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Case Report / Olgu Sunumu

Surgical management of subclavian steal syndrome in a patient with an aberrant right subclavian artery

Aberran sağ subklavyen arteri olan hastada subklavyen çalma sendromunun cerrahi tedavisi

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ABSTRACT

The coexistence of subclavian steal syndrome and aberrant right subclavian artery is a very rare condition. Herein, we report a case of a 73-year-old male patient with subclavian steal syndrome who underwent carotid-subclavian bypass surgery. A single supraclavicular incision was made and carotid-subclavian bypass operation was performed using a Dacron graft in the patient. The patient was asymptomatic at the three-month follow-up with no complications. Carotid-subclavian bypass appears to be the most effective method in treating symptomatic cases of subclavian steal syndrome with an aberrant right subclavian artery.

Keywords: Aberrant right subclavian artery, subclavian artery abnormalities, subclavian steal syndrome.

ÖZ

Subklavyen çalma sendromu ve aberan sağ subklavyen arter birlikteliği oldukça nadir görülen bir durumdur. Bu çalışmada, subklavyen çalma sendromu olan 73 yaşındaki bir erkek hastada yapılan karotis-subklavyen baypas ameliyat olgusu sunuldu. Hastaya tek supraklaviküler kesi yapıldı Dakron greft kullanılarak karotis-subklavyen baypas ameliyatı uygulandı. Hasta, üç aylık takip süresinde herhangi bir komplikasyon olmaksızın asemptomatikti. Semptomatik aberan sağ subklavyan arterli subklavyan çalma sendromu vakalarının tedavisinde karotis-subklavyan baypas en etkili yöntem olarak görülmektedir.

Anahtar sözcükler: Aberan sağ subklavyen arter, subklavyen arter anomalileri, subklavyen çalma sendromu.

The aberrant right subclavian artery (ARSA) is the most common aortic arch anomaly, arising distal to the left subclavian artery and extending posteriorly to the esophagus. It is mostly asymptomatic but can sometimes cause symptoms due to stenosis or aneurysm compressing the esophagus or trachea.[1] Subclavian steal syndrome (SSS) occurs after severe stenosis or occlusion of the proximal subclavian artery, which results in decreased or reversed blood flow to the ipsilateral vertebral artery. Occlusion or stenosis of ARSA that causes SSS is a very rare event that is treated surgically or percutaneously. Herein, we report a case of complete occlusion of the ARSA with subclavian steal phenomenon successfully treated by carotid-subclavian bypass (CSB).

CASE REPORT

A 73-year-old male presented with episodes of progressive dizziness and ataxia for six months. The patient had easy fatiguability of the right upper limb with exercise. On clinical examination, the pulses in the right arm were diminished, and blood pressure was 90/60 mmHg in the right arm and 130/80 mmHg in the left arm. Duplex ultrasound was suggestive of decreased and monophasic flow in the right upper limb arteries. Additionally, a total disappearance of the secondary component and complete attenuation of the waveform in the right subclavian artery were observed, along with reversed flow in the right vertebral artery. Computed tomography angiography (CTA) showed an ARSA originating as the last branch of the aortic

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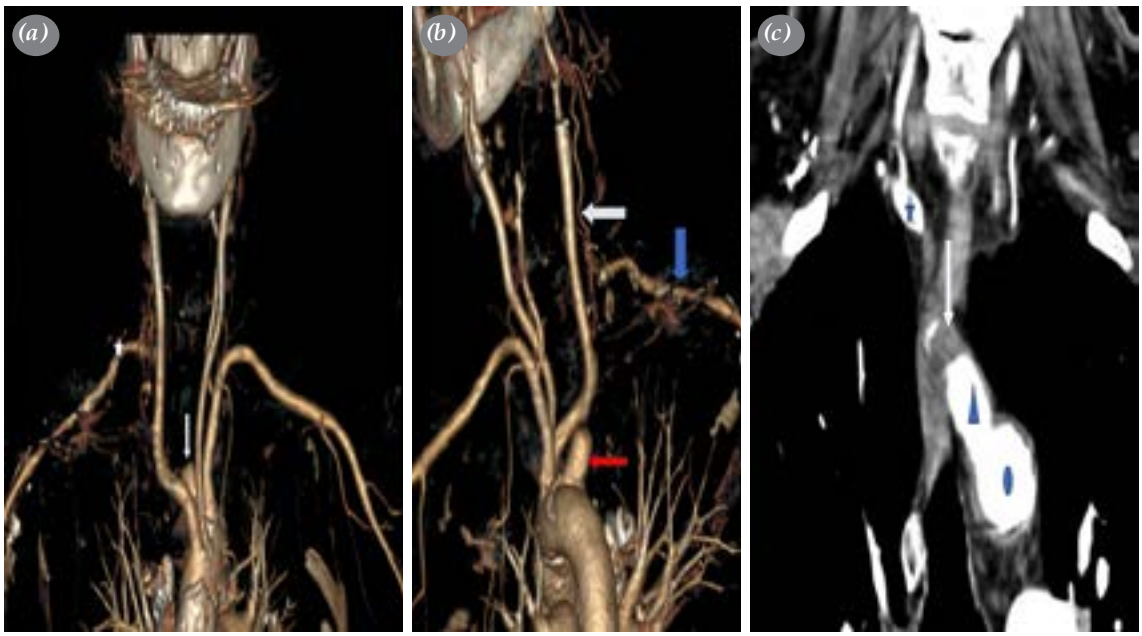

