

Hypothenar Hammer Syndrome Due to Penetrating Trauma: Case Report & Brief Review

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Abstract

Hypothenar Hammer Syndrome (HHS) is a rare disorder seen in those engaged in occupations with repetitive trauma to hypothenar region. It leads to thrombosis and formation of aneurysm or pseudoaneurysm in distal ulnar artery. It may very rarely occur secondary to penetrating trauma and maybe misdiagnosed. Symptoms may be acute or chronic with recurrent episodes of pain, numbness, tingling, cold intolerance, and weakness in the ulnar nerve distribution. Colour Doppler and Magnetic resonance angiography are the non-invasive modalities of choice for diagnosis. We report an atypical case of HHS in a young female with an ulnar artery pseudoaneurysm in dominant hand following a single episode of history of penetrating trauma to hypothenar region from a broken bangle, while washing clothes.

Keywords: Hypothenar Hammer Syndrome; Penetrating Trauma; Pseudoaneurysm

Introduction

Ulnar artery at wrist is the most common site of arterial aneurysms in upper extremity because of its superficial location and unique anatomic relation to the hook of the hamate. Hypothenar hammer syndrome is a rare vascular disorder resulting from injury to the ulnar artery at this level. It is classically seen in workers with repetitive blunt trauma to hypothenar region, with formation of thrombosis and rarely aneurysm or pseudoaneurysm in distal ulnar artery [1]. However, the cause was a single episode of penetrating trauma in our 28-year-old female patient presented here.



Figure 1: Photograph of patient's hand showing swelling in hypothenar region.

There was history of single episode of penetrating trauma to ulnar aspect of right hand due to a broken bangle 02 month back while washing clothes. The swelling increased in size over last 7 days. The patient developed paresthesias in the ring and little finger of right hand. There were no other systemic symptoms and no significant medical history. Physical examination showed swelling and

Case Report

A 28-year-old, right handed housewife presented with severe pain in right hand since 1 month with associated swelling in the region of right hypothenar eminence (Figure 1).

tenderness in the hypothenar region of the right hand, with mild overlying erythema. The patient experienced increased pain with passive and active range of motion. Both ulnar and radial pulses were normal. Diminished sensations (light touch and 2-point discrimination) were noted along medial one-and-a-half-digit ulnar distribution. There was mild weakness of the interosseous muscle, abductor digiti minimi and the lumbricals to the ring and the little finger with a positive Froment's sign. A pulsatile mass was palpable over the hypothenar eminence. Systemic examination was essentially normal.

Gray scale ultrasonography and colour Doppler of left hand were performed using 12 MHz linear probe. Gray scale ultrasonography showed an anechoic cystic saccular structure arising from the distal ulnar artery superficial to the hook of the hamate bone (Figure 2A). Colour Doppler ultrasound showed internal turbulent flow within this saccular structure suggestive of pseudoaneurysm (Figure 2B).

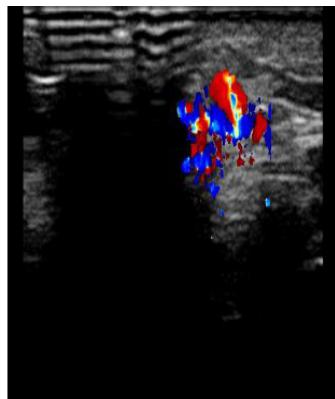


Figure 2A & B: Gray scale USG and color Doppler images showing lobulated pseudoaneurysm with flow on color Doppler.

Magnetic Resonance Angiography (MRA) was performed on a 1.5 T MRI scanner. Axial and coronal T1 weighted sequences, axial and coronal T2 weighted sequences and axial gradient echo sequences were obtained. Time of Flight (TOF) MRA images demonstrated the pseudoaneurysm arising from superficial branch of ulnar artery with maintained distal supply (Figures 3 & 4).

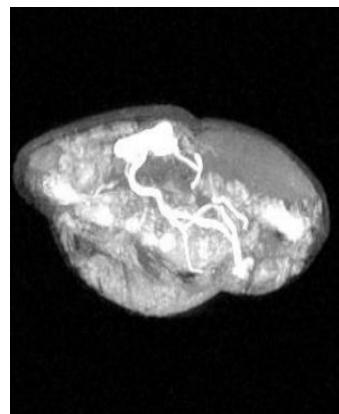


Figure 3A & B: MRA TOF axial and coronal images reveal focal out-pouching of superficial branch of Ulnar artery at the level of hook of hamate. The patency of proximal and distal vessels is maintained.

