CASE REPORT

Thenar hammer syndrome: a case report

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Background Raynaud’s phenomenon occurs among automobile mechanics secondary to long-term use of vibrating hand-held tools. It can also occur from traumatic injury to the upper extremity.

Aim This report describes a case of single digit Raynaud’s phenomenon in an automobile mechanic due to focal arterial impact trauma.

Case report A 38-year-old right-handed transmission mechanic complained of paraesthesia and blanching of the right index finger on exposure to cold and eventually developed a transient necrotic ulcer at the tip of the digit. He had a long history of occupational exposure to vibrating hand-held power tools. Evaluation for common causes of Raynaud’s phenomenon was negative. The diagnosis of hand–arm vibration syndrome (HAVS) was rejected because of the rapidity of progression and severity of the symptoms restricted only to the index finger without corresponding symptoms of the other digits of the right hand as would be expected. Angiography revealed an obstructive lesion of the distal right radial artery at the wrist and he was diagnosed with thenar hammer syndrome. This uncommon condition was due to focal injury of the distal radial artery caused by repeated slamming of transmission parts on a work table.

Conclusions Not all cases of Raynaud’s phenomenon in workers using vibrating hand-held tools are due to HAVS. Alternative aetiologies should be considered especially if symptoms are asymmetrical and unilateral.

Key words Automobile mechanic; hand–arm vibration syndrome; HAVS; thenar hammer syndrome.

Introduction

Individuals who use their hands to push, pound, squeeze or twist hard objects can cause blood vessel damage such as thrombosis, fibrosis, aneurysm and pseudo-aneurysm [1–3]. Vascular damage may occur acutely with high-energy blows or over time with repetitive lower impact forces. The hypothenar hammer syndrome is a more familiar manifestation of this type of injury involving the distal ulnar artery and its extension the superficial palmar arch [4]. In this article, we report a case of the thenar hammer syndrome, a less common counterpart to the hypothenar hammer syndrome, involving damage to the distal radial artery.

Case report

A 38-year-old right-handed male automobile transmission mechanic was referred for an assessment of a possible hand–arm vibration syndrome (HAVS). In the spring of 2003, he developed constant right index fingertip numbness. He also complained of blanching of the tip of the right index finger which occasionally extended as far as the proximal phalanx. The vasospastic episodes occurred on exposure to cold. He did not have blanching of the other digits on the right or left hand nor his feet. The paraesthesia would increase during the vasospastic episodes. He gradually developed a persistent callous at the tip of the finger which by July 2003 began to ulcerate. He denied any trauma to the right index finger and hand. The ulcer worsened despite antibiotic treatment and the fingertip became necrotic. He was subsequently treated with long-acting nifedipine, acetylsalicylic acid and pentoxyfylline and within 3 weeks the ulceration began to heal.

Personal and family histories were non-contributory. He never smoked and consumed ~6 beers/week. His medical history was negative for secondary causes of vascular and neuropathic disease of the hand, such as diabetes, connective tissue or thyroid disease and frostbite injuries. The only medication he was using at the time of the evaluation was ranitidine for reflux symptoms. Three years previously he was involved in a car accident resulting in a neck strain and associated chronic neck pain with occipital headaches. He also had a right acromioclavicular joint dislocation as a result of a motorcycle accident. He did not have any other sequelae involving the upper extremities as a result of these accidents. His
hobbies included recreational vehicle riding. The review of systems was negative other than occasional neck pain and occipital headaches. He did not have nocturnal paraesthesia or wakening.

He had worked as an automobile transmission mechanic for the last 20 years. During the first 5 years, he was primarily removing and installing transmissions and for the following 15 years he worked as a transmission rebuilder. As a remover–installer, he used vibrating hand tools 6–7 h/day and as a rebuilder for 4–5 h/day. He has worked 8 h/day, 5 days/week. The vibrating hand-held power tools he used included impact guns, die grinders, pneumatic drills, air hammers and air ratchets. He primarily used his right hand to operate the tools and his right index to operate the trigger.

When he was seen in the clinic in November 2003, clinical examination was essentially normal including normal appearance of his hands. All four extremities were pink and warm with normal capillary refill and peripheral pulses. Thoracic outlet manoeuvres were negative. The only notable abnormal signs included a positive Allen test with poor refill from the left ulnar artery and right radial artery. The right index finger had diminished pinprick sensation at the tip and reduced light touch sensation the whole length of the digit. Sensation in the other fingers and hand was normal. He had negative Phalen and Tinel signs at the wrists.