Figure 1. (a) Three-dimensional CTA anterior view; the white arrow shows ARSA completely occluded behind the esophagus after exit, and the white star shows the distal right subclavian artery filling the right vertebral artery. **(b)** Three-dimensional CTA posterior oblique view; the white arrow indicates the right vertebral artery filling the proximally occluded ARSA, the blue arrow shows the distal part of ARSA, and the red arrow shows the proximal part of the ARSA **(c)** Computed tomography angiography coronal section; the blue circle shows the descending aorta, the blue triangle shows the ARSA, the white arrow shows the occluded segment of the ARSA, and the blue star shows the distal right subclavian artery filling from the right vertebral artery.
CTA: Computed tomography angiography; ARSA: Aberrant right subclavian artery.

arch beyond the left subclavian artery. The ARSA was completely occluded behind the esophagus (Figure 1). The patient did not have symptoms such as intolerance to solid foods, dysphagia, dyspnea, or chest pain in the medical history.

Carotid-subclavian bypass surgery was planned for the patient due to the patient's old age and anxiety of thoracotomy. Under general anesthesia, a right supraclavicular incision was made, and the right common carotid artery and right subclavian artery were exposed. The CSB was performed with an 8-mm Dacron graft. End-to-side anastomosis technique was used both proximally in the common carotid artery and distally in the postvertebral part of the ARSA (Figure 2). Following surgery, the patient's vertebrobasilar symptoms and right arm weakness both resolved, and the difference in blood pressure between the right and left upper extremities disappeared. There were no complaints or findings indicating nerve damage during the postoperative period. Although there was a risk of seroma during CSB, the patient's drain was withdrawn on the first postoperative day, and no swelling suggestive of seroma was found in the surgical area at discharge. After an uneventful postoperative period, the patient was discharged on the fourth day. Rivaroxaban treatment was initiated for the patient who was on warfarin preoperatively for paroxysmal atrial fibrillation but failed to achieve an effective INR (international normalized ratio) level. At the three-month follow-up, the patient was asymptomatic. There was no significant difference in blood pressure between the upper limbs. A written informed consent was obtained from the patient.

DISCUSSION

Aberrant right subclavian artery, which arises directly from the aortic arch and transversing to the right side, often posterior to the esophagus, is a rare but medically significant anatomical deviation, with a prevalence ranging from 0.2 to 13.3% in the general population.[2] Subclavian steal syndrome is the result of cerebral hypoperfusion due to the diversion of blood flow to the arm through the vertebral artery, secondary to subclavian stenosis. The symptoms of vertebrobasilar insufficiency include dizziness, vertigo, confusion, headaches, ataxia, gait instability,

