SHORT REPORT

Hypothenar Hammer Syndrome: Rare or Underdiagnosed?

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Hypothenar hammer Syndrome (HHS) is a condition characterised by digital ischaemia as a result of repetitive trauma to the hypothenar eminence of the hand. It occurs in people who repeatedly use the palm of the hand as a hammer to push, grind or twist objects. It is a curable and a preventable cause of upper digital ischemia. In this report we present a case of HHS and discuss the causes and pathogenesis of this syndrome. We review the incidence, clinical characteristics, differential diagnosis, investigation and treatment.

Keywords: HHS; Digital Ischaemia; Repetitive hypothenar trauma; Occupational; Ulnar artery occlusion.

Case Report

A 68 year-old Caucasian male was referred to the vascular outpatient clinic by a dermatologist with gangrenous changes in the tip of the right middle finger. He had already had an amputation of the tip of his right little and left middle fingers after he had developed painful non-healing ulcers. He described a 10 years progressive history of pain and cold intolerance in the fingers of both hands. The gentleman had been working in the machinery industry for more than 30 years. His work required continuous use of spanners, which involved using his unprotected hands to hammer the spanner whenever it didn’t yield to ordinary pressure. His medical and family histories were unremarkable. He had smoked for many years but stopped 2 years ago. On examination, the tip of his right middle finger was gangrenous. His right little and left middle finger tips had been amputated. Blood pressure and pulses were normal and equal on both arms. Unfortunately Allen’s test was not done at that time. He had a normal FBC, ESR, serum glucose, Urea and Electrolytes, LFT, Antinuclear factor, rheumatoid factor, Cryoglobulins and thrombophilia screen. His C-ANCA titre was positive at 1:1000. Anti-MPO antibodies and anti-PR3 antibodies were negative. Plain radiography of the hand showed no bony abnormality. His recent echocardiogram was normal. Arrangements were made for him to have an amputation of the terminal phalanx of his right middle finger. Two weeks later he had a colour duplex scan which revealed normal blood flow within the subclavian, brachial, radial and ulnar arteries in both arms with damped flow in both palmar arches. Subsequently an angiogram was carried out (Figs. 1–3), and showed that the ulnar arteries on both sides were thready with progressive narrowing and complete occlusion in the lower third. There was a deficient ulnar component of the palmar arch, no digital arteries supplying the amputated stump of the little finger on the right side, and the digital arteries supplying the other fingers were also diseased.

Histology of the amputated middle finger showed no evidence of primary vasculitis. In view of his past history and both Duplex scan and angiographic findings a diagnosis of Hypothenar Hammer Syndrome was made. He was recently reviewed in the outpatient clinic and seemed to be managing well. There was no evidence of any further ischaemic changes in either hand (Fig. 4). Therefore a conservative approach has been adopted, particularly as the lesions in his ulnar arteries are not amenable to surgical intervention.

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The Ulnar artery, as it enters the hand anterior to the flexor retinaculum between the pisiform bone and the hook of hamate (Guyon’s canal), is fixed to the surrounding structure over a length of 2–3 cm. Between its deep palmar branch and the beginning of the superficial palmar arch, it is only protected by the skin, subcutaneous tissue, palmaris brevis muscle and superficial aponeurosis. Frequent blunt trauma to the hypothenar eminence compresses the unprotected ulnar artery against the hook of hamate triggering vasospasm of the artery. Continued trauma causes damage of the arterial intima which encourages platelet aggregation and thrombus formation. Distal embolization of the digital arteries exacerbates ischemia. Less commonly the repetitive blunt trauma results in ulnar artery aneurysm formation.

Fig. 1. Angiogram of the right hand showing a thready ulnar artery with occlusion of the lower third, deficient ulnar component of the palmar arch, and digital arteries supplying the amputated stump of the little finger.

Fig. 2. Angiogram of the left hand showing a thready ulnar artery with occlusion of the lower third, and deficient ulnar component of the palmar arch.

Fig. 3. Angiogram of the left forearm showing a normal radial artery. The ulnar artery appears normal in the upper two thirds of the forearm and then becomes thready and gradually occluded in the lower third.

Fig. 4. Patient’s hands after being recently reviewed in the outpatient clinic with healed stumps and no evidence of any further ischaemic changes in either hand.
Hypothenar Hammer Syndrome

In a more recent study it has been found that over 90% of sufferers have abnormal angiographic features in the contralateral asymptomatic hand, suggesting that this syndrome is more likely to happen in patients with a pre-existing palmar artery fibrodysplasia.\(^3,12\)

Despite the fact that the radial artery is much less commonly affected by a blunt trauma, as it is distant from the point of impact,\(^3,13\) it has been found that a vasospasm of the radial artery might occur secondary to ulnar artery injury.\(^3,11\)

**Incidence**

HHS was first described by Von Rosen\(^6,8\) in 1934 and since then several cases have been described. The largest cohort study prospectively enrolled 1300 patients, 21 of which had HHS giving an incidence of 1.6%.\(^12\) Although HHS is widely regarded as a rare condition\(^2,5,12\) this may be because cases are asymptomatic. This was supported by Little and Ferguson,\(^4\) who examined 79 workers who were habitual hypothenar hammerers and found 14% with objective evidence of occlusion. None of them had symptoms of sufficient severity to interfere with work activities. On the other hand a physician survey was conducted that supported the fact that this syndrome is underdiagnosed.\(^1\)