Initial laboratory tests to assess for secondary causes of neurovascular hand pathology were for the most part normal, including blood profile, urinalysis, serum glucose, thyroid-stimulating hormone, serum protein and immunoglobulins, homocysteine, antinuclear antibody, rheumatoid factor and cryoglobulins. He had mildly elevated total cholesterol (5.91 mmol/l) and triglycerides (3.09 mmol/l) but these were not considered significant in this case. Vascular studies demonstrated reduced digital/brachial systolic pressure ratios of <80% on all fingers. He had normal pulse waveforms on photoplethysmography. Electrophysiological studies of the right arm were normal with no evidence of carpal tunnel syndrome and normal conduction of both the ulnar and median nerves.

Given the restricted localization of signs and symptoms, the worker also had an angiogram of the right arm. This test demonstrated an abrupt cut-off in the radial artery at the level of the wrist (Figure 1). The obstructed radial artery outflow was limited to a small collateral vessel feeding the deep palmar circulation. Blood supply to the thumb and index finger came primarily from the ulnar artery by way of the superficial palmar arch of the hand with retrograde filling of the deep palmar arch. He was diagnosed with thenar hammer syndrome.

The mechanic was referred to a vascular surgeon but the radial artery lesion was not amenable for surgical correction. He has since returned to his job with the advice to avoid forceful impacts to the palms of his hands.

**Discussion**

The thenar hammer syndrome was first described by Wandtke et al. [5] as traumatic thenar ischemia and it was named by Janevski [1]. The thenar hammer syndrome is less common than the hypothenar hammer syndrome probably because it is more anatomically efficient and comfortable to use the hypothenar eminence to pound or hammer. Both syndromes have similar presentations but involving different sides of the hand; the thenar hammer syndrome typically will affect the thumb and index finger, while the hypothenar hammer syndrome will affect the remaining medial digits. Both can present with symptoms of numbness, paraesthesia, Raynaud’s phenomenon, pain and in severe cases, trophic changes including callus formation, ulceration and tissue necrosis. The thenar hammer syndrome is related to obstructive
injury of the distal radial artery and deep palmar arch, while the hypothenar hammer syndrome is the result of obstructive lesions of the distal ulnar artery and superficial palmar arch. Those with underlying arterial abnormalities or incomplete palmar arches are probably more susceptible to these traumatic types of arterial injuries [1,5,6]. The severity of the symptoms depends on the make-up flow through the interconnected deep and superficial palmar arches.

This man presented with persistent paraesthesia and decreased sensation as well as Raynaud’s phenomenon of the right index finger. These are characteristic signs and symptoms of HAVS [7]. He certainly had a long history of exposure to hand vibration from occupational use of power hand tools that could cause HAVS. The presentation, however, was unusual for HAVS in that it was limited to a single finger and was very rapidly progressive to a severe stage of vascular compromise. If the pathology was caused by exposure to vibration from hand-held power tools, one would expect the other fingers of the right hand to be similarly involved given that they would be exposed to equivalent vibration levels as the index finger. The cumulative dose of vibration necessary to cause the trophic changes in the index finger would undoubtedly have caused some neurovascular damage to the adjacent digits. This inconsistency required consideration of other more focal vascular pathology. Angiography of the right upper extremity localized the obstruction to the distal radial artery consistent with the thenar hammer syndrome.

The occupational history, however, did not provide a mechanism of injury to explain the pathology. On re-questioning the worker described some of his work tasks in more detail and the likely cause was identified. In rebuilding transmissions, the worker frequently had to ‘smash’ on the workbench parts of the transmission known as the governor and valve body. These parts consisted of aluminium housings with internal valves that over time become stuck and forcefully knocking them on the bench top was required to loosen the moving parts. The worker estimated that he would have to do this action several times in a row (three to more than a dozen) to free up the moving parts and this would be repeated ~10 times/week. It was concluded that this repeated forceful trauma to the right hand and wrist area produced the occlusion of the distal radial artery at the point where it passes dorsally around the first metacarpal and trapezium to enter the palm and form the deep palmar arch. The damaging mechanical energy was likely transmitted to the artery through these bones.

This case illustrates the need to consider alternative diagnoses and search for a reasonable mechanism of injury if the presentation is inconsistent with the expected disease manifestation for a given occupational exposure. The mechanic has returned to his job with the advice to avoid forceful impacts to the palms of his hands.

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Conflicts of interest
None declared.

References