Hand-arm vibration syndrome with distal brachial artery occlusion

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Abstract

Hand-arm vibration syndrome (HAVS) is a complex disorder of the peripheral extremities that is associated with occupational or recreational exposure to hand-transmitted vibration. Digital artery occlusion in HAVS is a common finding; however, proximal involvement is less likely. We present a case of HAVS with the initial presentation of acute limb ischemia and with thrombus burden extending from the distal brachial artery and into the ulnar and radial arteries. To our knowledge, no case of HAVS syndrome of similar severity has been previously described. This case emphasizes the potential dangers of HAVS and the necessity for proper prophylactic interventions at the workplace.

Keywords: arterial occlusion, arterial thrombosis, acute arm ischemia, occupational exposure, hand-arm vibration syndrome

Introduction

Hand-arm vibration syndrome (HAVS) is a complex disorder of the peripheral extremities that is associated with occupational or recreational exposure to hand-transmitted vibration. It involves multiple neurologic, vascular, and musculoskeletal abnormalities.[1] This condition should be distinguished from hypothenar hammer syndrome (HHS). This latter syndrome develops as a result of a lesion in the ulnar artery at the level of hamate bone, which occurs due to repetitive trauma from use of the hypothenar side of the hand as a hammer. Both HAVS and HHS have similar clinical presentations and pathophysiologic substrates, which can create an overlap between these two conditions.[2]

The most common presentation of HAVS is numbness and accompanying periodic blanching or vibration-induced white finger, which is the vascular component of the condition.[3,4] Secondary Raynaud's phenomenon due to HAVS has been well described and staged.[5] Advanced stages of vibration-induced white finger can lead to trophic changes in the skin, and up to 5% of patients with HAVS develop skin necrosis of the distal digits.[6] There is no gold standard for diagnosis of HAVS, and it remains a diagnosis of exclusion.[7]

Arterial thrombosis of the digital arteries has been previously reported with HAVS, and the clinical sequelae of arterial occlusion can be significant.[8,9] Distal arterial thrombosis rates are more common than proximal peripheral arterial occlusions. There are reported cases of extensive proximal ulnar arterial occlusions in HAVS.[10] To our knowledge, acute limb ischemia and brachial artery occlusion have never been reported in association with HAVS.

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Case report

A forty-year-old man presented to the hospital with the acute onset of excruciating pain, cyanosis,

and paresthesia of his right upper extremity. The patient worked in construction and had a history of using jackhammers and other vibrating tools for over 25 years. He reported frequently using his right hand as a hammer at work. He denied using any protective devices. His past medical history was significant for poorly treated hypertension and long-standing tobacco abuse. He had not seen a doctor in the past five years. He denied any history of diabetes, myocardial infarction, atrial fibrillation, a rheumatologic disorder, arterial or venous thrombosis, or a hypercoagulable disorder. He also denied any recent or remote history of trauma to the affected arm. He noted antecedent numbness, which started in his right ring finger and gradually extended to his right hand and arm over the course of the prior three weeks. He also described periodic bilateral cold-induced cyanosis of his fingers.

Physical examination showed cyanosis of his right arm up to the elbow and mottled digits of the left hand. A small ulcer was noted on his right fourth digit. His blood pressure was 170/100 mmHg. He had no signs of volume overload. Laboratory studies showed a white blood cell count of 14.1 k/μL, a platelet count of 113 k/μL, and a slight increase in ALT and AST with values of 61 and 39 IU/L, respectively. His urine drug screen was negative for illicit vasoactive agents. His initial ECG showed a normal sinus rhythm; no significant rhythm abnormalities were noted on subsequent telemetry monitoring strips.

His presentation was consistent with acute limb ischemia, and emergent angiography revealed an occluded right brachial artery at the antecubital segment (Figure 1). Aspiration thrombectomy and mechanical rheolytic thrombectomy were attempted multiple times with slight improvement in blood flow. There was persistent large thrombus burden, and subsequent placement of fountain catheter and catheter directed thrombolysis were performed. Repeat angiography 12 hours after lytic infusion showed return of flow within the brachial artery but persistent occlusion in the ulnar artery (Figure 2). Multiple attempts of angioplasty were performed at the level of the bifurcation of the ulnar and radial arteries; the ulnar artery occlusion persisted. Angiography did show appropriate flow in the radial artery, an intact palmar arch, and retrograde filling of the ulnar artery (Figure 3). At this time the procedure was terminated, and the patient was sent to the CICU for observation.

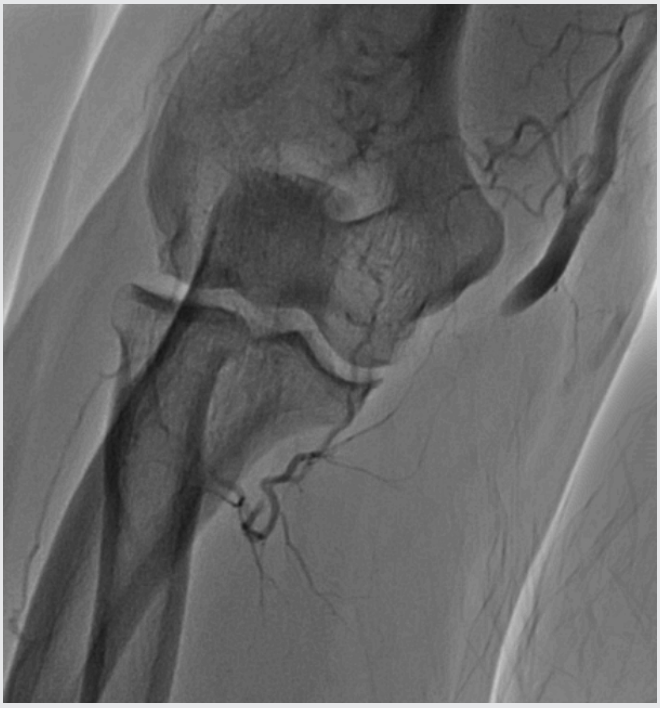

Figure 1. Occluded brachial artery at initial angiography.