HHS is an occupational disease that has been described in a number of industries in which the workers use their hands to pound or to push, including carpenters,\(^2\) motor mechanics, metal workers and lathe operators. Furthermore, HHS has also been described in mountain bikers\(^14\) and many other sports including baseball, volley ball,\(^6\) badminton,\(^7\) tennis,\(^15\) hand ball, softball, karate, weight lifting and hockey.\(^6\)

Kaji \(et\ al.\)^\(^16\) found 24 arteriographically diagnosed cases among 293 subjects diagnosed as vibration disease among a population study of 330 workers who were exposed to vibration in mining, forestry and other industries. In this series the right hand was involved in 53% of the cases, the left in 25% and both in 22%. Similarly Conn \(et\ al.\)^\(^10\) reported bilateral disease in 2 of 13 patients.

**Diagnosis**

HHS it is often incorrectly diagnosed,\(^5\) or diagnosed at a stage where irreversible consequences have already taken place. Differential diagnosis of upper extremity digital ischemia includes primary Raynaud’s disease, Raynaud’s phenomenon associated with underlying connective tissue disorder, buerger’s disease, vasculitis, arterial emboli from a cardiac source, atherosclerosis with secondary thrombosis, thoracic outlet obstruction and hypothenar hammer syndrome.\(^1,12\) HHS presentation maybe initially confused with that of Raynaud’s phenomenon. Therefore initial exclusion of other causes of Raynaud’s phenomenon should be performed, such as scleroderma, systemic lupus erythematosus, or rheumatic disease. Distinguishing manifestations of HHS from classic Raynaud’s phenomenon were summarised by Spencer Green and colleagues (Table 1).\(^18\) Supporting the above mentioned distinguishing factors, Pineda\(^19\) has stated that although pallor and cyanosis may appear, it is notable that hyperaemic redness was absent.

While Allen’s test maybe useful in diagnosis, Kaji \(et\ al.\)^\(^16\) found it to be negative in 17% of their cases. Doppler examination can be helpful.\(^6\) Taute \(et\ al.\)^\(^20\) found that colour duplex sonography enabled distinction between HHS and other causes of digital ischemia. Arteriography has been described as the gold standard test, which will differentiate HHS from other vascular abnormalities in the hand.\(^1,3-6\)

It is worth mentioning that 3 papers have reviewed HHS attributed to vibration exposure. Noel \(et\ al.\)^\(^17\) reported a HHS case with 25 years exposure to vibration. Lee and Evans\(^23\) reported a single case from Canada, with a vibration-induced white finger, but with a positive Allen’s test and arteriographically confirmed absence of the superficial palmar arch. Kaji \(et\ al.\), also reported 24 cases of HHS among 330 vibration-exposed workers. Hand-Arm vibration syndrome (HAVS) classically presents with Raynaud’s phenomenon.\(^5\) HHS usually affects the digits mainly supplied by the superficial palmar arch (medial 3 digits), while the lateral 2 digits are unlikely to be affected as the deep palmar arch is complete in 97% of the HHS cases.\(^7\) Therefore, it is highly likely that HHS might present in a similar pattern to that of HAVS or a Raynaud’s like symptoms. However the absence of typical hyperaemic flush in HHS is of distinguishing value along with a positive Allen’s test.\(^6\)

In our case the patient lost the terminal phalanx of the right little, middle and left middle fingers which is consistent with the pattern of HHS described above.

**Table 1. HHS; distinction from classic Raynaud’s phenomenon**\(^18\)

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<th>Feature</th>
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<td>Male preponderance</td>
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<td>Occupational history of repetitive hand and wrist trauma</td>
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<td>Asymmetric distribution</td>
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<td>Absence of the hyperaemic phase</td>
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<td>Diminished ulnar/radial pulses</td>
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<td>Digital ulcers in areas supplied by affected vessel</td>
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Management

Most authorities suggest conservative management should be tried before interventional treatment is planned. This includes cessation of the offending activity and the avoidance of exacerbating factors. Smoking cessation is essential, low-lipid diet is also important and repeated venesections to reduce smoking induced polycythemia has also been suggested. Anti-platelet therapy should also be considered and intra-venous heparin and prostaglandin E1 maybe useful. Vasodilators, such as calcium channels blockers and cervical sympathectomy may also be helpful although the latter may not be beneficial if collateral vessels are already maximally vasodilated. Surgical options include segmental ulnar artery excision with vein grafting in patients with severe symptoms and poor collateral circulation in whom conservative management has failed. In cases with ulnar artery aneurysms, Ulnar artery ligation to prevent further digital embolisations has been described. Sometimes resection of the aneurysm and end-to-end anastomosis of the Ulnar artery may be necessary. Finally amputation of ulcerated necrotic finger tips maybe required in advanced cases.

In conclusion, HHS is not as rare as it is thought to be. It is a curable and a preventable cause of upper limb digital ischemia. Occupational or recreational trauma maybe not volunteered by these patients, therefore such history should be carefully obtained and investigations should be conducted before irreversible consequences take place.

References