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Case Report

A case of coronary subclavian vertebral steal syndrome successfully treated with stenting to the stenosis of left subclavian artery

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ABSTRACT

Coronary subclavian vertebral steal syndrome (CSVSS) is a rare but important complication of coronary artery bypass graft surgery (CABG) when an internal mammary artery (IMA) is used. This syndrome is defined as a retrograde flow from coronary artery via the IMA and the vertebral artery to the subclavian artery due to a proximal subclavian artery stenosis. We describe a case of a 64-year-old female who underwent CABG, complaining of dyspnea and chest pain by exercise of left arm, and dizziness when she turned her face to the left. Her blood pressure was 113/69 mmHg in the left arm and 137/84 mmHg in the right arm. Coronary angiography revealed retrograde flow from the left anterior descending (LAD) artery to the left IMA. Aortography showed that the ostium of the left subclavian artery had a severe stenosis and that the left vertebral artery was visualized retrogradely. Thereby, the diagnosis of CSVSS was made. The stenosis of the left subclavian artery was successfully treated with a percutaneous transluminal angioplasty and stent implantation, resulting in the restoration of antegrade flow from the left IMA to the LAD artery and from the left subclavian artery to the left vertebral artery. She was discharged with no chest pain and dizziness.

<Learning objective: CSVSS is a rare but important complication of CABG. When patients who underwent CABG using IMA grafts complain of chest pain, arm claudication, or dizziness, physicians should suspect CSVSS. Proper physical examinations such as a difference in right and left blood pressure levels and a bruit of the subclavian area are needed.>

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Introduction

Coronary subclavian steal syndrome (CSSS) was first reported in 1974 by Harjola and Valle [1]. When an ipsilateral subclavian artery has a hemodynamically significant stenosis, a distal branch of the subclavian artery shows flow reversal. Therefore, the insufficient flow causes various symptoms. Patients who underwent coronary artery bypass graft (CABG) surgery using an internal mammary artery (IMA) may suffer from effort angina or even myocardial infarction when a stenosis or occlusion of the subclavian artery occurs. Some patients have dizziness or transient ischemic attack along with chest pain, which is caused by a retrograde flow of the vertebral artery. This pathophysiology is

called CSVSS. We report a case of CSVSS successfully treated by a transcatheter approach to the subclavian artery stenosis.

Case report

A 64-year-old woman was brought to the emergency department, complaining of severe dyspnea and chest pain. She underwent CABG surgery using the left IMA to the left anterior descending artery (LAD) and the right IMA to the left circumflex artery 5 years ago. Her chest pain got worse by exercise of the left arm. She also suffered from dizziness when she turned her face to the left. She had received medications for hypertension, type II diabetes mellitus, and dyslipidemia. She was a previous smoker (Brinkman index: 1560). On physical examination, the patient showed different blood pressure levels of 24 mmHg between arms (113/69 mmHg in the left arm and 137/84 mmHg in the right arm). Her blood pressure in right leg and left leg was 165/84 mmHg and 162/84 mmHg, respectively. A marked bruit was heard in the left

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supraclavicular area. An electrocardiogram showed sinus rhythm with T wave inversions in V1–V4. The troponin T level was less than 0.03 ng/ml, and the creatine kinase-MB level was 3.9 ng/ml, both of which were within normal ranges. She was admitted and elective coronary angiography was performed. Coronary angiography revealed patent left IMA and right IMA grafts and severe stenoses of the proximal LAD and the proximal left circumflex artery. Angiography also showed a retrograde flow from the LAD to the left IMA (Fig. 1A). Selective angiography of the left IMA failed to visualize the distal portion of the left IMA and the bypassed LAD due to competition of IMA blood flow with retrograde flow from LAD (Fig. 1B). Aortography showed a 90% stenosis of the proximal portion of the left subclavian artery (Fig. 2A), and the left vertebral artery was visualized retrogradely. A color Doppler ultrasonography revealed reversals of the left vertebral artery and the left subclavian artery flows (Fig. 3A). To confirm that her chest pain was due to ischemia in anteroseptal area perfused by the left IMA, we referred the patient for myocardial perfusion imaging with pharmacological stress using single photon emission computed tomography (SPECT). Myocardial SPECT demonstrated an adenosine-induced perfusion defect in the anteroseptal region (Fig. 3C). On the basis of these findings, the diagnosis of effort angina due to CSVSS was made.

