Received: 1 September 2021 | Revised: 28 February 2022 | Accepted: 28 March 2022

DOI: 10.1002/ccr3.5740

CASE REPORT

Clinical Case Reports Open Access WILEY

Subclavian steal syndrome secondary to atherosclerosis: A case report and review of literature

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Funding information
No specific funding used for this study

Abstract

Subclavian Steal Syndrome (SSS) is a rare vascular syndrome caused due to proximal occlusion or stenosis of subclavian or innominate artery. It is usually asymptomatic but occasionally may present with vertebro-basilar insufficiency and/or upper limb ischemia. Atherosclerosis is the most common cause.

KEYWORDS

cardiovascular disorders, transplant surgery, vascular surgery

1 | INTRODUCTION

Subclavian Steal Syndrome (SSS) is a vascular phenomenon characterized by proximal (before the origin of vertebral artery) occlusion or stenosis of subclavian or innominate artery resulting in decreased blood pressure in the distal part. This causes retrograde blood flow in the ipsilateral vertebral artery so as to compensate the perfusion of upper extremity. Thus, blood is siphoned away from the brain to the extremity of the affected side.[1–3]

Majority of the patients are asymptomatic due to adequate collateral circulation of the head and neck. A few of them may present as vertebro-basilar insufficiency and/or arm claudication, in the setting of physical exercise or arterio-venous fistula. Symptoms of vertebro-basilar ischemia includes dizziness, nystagmus, diplopia, hearing loss, tinnitus, and rarely transient ischemic attacks as well.[4] It is a rare disorder with prevalence ranging from 0.6% to 6.4%.[5] Atherosclerosis is the most common cause followed by vasculitis, thoracic outlet syndrome and iatrogenic interventions. Congenital abnormalities like right-sided aortic arch with an isolated left subclavian artery can also cause this disorder, especially in young patients.[4] It is present mostly on left side with left to right ratio of 4:1. Atherosclerotic SSS is more common in males and age group above 50 years.[5]

Doppler ultrasound, computerized tomography (CT), or magnetic resonance (MR) angiography are used for confirmation of diagnosis. Only symptomatic patients require revascularization procedures like bypass grafting or angioplasty and stenting.[2,5]

Here, we report a case of 57-year-old man of SSS who presented in Surgical Outpatient Department (SOPD) with vertigo, sense of imbalance, tingling, numbness, and claudication of left upper extremity.

2 | CASE PRESENTATION

A 57-year-old Ex-serviceman, a known hypertensive and diabetic on medication, was admitted for numbness and claudication in the left hand of 2 months duration, with mild tingling sensation in his left arm. He also gave history of vertigo and sense of imbalance for 2 months duration, blue discoloration and pain in the fingers of left hand for 2 weeks. There was no history of chest pain, palpitation, visual changes, aura, nausea, fever, upper respiratory, and ear discharge. His medical history included long-standing hypertension with hypercholesterolemia and was under regular medication as prescribed by his physician. On physical examination, his blood pressure (BP) was 140/90 mmHg in the right arm. However, the left radial pulse was feeble. So, BP was recorded in the left arm, which was found to be markedly low at 80/44 mmHg. His baseline laboratory investigations (complete blood count, renal function test, liver function test, urine routine, and microscopic examination), electrocardiogram, and chest X-ray were unremarkable. Our differential diagnoses were SSS, thoracic outlet syndrome, brachial plexus pathology, vestibular malfunction, cerebellar lesion, and cardiac ischemia. The cardiac cause was ruled out due to normal electrocardiogram and cardiac markers. There were no positive findings on vestibular and cerebellar examinations, tests for vertigo and neural examination of upper limbs. This gave rise to a strong clinical suspicion of SSS. So, the patient was referred for Doppler evaluation of the neck vessels. Doppler study showed complete reversal of the blood flow in the left vertebral artery, both in systole and diastole (Figure 1).

The findings were suggestive of Subclavian steal syndrome. Now, Multidetector Computed Tomography (MDCT) angiography of the neck vessels was advised. It showed irregular concentric wall thickening of the left subclavian artery near origin with partial luminal stenosis. Bilateral vertebral arteries and the left subclavian artery distal to the origin of the left vertebral artery showed normal luminal opacification with contrast (Figure 2), suggesting the feeding of distal left subclavian artery by the left vertebral artery.