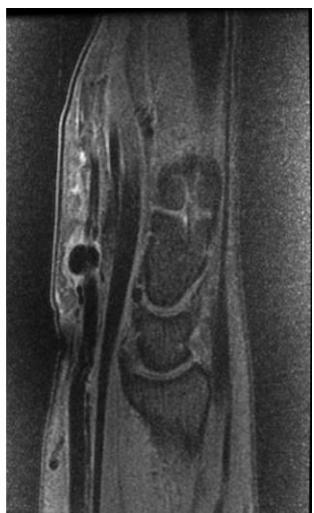
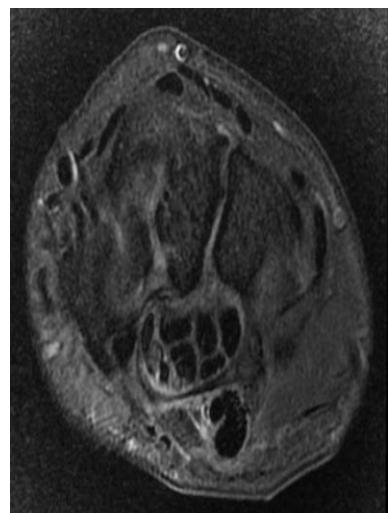


Figure 4A & B: Axial and sagittal PDFS images show 6 mm hypointense lobulated flow void in continuity with superficial branch of ulnar artery at the level of the hook of hamate s/o patent pseudoaneurysm.

The findings were confirmed at surgery. The pseudoaneurysm was distal to the boundary of the Guyon canal. The aneurysm was excised and end to end anastomosis was performed with good response on follow-up.

Discussion

Hypothenar hammer syndrome is a rare but likely underdiagnosed condition of digital vascular insufficiency caused by acute or repetitive trauma to the distal part of ulnar artery in the hypothenar region. It may rarely occur due to penetrating trauma. There are only about 500 reported cases. Marie et al reported an incidence of HHS of only 1.13% among 4148 patients referred for evaluation of Raynaud phenomenon. However, they also suggested that the prevalence of this syndrome may be underestimated as patients may be asymptomatic [2]. It was first described by von Rosen in a 23-year-old factory worker who was treated with excision of the thrombosed artery. Due to increased incidence of this syndrome in workers who repeatedly use the hypothenar eminence as a substitute for a hammer, Conn et al coined the term hypothenar hammer syndrome in 1970 [1].

This syndrome typically occurs in the dominant hand of middle aged men or athletes who use their hand as a hammer. Workers most at risk are metal workers, auto mechanics, miners, bakers, carpenters and construction workers. This syndrome is also seen in athletes engaged in badminton, golf, squash, mountain biking, weightlifting, martial arts, baseball, basketball, football and tennis. In one of the largest follow up series of patients with this syndrome by Marie et al, the most common associated occupation was factory worker (21.3%) [2]. Among the reported cases, the authors could find only 4 such cases secondary to penetrating trauma [3,4]. Patients are predominantly males and present with symptoms of unilateral hand and digit ischemia, affecting the dominant hand most commonly. Symptoms may be acute or chronic with recurrent episodes of pain, numbness, tingling, cold intolerance, and weakness in the ulnar nerve distribution. Severe cases may demonstrate findings of gangrene, ulceration or eschar formation [5]. The unilateral nature of the symptoms and the sparing of the thumb distinguishes hypothenar hammer syndrome from Raynaud's phenomenon. Hypothenar hammer syndrome is difficult to distinguish clinically from hand arm vibration syndrome because of similar symptoms and occupational exposure. Distinguishing features include absence of thumb involvement, abnormal Allen's sign and ulnar artery aneurysm in hypothenar hammer syndrome [6].

