Vertebral artery section for treating arterial compression of the medulla oblongata

Case report

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A case of a 30-year-old man who showed progressive pyramidal tract signs caused by compression of the left vertebral artery is presented. Initial decompression of the vertebral artery by placing a piece of sponge between the artery and medulla had no long-term effect. The left vertebral artery distal to the origin of the posterior inferior cerebellar artery was then sectioned, decompressing the medulla oblongata. The patient's symptoms improved postoperatively. This is the first reported case of brain-stem compression by an elongated vertebral artery treated by sectioning of the artery.

Key Words • vascular decompression • vertebral artery • brain-stem compression • medulla oblongata

Brain-stem dysfunction caused by an elongated vertebral artery compressing the brain stem is a rare pathological condition. Microvascular decompression has been performed for hemifacial spasm and trigeminal neuralgia; however, there are no previous reports of section of the vertebral artery for medullary decompression. We present such a case in detail and discuss the feasibility of this procedure as a therapeutic method.

Case Report

This 30-year-old man had been well until April, 1984, when he noticed clumsiness of the right lower extremity, followed by numbness of the right arm. Metrizamide-computerized tomography demonstrated compression of the medulla oblongata by the left vertebral artery, and he was referred to our University Hospital for treatment.

Examination. Neurological examination revealed mild pyramidal tract signs in the right upper and both lower extremities, and right hemisensory disturbance including the left side of the face. No bulbar signs were observed. Systemic blood pressure was normal and there were no clinical signs of arteriosclerosis. A magnetic resonance image revealed a flow-void area representing the left vertebral artery compressing the medulla oblongata, but no abnormality of the brain stem. Angiography disclosed a tortuous left vertebral artery (Fig. 1). This sclerotic artery was thought to be the likely cause of the symptoms and the patient underwent vascular decompression in August, 1985.

First Operation. With the patient in the prone position, a suboccipital craniectomy was performed. The portion of the left vertebral artery under the lower cranial nerves, mainly behind the hypoglossal nerve, had deformed the medulla. Initially, shifting the vertebral artery seemed to be impossible due to strong adhesions to the hypoglossal nerve and medulla. After several trials, a small wedge-shaped piece of sponge was inserted between the artery and medulla. The dentate ligaments around the foramen magnum were also cut.

Postoperatively, the patient could walk with the aid of a cane; however, several weeks later he ceased to be able to walk and the left leg became spastic. During this period, the systemic blood pressure did not change. The symptoms gradually worsened and, after collateral circulation through the right vertebral artery was confirmed by occluding the left vertebral artery with a balloon catheter, the patient underwent a second operation in January, 1987.

Second Operation. With the patient in the prone position, the previous craniectomy was reopened. The previously placed sponge was found to be adherent to
Decompression by vertebral artery section

Fig. 1. Preoperative left vertebral angiogram showing the elongated left vertebral artery.

Fig. 2. Postoperative vertebral angiograms taken on the day following the second operation. Left: Right vertebral angiogram showing enlargement of the right vertebral artery and good flow in the basilar artery. Right: Left vertebral angiogram showing the patent posterior inferior cerebellar artery.

the medulla and partially decompressing it by acting as a cushion; however, the vertebral artery was found to be still pressing against the medulla. Since good collateral flow to the basilar artery through the right vertebral artery had been confirmed preoperatively, the left vertebral artery was sectioned just distal to the origin of the posterior inferior cerebellar artery (PICA) and the cut ends were obliterated using Sugita aneurysm clips.

Postoperative Course. Postoperatively, the symptoms improved slightly, including the right hemisensory disturbance and bilateral pyramidal tract signs, and especially spasticity of the left leg. Dysphagia occurred but disappeared 1 month later. After a follow-up period of 5½ years, the patient is currently stable and is working as an office employee, although the pyramidal tract sign remains and he uses a wheelchair. The patient was ambulatory before the first operation, could walk only transiently after it, and could not walk at all after the second operation. However, the spasticity decreased after the second operation and he could carry on his previous work. The vertebral angiogram taken on the day following the second operation showed enlargement of the right vertebral artery, and the left PICA was well visualized (Fig. 2).

Discussion

This patient presented with progressive bilateral pyramidal tract signs. The radiological and surgical findings suggested that the left vertebral artery was compressing the corticospinal tracts. Considering the incidence of atherosclerosis of major cerebral arteries in elderly people and the reported cases of megadolichoectatic vertebral artery, it appears that the incidence of this kind of dysfunction is high, with several reports describing cranial nerve deficits secondary to a tortuous vertebral artery. However, there has been only one case reported in which the elongated vertebral artery compressed the medulla oblongata, leading to clinical symptoms. That case was treated surgically, using slings to attach the vertebral artery to the nearby dura mater. This is the second reported case of hemiparesis caused by vascular compression of the medulla oblongata.

Initially, our patient was transiently improved by vascular decompression accomplished by placing a sponge fragment between the artery and medulla oblongata. Microvascular decompression has been widely performed for various clinical symptoms such as nystagmus, tinnitus, and torticollis, as well as hemifacial spasm and trigeminal neuralgia. In the present case, the tortuous vertebral artery could not be mobilized from the medulla. This characteristic feature of the megadolichoobasilar anomaly or elongated vertebral artery sometimes requires fixation of the artery to the dura mater or application of a fenestrated clip to mobilize the affected nerves free from the offending artery. In this case, if an adequate vascular decompression had been achieved at the first surgery using ordinary techniques, sectioning the vertebral artery would not have been necessary. Occlusion of the vertebral artery distal to the PICA using a detachable balloon catheter might also have been effective. At surgery, however, we decided to section the vertebral artery itself because mobilizing it had failed to relieve the pressure.

The postoperative angiogram showed a well-developed contralateral vertebral artery. It is interesting that the artery had enlarged in 1 day when the flow from the other side was obliterated. Flow-induced changes, acute and chronic, in arterial diameter are generally acknowledged. Rodbard has provided a thorough re-
view of this phenomenon, suggesting that chronic changes in blood flow induce some "anatomic reorganization of the vessel" to accommodate the enlarged lumen. Experimentally, the rabbit basilar artery was shown to enlarge 4 weeks after ligation of both internal carotid arteries. Our case is a clinical demonstration that such a phenomenon may occur within 1 day.

Sectioning the artery is an option for vascular decompression when the collateral circulation from the contralateral vertebral artery is fully developed. Vertebral artery section should be carried out at a point where there are no perforating branches. It may be a safer procedure than transposition of the vertebral artery, where the perforators can be torn or compromised. Although conventional methods of decompression should be used first, sectioning the vertebral artery was a final and appropriate option for this case.

References

Manuscript received August 6, 1992. Accepted in final form November 16, 1992.

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