The left internal jugular vein thrombosis was also demonstrated in 3D Volume rendered angiographic images, showing stenosis of left subclavian artery proximal to the origin of left vertebral artery (Figure 3). The findings were conclusive of SSS secondary to occlusion of proximal left subclavian artery due to atherosclerosis. The patient referred to Cardiothoracic and Vascular Surgery (CTVS) department to another center for endovascular subclavian stenting (8 mm × 37 mm) He improved significantly after the intervention and was followed up for 6 months where his symptoms did not recur. On his first follow-up at our center, Doppler ultrasonography of neck vessels was done. It showed normal blood flow in bilateral vertebral arteries in both systole and diastole.

3 | DISCUSSION

The term "Subclavian Steal Syndrome" was coined by Fisher in 1961, and the first case was reported by Contorni.[5,6] It is a rare cerebrovascular insufficiency syndrome in which occlusion or narrowing of the first portion of subclavian artery (i.e., proximal to the origin of vertebral artery) leads to decreased pressure in distal segment. This pressure difference causes reversal of blood flow in ipsilateral vertebral artery. In this way, blood from basilar territory is diverted into the subclavian artery to compensate for decreased brachial perfusion. It is more common in age group above 55 years. Male to female ratio is 2:1. Most of the patients are asymptomatic because of enough collateral circulation of head and neck. However, excess compensatory blood flow to ipsilateral arm may result in neurological symptoms from vertebro-basilar ischemia. Major collateral supply maintained by posterior communicating artery of Circle of Willis may become inadequate due to concomitant

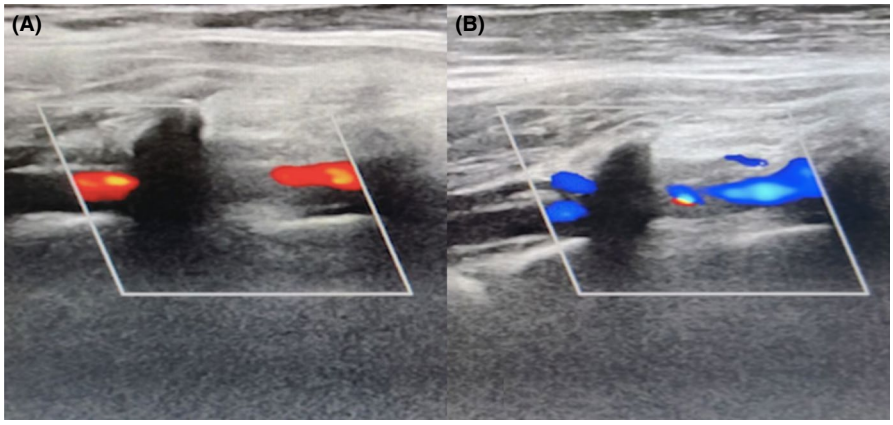

FIGURE 1 Doppler study showing complete reversal of the blood flow in the left vertebral artery. ((A) Right vertebral artery; (B) Left vertebral artery)

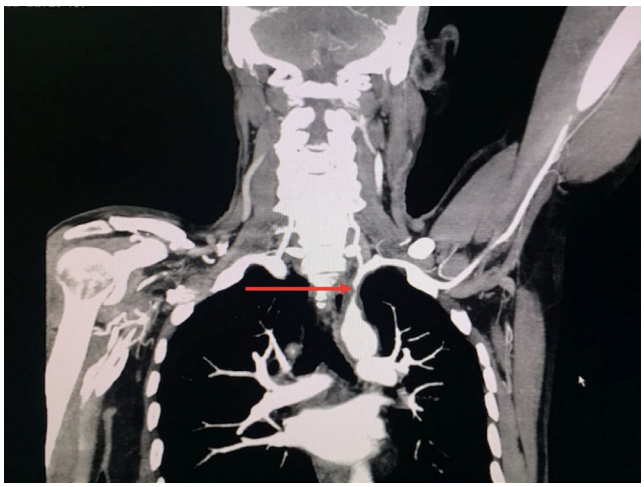

FIGURE 2 MDCT (Multidetector Computed Tomography) angiography of the neck vessels showing partial obstruction of left subclavian artery (red arrow) proximal to the origin of left vertebral artery

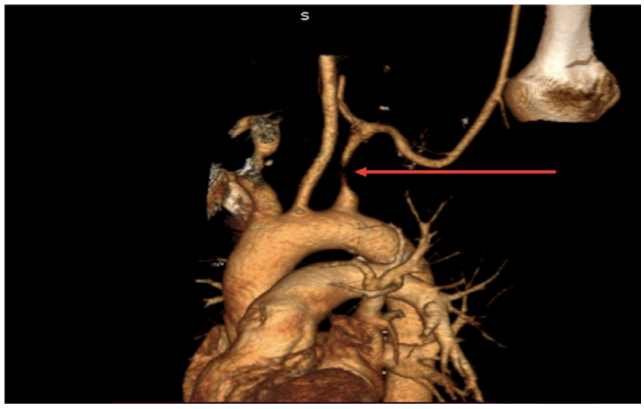

FIGURE 3 3D volume rendered angiographic images showing stenosis of left subclavian artery (Red arrow) proximal to the origin of left vertebral artery

carotid obstructive pathology. Likewise, SSS may present with features of coronary insufficiency in patients with internal mammary bypass graft.[1,2,7]

