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CLINICAL VIGNETTE

Arm Claudication in a Bowler

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A 72-year-old left handed male with history of hypertension, type 2 diabetes mellitus and coronary artery disease presented for cardiac follow-up complaining of left arm weakness. He denied chest pains or shortness of breath. He was adherent to his diet, exercise and medications. He walked briskly for 30 minutes four times a week. He also bowled three times a week. Recently, his left arm fatigued before his game was complete. This weakness resulted in a poor performance and the ball slipping from his hand. He added weight training to his exercise regimen but failed to see an improvement. A neurology evaluation was pending.

Medications included a beta-blocker, statin, aspirin and plavix. He had previous intolerance to ACE inhibitors. He reported a history of 45 pack-year tobacco use and a 10-year history of chewing smokeless tobacco.

On examination, there was a 30 mm Hg systolic pressure difference between the right and left arms. The left radial pulse was diminished compared to the right, and bilateral soft carotid bruits were present. Venous pressures in the neck were normal. Cardiac examination revealed a grade two systolic ejection murmur that radiated to the base of the heart. Lungs and abdomen were within normal limits. There were no abdominal bruits and pulses in the lower extremities were normal.

ECG and routine laboratory studies were within normal limits. An ankle brachial index performed in the office found a 35 mm Hg lower blood pressure in the left arm compared to the right.

The patient's symptoms were suggestive of left arm claudication, and non-invasive evaluation was suggestive of left subclavian artery stenosis. An angiogram was advised but the patient refused and opted for further non-invasive imaging. MRA revealed a discrete high-grade stenosis in the left subclavian artery, proximal to the origin of the vertebral artery. An endovascular procedure was performed including balloon angioplasty of the subclavian stenosis, followed by stent implantation.

In follow-up, the patient had equal blood pressures in both arms and his symptoms completely resolved.

Background

The incidence of subclavian stenosis ranges from 3-4% in the general population[1]. In those with peripheral arterial disease (PAD), the incidence increases to 11-18%[2]. Fifty percent of patients with subclavian or innominate lesions also have concurrent CAD, 27% have PAD and 29% have carotid disease[2,3]. Thus, patients with subclavian ste-nosis are at increased risk for CAD and stroke. Conversely, patients with atherosclerotic risk factors such as smoking, hypertension, low HDL and history of PAD are at increased risk of developing subclavian stenosis, with PAD being the strongest predictor[4]. The prevalence of subclavian artery ste-nosis is likely underestimated since the disease is largely asymptomatic[4].

Etiology

Atherosclerosis is the most common cause of subclavian stenosis[5]. Left-sided stenosis is four times more common, likely due to increased turbulence from a more acute origin of the left subclavian artery[6].

Coronary subclavian steal can occur in patients who have undergone Coronary Artery Bypass Grafting (CABG) with Internal Mammary Artery Grafts (IMA). During upper extremity exercise, flow through the IMA may reverse in the setting of significant subclavian artery stenosis proximal to the origin of the ipsilateral IMA, and thus "stealing" blood flow that would otherwise feed the coronary circulation[7].

Similarly, steal phenomenon can occur in the vertebrobasilar arteries which compromise the cerebral circulation. As in coronary-subclavian steal, blood flow is "stolen" from the cerebral circulation by the distal subclavian artery, which has a lower pressure due to stenosis or occlusion proximal to the vertebral artery[8].

Other etiologies for subclavian artery stenosis include Takayasu arteritis, thoracic outlet syndrome, inflammation due to radiation exposure, fibromuscular dysplasia, and congenital vascular anomalies.

Clinical Presentation

Most patients with subclavian artery stenosis are asymptomatic and require no intervention. Patients may present with arm claudication, muscle fatigue, rest pain and even distal necrosis from showering emboli[5]. Anginal symptoms can occur due to coronary-

subclavian steal. Neurological symptoms occur when the vertebrobasilar arteries are compromised and can manifest as visual changes, syncope, ataxia, problems with balance, dysarthria, vertigo, and facial sensory deficits[5,9].

There is often a >15mmHg difference in brachial blood pressure between the affected arm and normal arm[1] as well as absent or diminished axillary, brachial, radial, or ulnar pulses in the affected arm[5].

Diagnosis

To evaluate a significant blood pressure difference between right and left arms, Duplex Ultrasound with color flow is the initial imaging of choice. Obstruction is suggested on ultrasound if there is waveform dampening, monophasic changes, turbulent flow, and heightened blood flow velocities at suspected sites of subclavian lesions[10].

Contrast-enhanced magnetic resonance angiography (MRA) provides accurate visualization of artery anatomy as well as the stenoses themselves[11]. Alternatively, CT angiography may accurately delineate anatomy of the subclavian artery when MRA is not available. Contrast angiography is an invasive diagnostic test that can also reveal subclavian lesions to confirm the diagnosis.

Patients who are planning to undergo CABG with IMA grafting should receive screening with non-invasive testing when a >10-15 mmHg difference is found on bilateral blood pressure testing or they have a history of known PAD[12]. Angiography before noninvasive testing is currently debatable due to the risks of invasive procedures[12].

Management

Risk factors for cardiovascular disease (CVD), including smoking, dyslipidemia, hypertension, diabetes, poor diet and sedentary lifestyle, should be assessed and treated. Medical therapy should also include anti-platelet therapy with aspirin or clopidogrel[5].

If symptoms persist, interventional therapy with revascularization is indicated. Surgical therapies include axillo-axillary bypass, carotid-subclavian bypass, and transposition of the subclavian artery. Endovascular procedures are gaining popularity, with balloon angioplasty and/or stenting. A 2011 Cochrane review concluded there is insufficient evidence to determine if stenting is more effective than angioplasty due to the lack of any randomized studies[13]. Regardless, percutaneous intervention is favored to surgery since it has demonstrated technical success (as high as 98% success rates with experienced physicians), long-term patency (85-90% at 3 years), low complication rates[14], and shorter healing times and length of hospital stay[15].

Conclusion

Due to its association with cardiovascular disease (CVD), the diagnosis of subclavian stenosis is a predictor of higher mortality and CVD mortality[16]. Proper and timely identification and treatment of risk factors and/or symptomatic stenosis is important. Primary care physicians should be aware of subclavian stenosis not only due to its association with CVD but also due to its effect on blood pressure readings. Bilateral blood pressure measuring should occur routinely, as is recommended by the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC VII)[17] for hypertension screening. Since subclavian stenosis is largely asymptomatic, unilateral blood pressure measurement can potentially lead to false blood pressure readings and suboptimal treatment of hypertension[4].

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