable hemody-

namics^(11,12). However, some patients with a previous blunt trauma may have no obvious or only few symptoms at all⁽¹³⁾. A non-invasive Doppler study, extracranial or intracranial devices, has been reported to be a useful tool to make a diagnosis and to decide if a further surgical procedure is indicated or not⁽¹⁴⁻¹⁶⁾. We reported a patient who was diagnosed as type I CCF in 1993 after head trauma 5 years before. The patient was followed up for 10 years without operation, and there was a hemodynamic decline of the CCF by neuroimage and Doppler findings.

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CASE REPORT

A 42-year-old man was diagnosed to have a carotid-cavernous sinus fistula in 1993. He had a blunt head injury in 1988 at the age of 27. During which period, brain stem injury was noted according to the medical record. He visited clinics for many years because of uncontrolled palatal and throat movements and involuntary facial twitching. The medication of clonazepam, baclofen and carbamazepine seemed effective in ameliorating the symptoms initially. Transcranial Doppler (TCD) study (EME, TC 2000 device) showed a high peak systolic velocity (PSV) of the right middle cerebral artery (MCA: PSV=146 cm/sec) and the internal carotid artery (ICA: PSV=202 cm/sec) with a low pulsatility index (MCA: PI=0.42; ICA: PI=0.4). The patient was followed up in outpatient clinic for years without neurological deterioration. He was admitted for Doppler and imaging analysis in early 2002. On physical and neurological evaluations, influent speech and hoarse voice were noted due to poorly coordinated palatal and throat muscles. Asymmetrical facial appearance and dysconjugated eyeball movement were seen. Ectasic vessels in the left eye and bruits over the left forehead were also found. There was neither neck stiffness nor meningeal irritation.

Cranial nerves including III, IV, VI, VII, IX, X were all involved. Muscle strength, all types of sensation and balance function in four limbs were normal. Laboratory data showed no hematological abnormalities. Extracranial and intracranial Doppler scans showed a normal flow velocity with low resistance of Willis circle and the ophthalmic vein was not prominent (e.g., ICA: PSV=114 cm/sec, PI=0.69; MCA: PSV=82 cm/sec, PI=0.5) (Fig. 1). Partial flow shunting to vascular beds ipsilaterally or contralaterally was assumed. Magnetic resonance imaging study revealed a huge, lobulated lesion over the cavernous portion more on the right side. There was no enlargement of this pseudo-aneurysm compared with the previous study (Fig. 2). Cerebral angiography showed an early filling to the left common carotid artery and drainage to the inferior petrous sinus (Fig. 3). Magnetic resonance angiography (MRA) demonstrated an increasing outflow to the petrous sinus and sigmoid sinus, and to some extent, the cortical veins and internal jugular veins. The posterior collateral circulation was also found via branches of vertebral vessels (Fig. 3). Patient received baclofen, propranolol and carbamazepine for prickling sensation over his head and facial twitching (Fig. 3). He was in a stationary condition during the follow-up period of 10 years.

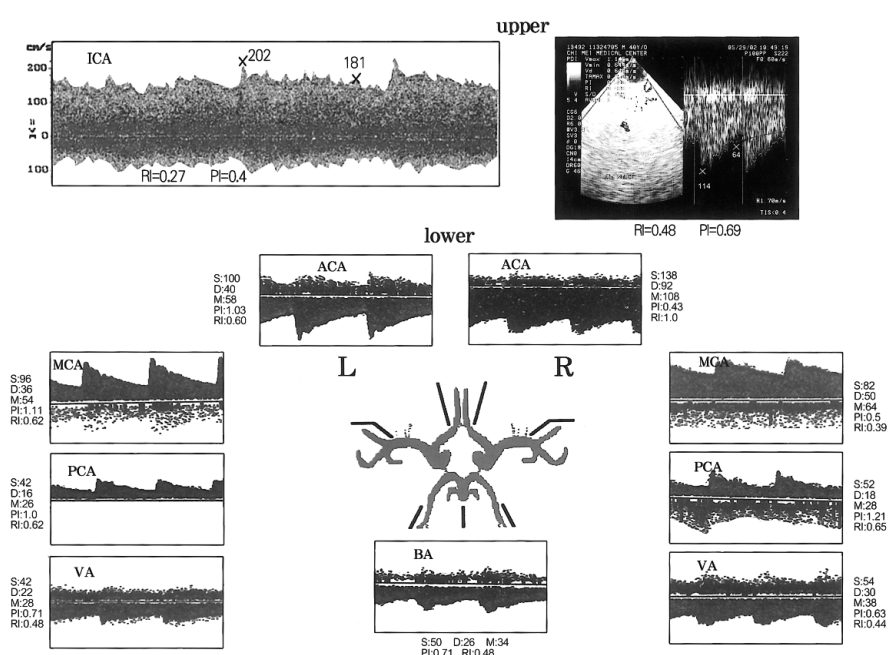


Figure 1. (Upper panel) High PSV /EDV (202 /181cm/sec) and low resistance at right internal carotid artery (ICA: PI=0.4) were seen in 1994 (left). In a follow-up study, the PSV/ EDV was decreased and PI was increased in 2002 (right). (e.g., ICA: PSV/EDV=114/64 cm/sec, PI=0.69). (Lower panel) Normal dynamics of Willis circle in 2002.