Unique anatomical features of distal ulnar artery make it prone for trauma and are also responsible for varied symptomatology of this disorder. It runs a relatively superficial course in Guyon's canal, covered only by Palmaris brevis and scanty subcutaneous tissue. This approximately 2 cm long segment of ulnar artery lies against the hook of hamate bone. Repetitive hypothenar trauma compresses this superficial segment against the hook of hamate and damages the intimal layer of the superficial segment of the artery, leading to vasospasm, platelet aggregation and thrombus formation. If the damage extends to the media of the arterial wall, formation of an aneurysm may occur. Intra-aneurysmal thrombus

formation may lead to distal embolization and cause digital artery occlusions [5]. Ulnar artery aneurysms can be true aneurysms with all 3 layers of the arterial wall expanded producing a fusiform or sometimes corkscrew configuration. False or pseudoaneurysms result from penetrating trauma to the ulnar artery. Pseudoaneurysms have a lower propensity for distal embolization, but they can expand and rupture, causing external bleeding [7].

The symptoms of hypothenar hammer syndrome depend on the location and degree of vessel occlusions, formation of aneurysms as well as the individual variations in the arterial supply of the hand [7]. In some cases, the adjacent sensory branches of the ulnar nerve are compressed by aneurysm or thrombosis, causing pain and paraesthesia, also known as Guyon's canal syndrome, which normally requires surgical decompression [5]. On physical examination, the hand and ulnar digits, usually the long, ring, and small fingers, may have pallor, cyanosis, splinter haemorrhages, ulcerations, and/or wounds. Lateral 2 digits are less commonly affected. Signs in the thumb have never been described. A pulsatile mass may be found at the level of the wrist [1]. Predisposing risk factors for hypothenar hammer syndrome include tobacco smoking, strenuous manual labor, dominant hand, and male gender [8]. In our patient, it was a single episode of penetrating trauma. Preexisting fibrodysplasia of the ulnar artery may also be a predisposing factor for this syndrome. Ferris et al postulated that patients with this syndrome have a pre-existing vascular disorder predisposing them to injury, since histological specimen were compatible with fibromuscular dysplasia with superimposed trauma [8]. However, other authors have not been able to confirm this theory.

Diagnostic tests include the bedside Allen's test, ultrasound with Doppler mapping, angiography, Computed Tomography Angiography (CTA) and MRA. Allen's test assesses superficial palmar arch patency and a positive test indicates arterial occlusion [7]. Although not specific to the HHS, an abnormal Allen's test warrants further testing in a patient with a suspicious history. Doppler assisted Allen's test may be done by occlusion of the radial arterial flow by direct digital pressure. Loss of Doppler signal on radial compression implies the absence of arterial input from the ulnar artery. Rather than being completely obliterated, it is possible that the flow signal may be damped which indicates stenosis or corkscrew deformity of the ulnar artery [9]. In our patient color Doppler examination demonstrated Pseudoaneurysm confirming our clinical suspicion. Angiography remains the gold standard test for accurately showing arterial damage consistent with hypothenar hammer syndrome [10]. Multidetector CTA has been reported to be useful in detecting HHS lesions; it has been found to demonstrate precise vascular mapping of radial and ulnar arteries, showing thrombosed or nonthrombosed aneurysm of the ulnar artery, and palmar arches as well as the first few centimeters of the digital arteries. Moreover, this test can be used to show the relationship between the ulnar artery and the hamate bone. Finally, MRA with

3D acquisition may also be helpful to depict the localization and extent of vessel injury in hypothenar hammer syndrome, providing valuable information about the distribution pattern of the hand vasculature and the presence of collateral [11].

Optimal therapy for hypothenar hammer syndrome has still not been determined. The first priority should be the avoidance of further traumatic ulnar artery injury. Conservative nonoperative treatments include smoking cessation, avoidance of recurrent trauma, use of padded protective gloves, calcium channel blockers (e.g., nifedipine and diltiazem) to limit vasospasm, antiplatelet or anticoagulant agents, local care of necrotic fingers, and use of pentoxifylline to reduce blood viscosity. The most common indication for surgical management is the presence of ischemia and vascular damage to multiple digital arteries in the setting of insufficient collateral circulation. The surgical reconstructive procedures for hypothenar hammer syndrome patients include resection of the occluded artery segment, followed by vein graft interposition; and resection of the aneurysm and end-to-end reconstruction with venous or arterial grafts [1]. In our patient, the aneurysm was excised and end to end anastomosis was performed.

Conclusion

Hypothenar hammer syndrome is a rare disorder and usually occurs due to repetitive trauma to the hypothenar eminence. Hence, penetrating trauma as an etiology maybe misguiding resulting in missed diagnosis.

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