Hypothenar Hammer Syndrome in a Computer Programmer: CTA Diagnosis and Surgical and Endovascular Treatment

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Finger ischemia due to embolic occlusion of digital arteries resulting from trauma to the palmar ulnar artery has been termed hypothenar hammer syndrome (HHS). In HHS, arterial thrombosis and/or aneurysm formation with embolization to the digital arteries causes symptoms of ischemia. We describe a patient in whom the initial diagnosis was made on multidetector computed tomographic angiography (CTA), as well as his endovascular and surgical management.

Keywords: hypothenar hammer syndrome; CT angiography; fibrinolysis; ulnar artery

Introduction

Upper extremity digital ischemia can result from a number of pathologies including atherosclerosis, Raynaud disease and phenomenon, vasculitis, arterial emboli, thromboangiitis obliterans, thoracic outlet syndrome, and hypothenar hammer syndrome (HHS).1 Hypothenar hammer syndrome is encountered in patients using the hypothenar eminence of the hand to strike, push, or squeeze hard objects. Trauma may cause injury to the palmar branch of the ulnar artery as it is compressed against the hook of the hamate. Symptoms commonly mimic Raynaud syndrome, but in more severe cases ischemic ulcerations of the fingers have been described.2 Stenosis, thrombosis, or aneurysm formation of the ulnar artery may result from this repetitive trauma. The diagnosis is typically established with angiography but Doppler ultrasound can also be helpful in this clinical setting. Treatment includes pain control and anticoagulation. Endovascular techniques like catheter-directed thrombolysis as well as surgery may be needed in severe cases. Hypothenar hammer syndrome can present with either a segmental occlusion of the ulnar artery or a patent ulnar artery with elongation and corkscrew appearance.3 Computed tomographic angiography (CTA) has been established as a reliable diagnostic tool for the evaluation of vascular disease in many parts of the body. Its use in the upper extremity is less well explored. We report on a patient with HHS in whom the primary diagnosis was established with CTA as well as his endovascular and surgical management.

Case Report

A 53-year-old man presented with blue and throbbing fourth and fifth digits of his dominant right hand. No other symptoms were present in the
affected limb or any other extremity. There was no medical history or family history of Raynaud disease or other vascular disorders. He worked as a computer programmer and was not exposed to equipment that may expose the hypothenar to trauma. On examination, the right fourth and fifth digits were blue and cold with mild tenderness at the right distal phalanx of the small finger. There was no tissue loss.

Upper extremity CTA performed on a 16-slice scanner (GE Lightspeed 16, GE Medical Systems, Milwaukee, WI) using a collimation of 0.63 mm showed occlusion of the right ulnar artery just distal to the hook of the hamate (Figure 1). The proper digital arteries of the fifth digit could not be positively identified. A diagnosis of HHS was made. Digital subtraction angiography was performed and confirmed occlusion of the distal right ulnar artery with filling defects in the occluded segment as well as occlusion of the proper digital arteries of the fifth digits beyond the midphalanx (Figure 2A and B). A microcatheter was placed into the ulnar artery and local therapy with tissue plasminogen activator (tPA) was initiated at a dose of 0.5 mg/h. Tissue plasminogen activator was continued for 72 hours until flow was restored in the ulnar artery and the patient was clinically improving. The previously occluded segment of the ulnar artery had a corkscrew appearance and the distal proper digital arteries of the fifth digit remained occluded (Figure 2C). The patient was discharged but returned 48 hours later as he again started to develop pain and numbness in the tip of his right fifth digit. On physical examination, the tip of the small finger was dusky with 2 to 3 seconds capillary refill. A decision was made to perform digital sympathectomy of the right small finger at the level of the Metacarpophalangeal, MCP and proximal phalanx. This operation was done successfully and a follow-up visit 1 week later revealed significant improvement in the circulation of the right little finger, with only minimal pain and normal sensation. The bluish discoloration of the tip of the finger had disappeared. At last follow-up 5 months after initial presentation, the patient remained asymptomatic.

Discussion

Hypothenar hammer syndrome was first described by Conn in 1970, and its cause was identified as repetitive blunt trauma to the distal ulnar artery and superficial palmar arch where they are vulnerable to mechanical injury due to entrapment between the external force and the hamulus. The trauma to the hypothenar eminence is usually chronic, however, severe acute attacks of the syndrome have been reported. The arterial damage may present acutely or with intermittent signs and symptoms and can lead to aneurysm formation with or without vessel thrombosis and microemboli.

