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Partial subclavian steal syndrome in a congenitally anomalous subclavian artery

Anton Krnić,[1] Zvonimir Sučić,[1] Nikša Vučić,[2] Ivan Krolo,[3]

[1]Department of Radiology, [2]Internal Medicine Department, »Holy Ghost« General Hospital, Zagreb, Croatia, [3]Department of Radiology, »Sisters of Mercy« Clinical Hospital, Zagreb, Croatia

Background. *A subclavian steal syndrome results from the abnormal flow of blood due to the occlusion in the subclavian artery proximal to the origin of the vertebral artery. A case of a male patient with a partial subclavian steal syndrome is presented.*

Case report. *The syndrome was caused by a stenotic lesion of an aberrant right sublcavian artery (the so called »lusorian artery«). The partial subclavian steal was recognized using the duplex ultrasound which showed the »to and fro« pattern in the right vertebral artery. Angiography of the aortic arch revealed the arterial anomaly. In our case, duplex ultrasound was a crucial method in diagnosing the partial subclavian steal syndrome. However, in order to show the arterial anomaly, the final evaluation had to be performed using arteriography.*

Conclusions. *The early recognized partial subclavian steal syndrome provides good understanding of patient's symptoms, successful follow up, and a variety of treatment options.*

Key words: subclavian artery – abnormalities – radiography – ultrasonography; subclavian steal syndrome; angiography; Doppler duplex; vertebral artery

Introduction

The most frequent congenital malformation of the aortic arch branches is the aberrant right subclavian artery.[1] It is found in 0.5-1% of the population.[1] Although the compression of the oesophagus may occur, most patients are asymptomatic.[1] The syndrome of subclavian steal caused by an occlusive lesion of the aberrant subclavian artery is a rare clinical finding.[1-4] This syndrome results from the abnormal flow of blood due to the occlusion in the subclavian artery proximal to the origin of the vertebral artery. Blood flow through the vertebral artery is consequently reversed and the subclavian one thus »steals« cerebral blood.

The syndrome of partial subclavian steal, caused by the stenotic lesion of the aberrant artery, has not been described in literature yet.

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Correspondence to: Anton Krnić, MD, Department of Radiology, »Sveti Duh« General Hospital, Sveti Duh 64, HR-10000 Zagreb, Croatia; Fax: +385 1 37 72 136; E-mail: anton.krnic@zg.t-com.hr

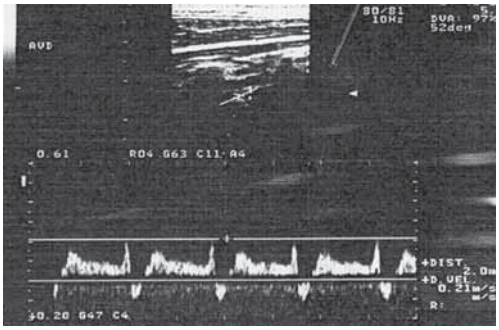

Figure 1a. Duplex ultrasound of the right vertebral artery: there is a reverse flow in late systole (the 'to and fro' pattern), indicating partial subclavian steal syndrome.

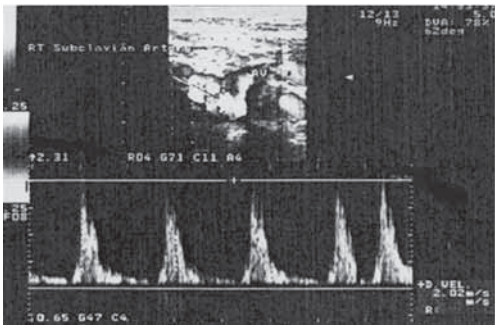

Figure 1b. Duplex ultrasound of the right subclavian artery, proximally to the vertebral artery origin: there is a significantly higher peak systolic velocity (231cm/s), with flow turbulency (filled systolic window), indicating stenosis.