Figure 2. (Left) A lobulated lesion and distended right cavernous sinus was seen on T2WI in 1999 (arrow). (Middle) This lesion was not enlarged after 3 years follow-up on MRI. (Right) Row images of 3D top MRA revealed a clearer edge of distended cavernous sinus.



Figure 3. (Left upper) An outlook of this 42-year-old patient. (Right upper) An early filling opacity intercrossed to left CCA with a drainage out ipsilateral inferior petrous sinus was noted in the conventional angiography. (Left lower) Dynamic Gd-DTPA enhanced MRA showed an opacified, lobulated and dilated right cavernous sinus which was fed by the right ICA. (Right lower) Plenty of vertebral radicular arteries (arrow) and engorged jugular vein (arrowhead) indicated collateralization and drainage paths. (PSV: peak systolic velocity; EDV: end diastolic velocity; PI: pulsatility index; RI: resistance index; ICA: internal carotid artery; ACA: anterior cerebral artery; MCA: middle cerebral artery; PCA: posterior cerebral artery; VA: Vertebral artery; BA: basilar artery)

DISCUSSION

Direct type of CCF (Barrow type A) is the most common type in traumatic injury via direct flow from the carotid artery to the cavernous sinus⁽¹⁻⁵⁾. Immediate type of CCF may occur hours or weeks after trauma. However, CCF may occasionally develop months or even years later^(6,7). The pseudo-aneurysms may rupture and

present as subarachnoid hemorrhages⁽¹³⁾. Most treatment procedures including balloon tampon, vessel ligation, partial thrombosis or laser induced thrombosis were tried to revert the shunting flow to a normal level. However, advanced managements without flow restoration could happen in some occasions^(1,2). The dilemma of “benefit versus risk” has puzzled all the neurosurgeons and is usually criticized on the goal of patient- treated or dis-

ease-treated strategy. With the help of non-invasive Doppler examinations, the vascular dynamics can be monitored easily⁽¹⁴⁻¹⁶⁾. Pseudo-aneurysms may resolve spontaneously and result in a fibrotic wall and development of neointima⁽¹²⁾. Spontaneous closure is noted in the indirect type CCF and is uncommon in the direct type. However, the direct type CCF with bilateral high-flow velocities may also occlude spontaneously with a cortical venous reflux⁽⁵⁾. An earlier drainage or a collateral circulation may play some roles in ameliorating the symptoms of chemosis, exophthalmos and inducing partial thrombosis or a complete resolution of the sinus pseudo-aneurysms.

Our case is a direct type of CCF which occurred fifteen years ago after a blunt injury with a multiple cranial nerve involvement (III, IV, VI, VII, IX, X) during the course. A huge lobulated vascular lesion was noted at the cavernous portion by the neuro-image study. Neither a detachable balloon nor an advanced therapy was done. This lesion was monitored with extracranial and transcranial ultrasound scans for years and no dynamic instability had been detected. MRA showed an increased shunting collateral and drainage outflow. The mechanisms remained unknown. We postulated that the major dynamic flows communicated with other branch vessels made the new vascular architectures more flexible and plastic, and induced a partial thrombosis of the CCF by a pressure gradient.

Although cerebral angiography is still the main stream for a definite diagnosis of CCF, its invasive nature and potential risks have made it impractical for continuous monitoring. Currently, MRA or computerized tomographic angiograms provide a clearer image to demonstrate vascular abnormalities. However, a poorly defined collateral circulation, poor detection of blood flow and difficulties in reproducibility limit its frequency of clinical uses.

CONCLUSION

Although surgical procedure is favored in the direct type CCF, non-invasive Doppler study can provide a parametric consideration during the medical or surgical dilemma. We consider the routine use of non-invasive

Doppler study as part of the diagnostic protocol may help to standardize and quantify the hemodynamic changes in the treatment of CCF. It is possible that in patients with chronic CCF, a palliative treatment may overweight endovascular therapy if the regular Doppler follow-up shows a stable condition.

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