The stenosis of the left subclavian artery was successfully treated with a percutaneous transluminal angioplasty and

implantation of a self-expandable stent (Omnilink Elite 10.0–19 mm; Abbott Vascular, Abbott Park, IL, USA). Post-procedural angiography demonstrated a widely patent left subclavian artery (Fig. 2B) and the left vertebral artery was also visualized antegradely. Coronary angiography showed the absence of retrograde flow from the LAD to the left IMA (Fig. 1C). Selective angiography of the left IMA antegradely visualized the IMA and the bypassed LAD (Fig. 1D). After the endovascular treatment of the left subclavian artery, her blood pressure was 129/72 mmHg in the left arm and 130/73 mmHg in the right arm. A color Doppler ultrasonography of the left vertebral artery revealed antegrade flows (Fig. 3B). Myocardial SPECT demonstrated improved perfusion in the anteroseptal region compared with the preoperative findings (Fig. 3D). She was free from chest pain and dizziness after the treatment and discharged after 9 days of endovascular treatment.

Discussion

CSVSS is a rare complication of CABG when an IMA is used. Hwang et al. reported that the prevalence of a significant proximal left subclavian artery stenosis in patients referred for isolated CABG was 2.5% [2]. Although the most common cause of subclavian artery stenosis is atherosclerosis, other pathological etiologies could cause CSVSS including Takayasu's arteritis, radiation

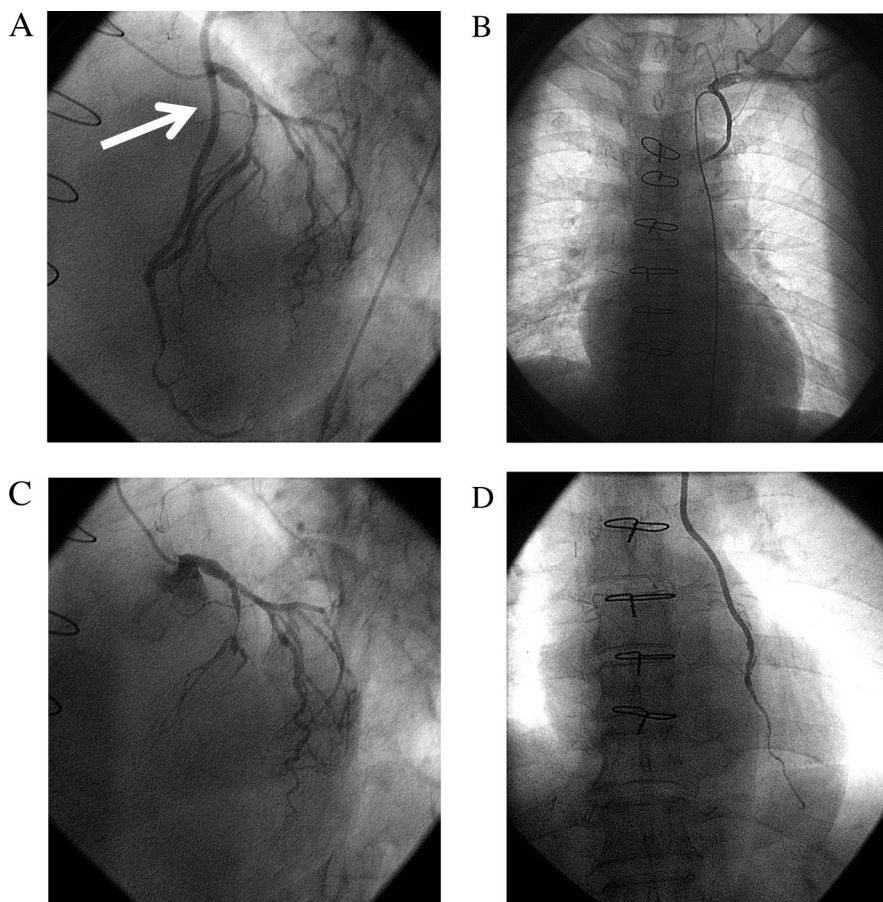


Fig. 1.

Coronary and left internal mammary artery (IMA) angiography before and after endovascular treatment of the left subclavian artery. (A) Before the endovascular treatment of the left subclavian artery stenosis, coronary angiography revealed the patent left IMA graft and severe stenoses of the left anterior descending (LAD) artery and the left circumflex artery. Angiography also showed the retrograde flows from the LAD to the left IMA (arrow). (B) Before the endovascular treatment of the left subclavian artery stenosis, selective angiography of the left IMA failed to visualize distal portion of the IMA and the bypassed LAD. (C) After the endovascular treatment of the left subclavian artery stenosis, coronary angiography demonstrated the absence of retrograde flows from the LAD to the left IMA. (D) After the endovascular treatment of the left subclavian artery stenosis, selective angiography of the left IMA clearly visualized distal portion of the IMA and the bypassed LAD.

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