Case report

A 49 year-old man was seen because of dizziness and intermittent paresthesia of the right arm. When he was checked up, there was a blood pressure difference between both arms (right brachial pressure 90/60 mmHg, left 120/80 mmHg). Electronistagmography confirmed no vestibular lesion.

Duplex scanning showed miscellaneous plaque of the right internal carotid artery (30% stenosis), with moderately increased peak systolic velocity. The right vertebral artery was hypoplastic, with a spectral alteration characteristic for the initial subclavian steal syndrome (the 'to and fro' pattern, Figure 1a).[5] There were increased velocities and turbulent flow in the proximal segment of the right subclavian artery which suggested significant proximal stenosis of the artery (Figure 1b). The transcranial Doppler also showed a flow asymmetry between right and left vertebral artery. Unlike the left vertebral artery, which showed normal, towards brain directed flow (Figure 2a), the right vertebral artery showed bidirectional flow with decreased peak systolic velocity (Figure 2b).

The clinical and duplex findings indicated the presence of a partial subclavian steal caused by moderate stenosis of the right subclavian artery. Angiography additionally showed the abnormal origin and course of the right subclavian artery, well known as the »lusorian artery« (Figure 3a, 3b).[1-4] It also showed the mild to moderate grade stenosis of the artery in the middle

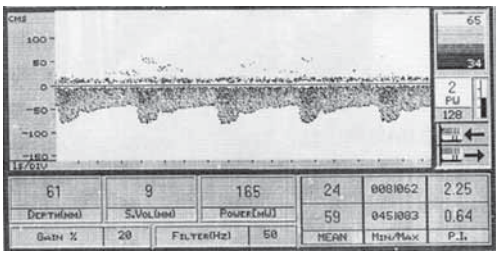

Figure 2a. Transcranial continuous waveform Doppler of the left vertebral artery: there is a normal flow pattern, with normal peak systolic velocity (59 cm/s).

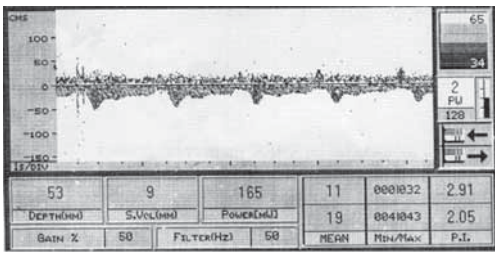

Figure 2b. Transcranial continuous waveform Doppler of the right vertebral artery: there is a bidirectional flow with reduced peak systolic velocity (19 cm/s).

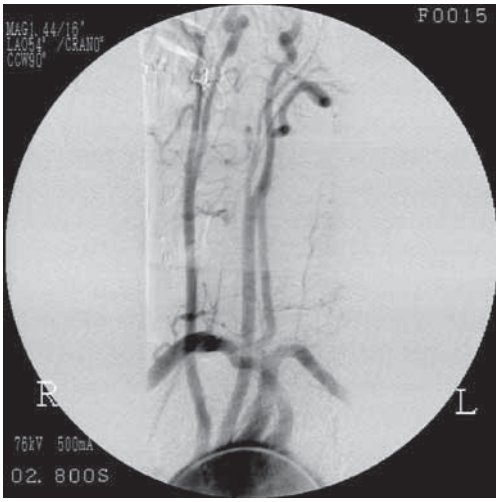

Figure 3a. Digital subtraction angiography of the aortic arch: there is an aberrant right subclavian artery, which arises as the most distal vessel from the aortic arch and crosses the middle line. The image provides evidence of a mild to moderate grade stenosis of the aberrant artery in middle line, but there is no clear evidence of steal syndrome.

