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## CLINICAL VIGNETTE

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# A Case of Subclavian Steal Syndrome

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A 72-year-old male with history of diabetes, hypertension, hyperlipidemia, coronary artery disease presented to the Emergency Department with left arm pain and intermittent numbness for the past 2 days worse with sleeping. He denied any other weakness or areas of numbness. He noted no change in vision, speech or word finding ability. Additionally, he denied dizziness, neck pain, chest pain, shortness of breath nor syncope. There was no recent trauma, fall or new activities.

His vital signs were unremarkable. Despite his history, he was asymptomatic upon presentation. At rest, his blood pressures were equal in bilateral upper extremities. He had no sensation of numbness nor weakness on exam. Strong pulses were felt in his right upper extremity but difficult to palpate in his left upper extremity. The patient's hands were warm bilaterally with good capillary refill. He had a symmetric face, no slurred speech and was ambulating with ease.

Based on history, risk factors and physical exam there was concern for subclavian steal syndrome. He was admitted to the hospital for imaging and further consultation with the Vascular surgery service.

Arterial ultrasounds of bilateral carotids and bilateral upper extremities revealed abnormal low velocity, monophasic, and low resistance waveforms throughout the left upper extremity arteries, highly suspicious for a proximal left subclavian artery stenosis. Additionally, the left vertebral artery demonstrated reversed flow, compatible with a left subclavian steal syndrome. The right vertebral artery demonstrated normal waveforms and antegrade flow. The patient also had 70-95% left internal carotid artery stenosis.

The patient was deemed a candidate for surgical intervention, however he refused. After the diagnosis was determined, he felt comfortable being discharged with his symptoms.

### Discussion

The phenomenon "subclavian steal" refers to a phenomenon of flow reversal in the vertebral artery ipsilateral to a hemodynamically significant stenosis or occlusion of the prevertebral subclavian artery.<sup>1-3</sup> Steal syndrome implies a significant arterial insufficiency to the brain or upper extremity, from the vertebrobasilar artery and subclavian artery respectively.

Proximal occlusion of the subclavian artery to the vertebral artery results in a decrease flow of blood to the arm.<sup>4-5</sup>

Therefore, there is a retrograde flow from the contralateral vertebral artery to the basilar artery then to the ipsilateral vertebral artery. This allows flow to the arm however decreases flow to the brainstem producing neurological effects.<sup>6-7</sup>

### Risk Factors

The most common cause for subclavian steal syndrome is atherosclerosis. Individuals who have peripheral artery disease generally have atherosclerotic disease greater in their lower extremities than their upper extremities. Approximately 30% of patients of these patients will have subclavian artery occlusion but very few are symptomatic with subclavian steal syndrome.<sup>7</sup>

The syndrome occurs most often in men with more than 75% occurring in the left arm due to the acute origin of the left subclavian artery off the aortic arch.

Other conditions that may increase the risk of subclavian stenosis include: Takayasu arteritis, thoracic outlet compression, and post-surgical changes following repair of congenital anomalies such as Tetralogy of Fallot and coarctation of the aorta.

### Clinical Presentation

Most patients with subclavian artery stenosis are asymptomatic. Many are diagnosed after an incidental finding of a difference in blood pressures in both arms or from ultrasound testing for carotid or coronary artery disease. When symptoms do occur, they are due to ipsilateral arm ischemia. They may have exercise-induced pain, paresthesias, coolness, fatigue or numbness. A large pressure difference of >40mmHg between the arms is more commonly associated with symptoms and the need for intervention.<sup>8</sup> Neurologic symptoms are less common but may be due to vertebrobasilar ischemia of the brain. These include dizziness, ataxia, disequilibrium, nystagmus, visual and auditory changes and syncope. This can occur with upper extremity exercise or with head movements usually toward the opposite side.<sup>8</sup> Neurologic symptoms are dependent on the presence of collateral blood supply since most patient have underlying arterial disease.

On exam, there is usually a difference in systolic blood pressures with a decrease greater than 15mmHg to the affected side. Additionally, the radial pulse of the affected side would have a decrease in amplitude and delay in arrival compared to the

unaffected side. Additional exam of the carotid arteries and vertebral arteries should be performed to note any thrills or bruits.

Imaging is necessary to definitively establish the diagnosis. Duplex ultrasound can diagnose and semi-quantify stenosis and demonstrate reversal of flow. Additional modes of imaging include: transcranial Doppler, Magnetic Resonance Angiography, and CT angiography.

### Management

Subclavian stenosis is a marker of atherosclerotic disease and future cardiovascular events. It is associated with increase mortality therefore secondary prevention may be beneficial for asymptomatic patients such as: life style changes, blood pressure control, treatment of dyslipidemia, glycemic control, smoking cessation, and antithrombotic therapy.<sup>9</sup>

If a patient with subclavian stenosis is asymptomatic, more targeted treatment may not be necessary. Additionally, if there is significant surgical risk and unfavorable anatomy for intervention, treatment with an antiplatelet may be started.

Both extra-anatomic bypass and percutaneous transluminal angioplasty are safe and effective.<sup>10</sup> Symptomatic patients with ulcerated lesion in the subclavian artery may be treated with revascularization through open surgical bypass.<sup>11-12</sup> Extra-anatomic revascularization is the most common form of surgical correction.<sup>13</sup> Endovascular intervention has shown to have low mortality and morbidity.<sup>14-15</sup>

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