Clinical features if present can be broadly divided into two categories: neurological and brachial. The former include diplopia, vertigo, syncope, ataxia, headache, dysarthria, convulsions, mental changes, tinnitus, and dysphasia. Limb symptoms include paresis, intermittent claudication, paresthesia, and gangrene of fingers.[8] Physical examination shows blood pressure difference of more than 15 mmHg on bilateral upper extremities, feeble pulse on affected side, bruits over the supraclavicular region, and atrophic changes in ipsilateral extremity.[4] Different diagnostic modalities can be employed for confirmation like Doppler ultrasound, magnetic resonance angiography, or CT-angiography. Subtraction Angiography can be used therapeutically during the procedure.[9] Diagnostic criteria include occlusion or marked stenosis of subclavian or innominate artery, retrograde vertebral blood flow, and patency of both vertebral and basilar arteries.[8]

Mildly symptomatic cases can be managed with medical therapy and observation. Aspirin, statins, beta-blockers, and angiotensin converting enzyme (ACE) Inhibitors are recommended. Patients with severe symptoms require some form of revascularization. Increased blood pressure difference of more than 40–50 mmHg in both arms also need interventions. Surgical interventions include Carotid-subclavian bypass, axillo-axillary bypass, and carotid transposition. Among these, Carotid-subclavian bypass is most preferred due to its lower operative risk and long-term satisfactory results. This can be done in asymptomatic patients to prevent the evolution of symptoms of vertebro-basilar insufficiency. Balloon angioplasty with proper stenting is the minimally invasive technique employed in modern times. Side by side, appropriate management of risk factors like hypertension, diabetes mellitus, and tobacco use is equally important.[2,4,6]

Though SSS due to left-sided subclavian artery stenosis/occlusion is more common, right-sided artery occlusion has been reported.[10] Budincevic H et al.[3] and Aseem WM et al.[11] reported bilateral SSS, the former without significant symptoms. In our case, left-sided pathology is present with atherosclerosis as the underlying cause. Similarly, ocular and auditory symptoms were present in cases reported by Lum CF et al.[12] and Psillas G et al.[2] respectively, which are not present in our case. Likewise, abnormal saccades and nystagmus were also seen in some studies.[2,3] In a case study by Komatsubara I et al.[13] syncope and arm weakness were present. Moreover, nausea and vomiting were also seen in one case study.[10] One unique symptom present in our case is cyanosis of fingers of the affected arm.

Therefore, any patient who presents with difference in pulse and blood pressure in bilateral limbs should be evaluated for SSS. This disorder may present with any of the features. Unilateral upper limb pain, paresis, paresthesia, and cyanosis of fingers should not be ignored. In the same way, isolated neurological symptoms like vertigo, dizziness, ataxia, hearing loss, tinnitus, and blurring of vision can be alarming, especially in patients with co-morbidities like hypertension and diabetes mellitus. For symptomatic patients, immediate intervention is necessary.

There are certain limitations associated with our study to be mentioned. Since CTVS facility was not available in our center, the patient was referred outside. So, we could not study much about the process of interventions done in this case. Moreover, we could not follow-up beyond 6 months and are not aware of his present condition.

ACKNOWLEDGEMENT

No acknowledgements.

CONFLICT OF INTEREST

None declared.

AUTHOR CONTRIBUTIONS

SB involved in conceptualization. All authors, SB, BDP, SR, BK and NT, have contributed to writing, editing, and preparation of manuscript and have reviewed it before submission.

ETHICAL APPROVAL

Written informed consent was obtained from the patient for publication of case report and associated images. Since this report involves no experiments, the ethical approval is waived.

CONSENT

A copy of written consent is available for review by editors of this journal on request.

DATA AVAILABILITY STATEMENT

Data sharing not applicable – no new data generated.

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How to cite this article: Basukala S, Pathak BD, Rijal S, Karki B, Thapa N. Subclavian steal syndrome secondary to atherosclerosis: A case report and review of literature. *Clin Case Rep*. 2022;10:e05740. doi:10.1002/ccr3.5740