Following the procedure the patient had normal arm perfusion and no more pain or discoloration. A vasculitis work up (antiproteinase-3 antibodies, antimyeloperoxidase antibodies, and antinuclear antibodies) was negative. Glycosylated hemoglobin level was 5.2%. His total cholesterol was 174 mg/dL, and the LDL was 115 mg/dL. Digital plethysmography revealed severely reduced waveforms in the right fourth digit and moderate reduction in the left fourth and fifth digits. The patient was discharged on apixaban 5 mg twice daily, aspirin 81 mg daily, atorvastatin 10 mg nightly, and nifedipine ER 30 mg daily. He was advised to discontinue vibration tool use, to protect his fingers from cold exposure, and to stop smoking immediately. At a six month follow up he denied numbness, paresthesias, pain, and discoloration of the hands. He had stopped using vibrating tools at work.

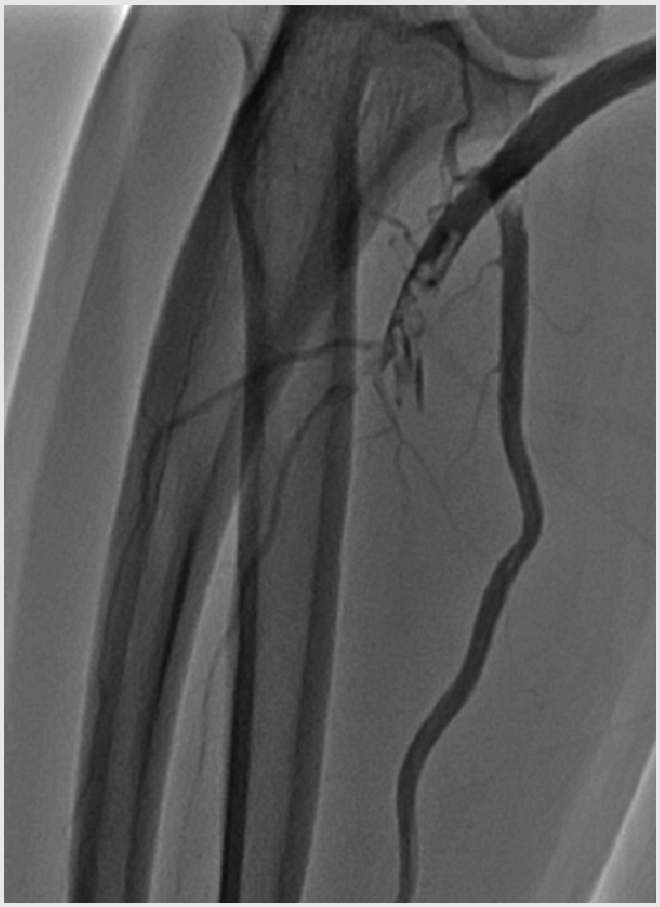

Figure 2. Occluded ulnar artery at subsequent angiography after 12 hours of thrombolytic administration. There is appropriate blood flow in radial artery with proximal thrombus burden.

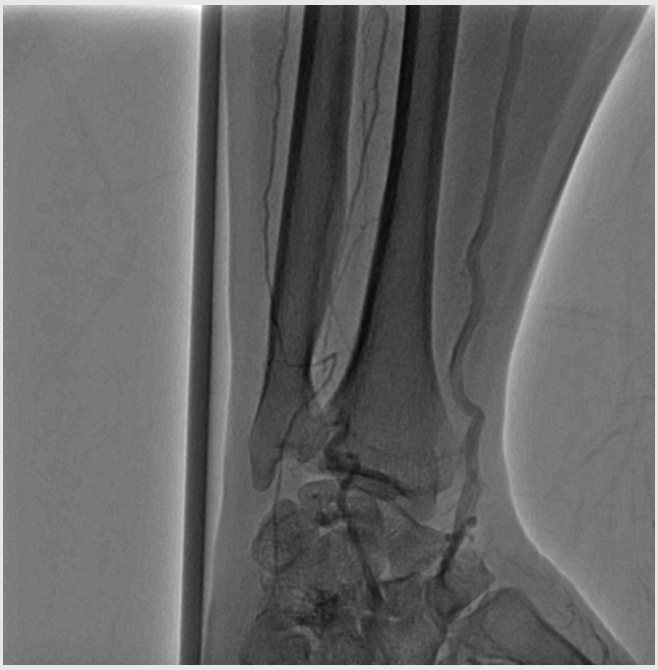

Figure 3. Angiography shows a patent radial artery with reconstituted flow to an occluded ulnar artery by the palmar arch.

Discussion

This is the most severe HAVS case reported to our knowledge with thrombotic involvement of the ulnar, radial, and brachial arteries. The patient was diagnosed with acute limb ischemia, which also makes it an unusual presentation of HAVS. Another interesting feature of this case is the extensive thrombus burden requiring manual aspiration, mechanical thrombectomy, and catheter directed lytic therapy. The mechanism of distal brachial artery occlusion is thought to be proximal extension of more distal thrombosis. The case emphasizes the potential dangers of HAVS and thus the need for early recognition by clinicians for proper therapeutic interventions and lifestyle modifications. It also emphasizes the need for occupational safety at the workplace, including education, periodical risk assessment and health surveillance, and effective use of protective devices.

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