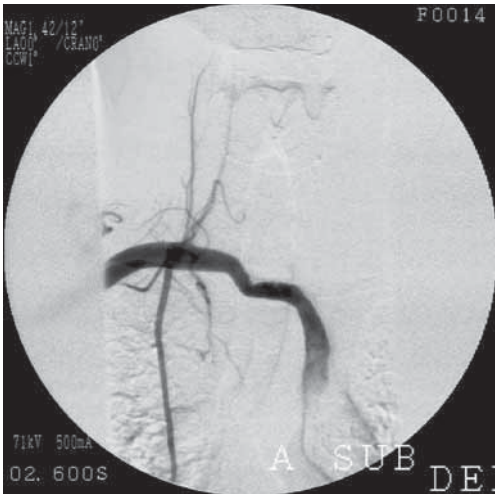

Figure 3b. Selective digital subtraction angiography of the aberrant right subclavian artery (lusorian artery).

line (Figure 3a, 3b). It, however, did not provide clear evidence for the presence of the subclavian steal.

Since the patient did not complain of dysphagia, no further evaluation (oesophagogram or CT) was done.

The patient was finally released form the hospital and was referred for internist and neurological follow-up.

Discussion

The stenosis of the subclavian artery in our patient was likely the result of progression of an atherosclerotic lesion in the segment of the artery which was in contact with the esophagus.[1-4] It resulted in the partial reversal of blood flow in the vertebral artery.

The partial reversal of blood flow in our patient could clearly be confirmed only by duplex ultrasound (Figure 1a). It resulted in clinical symptoms known as the partial subclavian steal syndrome.[5]

Unlike us, De Vleeschauwer *et al.*[1], as well as other authors reported patients that had severe stenosis or occlusion of the aberrant subclavian artery and, thus, suffered steal syndrome in its advanced phase, known as the total subclavian steal syndrome. In those patients, the symptoms were much more pronounced and the syndrome was easier to diagnose using duplex ultrasound or other imaging modalities as well.[1-4]

The anomalous origin of the right subclavian artery was first reported about 200 years ago by Bayford.[6] The anomalous right subclavian artery (»arteria lusoria«) passes behind the oesophagus in about 80% of the cases and in these cases a posterior notch can be seen in oesophagogam and during endoscopy.[1,7] The most common symptom is dysphagia, the so-called »dysphagia lusoria« - dysphagia secondary to a freak of nature.[8] CT, MR and endoscopic ultrasound help in differential diagnosis.[7-9]

Treatment options, if indicated, include conservative treatment, surgical treatment, and endovascular treatment, which is recently also considered in cases of subclavian steal. [1,3,4,7-11]

In conclusion, patients with the lusorian artery can develop a subclavian steal syndrome, caused by a stentoic lesion of the retroesophageal segment of the aberrant artery. The subclavian steal can be recognized in its early, partial phase. At that stage duplex ultrasound is the major and usually the only enough sensitive diagnostic tool. In order to diagnose it, the ultrasononographer should be familiar with the 'to and fro' flow pattern in the vertebral artery.[5] Early ultrasonographic recognition of the condition could provide a better, on-time, understanding of patient's symptoms. In that way, it is possible to plan treatment and follow-up options in a more efficient way.

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Sindrom kraje krvi pri prirojeni anomaliji podključnične arterije

Krnić A, Sučić Z, Vučić N, Krolo I

Izhodišča. Sindrom podključnične kraje krvi nastane zaradi motenega pretoka podključnične arterije, ki ga povzroča zapora proksimalno od ustja vratne arterije. V članku opisujemo primer bolnika z delnim sindromom podključnične kraje krvi.
Prikaz primera. Sindrom je povzročila zožitev, ki je nastala zaradi aberantne desne podključnične arterije. Krajo krvi smo prepoznali z dvojnim Doppler ultrazvokom, ki je pokazal značilen vzorec pretoka v vratni arteriji; angiografija aortnega loka pa je pokazala arterijsko anomalijo. Čeprav je bila preiskava z dvojnim Doppler ultrazvokom odločilna, smo arterijsko anomalijo morali potrditi z angiografijo.
Zaključki. Zgodnje odkritje delnega sindroma podključnične kraje krvi nam omogoča, da razumemo vzrok nastanka bolnikovih simptomov ter uspešno sledenje in zdravljenje bolezni.