Hypothenar hammer syndrome is more common in men and typically occurs around the 40th year of age. Clinically, HHS presents with ischemia of the second, third, fourth, or fifth digits of the dominant hand. Patients typically complain of pain with paresthesias, cold sensitivity, finger claudication, and discoloration of the fingertips. The main differential considerations are connective tissues disorders and/or Raynaud disease.

An Allen test can be used to clinically assess the patency of the superficial palmar arch. However, this test was reported to be negative in 14% of patients with HHHS in 1 study.
The “gold standard” for radiological diagnosis of HHS is angiography. Ferris et al described the following angiographic findings in HHS: segmental occlusion of the ulnar artery or a patent ulnar artery with elongation and corkscrew appearance. Based on their angiographic appearance the following classification was proposed by Kaji et al: Type 1: Stenosis of the superficial palmar arch around the hook of hamate with intact deep palmar arch, (2a-) occlusion of the superficial palmar arch around the hook of hamate with intact deep palmar arch, (2b-) occlusion of both superficial and deep palmar arches around the hook of hamate bone, (3a-) occlusion of the ulnar artery at the proximal part of the wrist with simple dilatation of the dorsal carpal branch or the formation of a collateral palmar arch between the dorsal carpal branch of the ulnar artery and the palmar arch, (3b-) occlusion of the ulnar artery near the wrist with the concomitant occlusion of the dorsal carpal branch of the ulnar artery.

Doppler ultrasound may serve as an initial tool but requires operator experience and a compliant patient. Newer diagnostic tools include magnetic resonance imaging (MRI) and CTA. Contrast-enhanced magnetic resonance angiography (ceMRA) in HHS was described in a series of 5 patients, where ceMRA provided information about the morphology and extent of vessel injury and the morphology of the ulnar artery, the palmar arches and common volar digital arteries. The proper digital arteries could not be adequately assessed with the

![Figure 2](Figure 2. A, Initial diagnostic angiogram with the catheter in the brachial artery shows thrombotic occlusion of the distal ulnar artery (arrow) as well as occlusion of the distal proper digital arteries (arrowheads). B, Superselective ulnar DSA shows occlusion of distal ulnar artery with a filling defect (arrow). C, Ulnar DSA post catheter directed thrombolysis shows the recanalized ulnar artery which has a corkscrew appearance (arrow); the distal proper palmar digital arteries are still occluded (arrowheads).)
technique employed by these authors. The role of CTA in this setting is not known due to the rarity of the entity, but CTA was shown to be capable to depict the typical findings in a case in a review of pathologic conditions of the hypothenar eminence whose authors considered multidetector computed tomography (MDCT) an efficient method to diagnose the syndrome.

Treatment of HHS is controversial. Conservative care includes: (1) avoidance of further trauma as well as (2) antiplatelet agents or anticoagulation (3) in acute cases pain control, local wound management as well as revascularization are required. Studies regarding surgical treatment of HHS are limited to small numbers and variable types of pathology (thrombosis versus aneurysm). Surgical treatment modalities range from ligation of the ulnar artery to venous or arterial bypass grafts as well as digital sympathectomy. Endovascular techniques used in HHS are application of intra-arterial vasodilators and/or intra-arterial thrombolysis.

Although our patient had no history of violent repetitive trauma to the hands as traditionally reported, we speculate that this case was most likely the result of continuous micro trauma to the ulnar artery caused by pressure of the hypothenar eminence against the hard desk surface when operating the mouse and keyboard.

Computed tomographic angiography of the upper extremities has evolved into a robust diagnostic tool for the evaluation of the upper extremity arterial system. Our experience with more than 100 cases suggests it to be a valuable diagnostic modality if the pathology is proximal to the digital arteries. The digital arteries remain the domain of Digital Subtraction Angiography, DSA (unpublished data).

In summary, we describe a case where the diagnosis of HHS was made with MDCT angiography in a patient presenting with hand symptoms in the emergency room. This diagnosis was confirmed with DSA and the combination of endovascular thrombolysis and digital sympathectomy led to a good outcome.

References