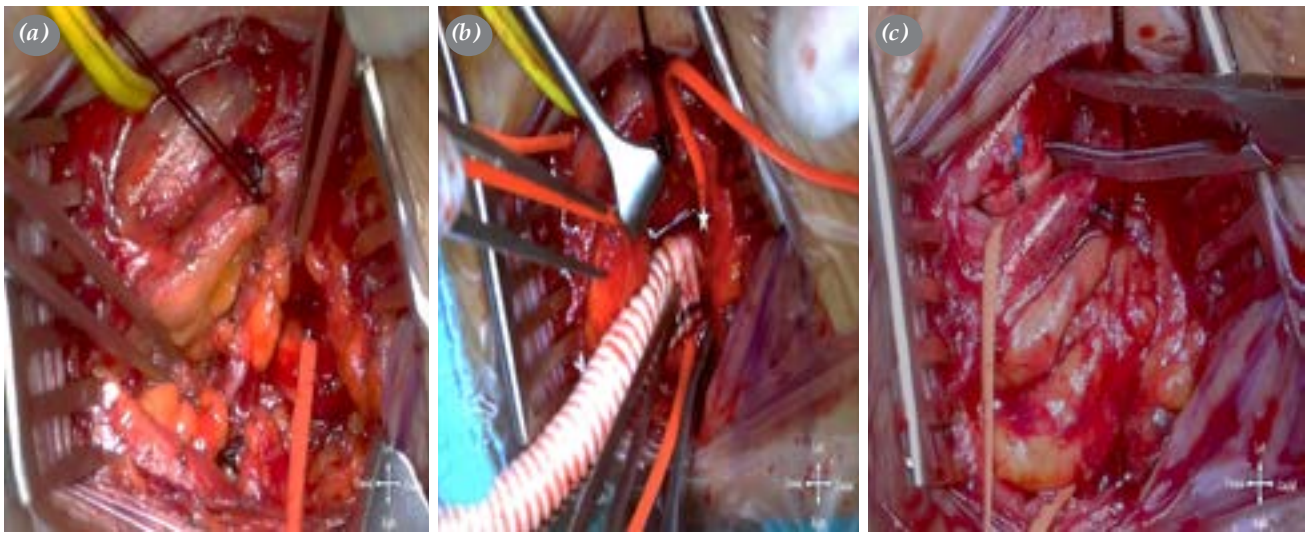

Figure 2. Intraoperative view of CSB using a Dacron graft. **(a)** The red vessel loop indicates the right subclavian artery, and the yellow vessel loop indicates the right carotid artery. **(b)** The white star indicates the right subclavian artery-graft anastomosis. **(c)** The blue star indicates right carotid artery-graft anastomosis.

and diplopia. Several of these symptoms were observed in our patient. In a large case series, SSS was more commonly associated with left-sided lesions, while right-sided lesions accounted for only 30% of cases.[3] This may be explained by the fact that the diameter of the brachiocephalic artery on the right side is larger than that of the left subclavian artery and has less potential for occlusion by atherosclerotic plaques. Due to their similar dimensions, there exists a risk that an ARSA might face the same likelihood of developing early symptomatic occlusive disease. Right-sided SSS resulting from ARSA was first reported in 1986.[4] In a recent case report and literature review published by Kimyaghalam et al.,[5] they noted that prior to their own cases, only seven similar cases were encountered. Two out of these seven patients had stenosis, while five had occlusion. The two patients with stenosis were treated with a stent. For the two patients with occlusion, the main issue was thrombosis in the Kommerell's diverticulum, for which anticoagulant therapy was administered. In one patient, no thrombosis was observed at the 1-month follow-up, but there is no information provided about the clinical course of the other patient. Three patients underwent surgical treatment: two received subclavian-carotid transposition and one received CSB with a dacron graft.

Surgical treatment for this condition is indicated only in symptomatic patients, as in the case described above. Ligation of the ARSA via the intrathoracic approach and reimplantation into the aorta or its branches was described by Bailey et al.[6] and is still advised by some surgeons today. Carotid-subclavian bypass via the extrathoracic approach appears to be a safer option in the absence of Kommerell's diverticulum and symptomatic compression of surrounding organs, such as the esophagus and trachea, and in cases with comorbidity.

In most of the limited cases in the literature, CSB using Dacron or polytetrafluoroethylene grafts, either through subclavicular and carotid incisions or through a single supraclavicular incision, has been highly successful in relieving symptoms.[5] In two case reports with selected and subtotal occlusion, endovascular treatment was attempted.[5,7] In one of these cases, stent placement could not be achieved owing to dense calcification, and the treatment was converted to CSB surgery.[5] In another case, endovascular treatment was completed successfully.[7]

In conclusion, the coexistence of ARSA and SSS is very rare in the literature. Symptomatic cases should be treated. Although endovascular treatment is preferred in selected cases, CSB appears to be the most effective method for relieving symptoms, with low mortality and morbidity, as supported by our case.

Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

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