

## Hypothenar hammer syndrome

Hypothenar hammer syndrome (HHS) is caused by repetitive use of the hand as a hammer so that there is thrombosis of the superficial palmar arch of the ulnar artery. There is trauma over the hook of hamate, where the superficial branch of the palmar artery lies. This leads to vascular insufficiency of the ulnar side of the hand.<sup>[1]</sup>

### Epidemiology<sup>[1] [2] [3]</sup>

- Hypothenar hammer syndrome (HHS) is probably rare, but may be underdiagnosed.
- Typically, it occurs in men around age 40 years, in occupations and sports where the heel of the hand is used as a hammer or is subject to repeated force; for example:
  - Occupations such as metal workers, machinists, mechanics, miners, sawmill workers, carpenters, bricklayers, butchers, bakers and those using vibrating tools.
  - Various sports, including golf, mountain biking, baseball, softball, hockey and martial arts.<sup>[1]</sup>

### Aetiology<sup>[1] [2] [3]</sup>

Likely factors involved in causation are:

- Single or repeated blows to the heel of the hand
- Pre-existing abnormalities of the arteries or variations in arterial anatomy (eg incomplete superficial palmar arch)
- Underlying prothrombotic factors<sup>[4]</sup>
- Other anatomical variations, eg an anomalous hypothenar muscle.<sup>[5]</sup>

## **Anatomy and pathophysiology**<sup>[2]</sup> <sup>[6]</sup>

The ulnar artery is vulnerable in the distal portion of Guyon's canal, where it is not protected by the palmaris brevis muscle. Guyon's canal is a depression between the pisiform and hook of hamate that is converted into a fibro-osseous tunnel by the pisohamate ligament. At this site, the superficial branch of the ulnar artery can be compressed against the bony hook of the hamate.

Repetitive blunt trauma may lead to arterial damage, thrombus formation, aneurysm of the artery or microemboli, leading to digital ischaemia.

Sensory branches of the ulnar nerve run nearby and their involvement may contribute to symptoms.

## **Presentation**<sup>[2]</sup>

### **Symptoms**

- Digital symptoms (in the index, middle, ring or little fingers) – pain, paraesthesia, cold sensitivity, blanching or claudication.
- Hypothenar pain.

### **Signs**<sup>[1]</sup> <sup>[6]</sup>

Possible signs are:

- A hypothenar callus or tenderness.
- Pulsatile hypothenar mass (if aneurysm present).
- Discolouration of fingers – white or purplish, usually lacking the 'blush' (red) phase of Raynaud's phenomenon.
- Cool fingertips.
- Positive Allen's test (see below).
- In severe cases, other signs of digital ischaemia, eg finger pulp wasting, ulcers, eschar or gangrene.

### **Allen's test**<sup>[2]</sup>

The Allen's test assesses the patency of the superficial palmar arch. The test is performed as follows:

- The patient sits with the hands supinated on the knees.
- The examiner compresses the radial and ulnar arteries (using his thumbs).
- The patient opens and closes their fist rapidly several times, to exsanguinate the hand (taking care not to overextend the fingers).
- The ulnar artery is released; normal colour should return to the palm of the hand within 5 seconds. If the ulnar artery is occluded, colour will return to the palm only on release of the radial artery. This is termed a 'positive Allen's test'.

A positive Allen's test indicates occlusion or incomplete development of the superficial palmar arch or distal ulnar artery. However, there are false positives and false negatives using the Allen's test.

## Investigations<sup>[2]</sup>

- The 'gold standard' is arteriography, although this is invasive.
- Noninvasive tests are:
  - Doppler colour imaging
  - Thermography
  - Cold stress testing
  - Digital pulse volumes
  - Plethysmography

## Differential diagnosis<sup>[1]</sup>

- Hand-arm vibration syndrome

- Raynaud's phenomenon from other causes. Features which differ between hypothenar hammer syndrome (HHS) and classical Raynaud's are:
  - Male preponderance and occupational history
  - Allen's test
  - Lack of the normal hyperaemic flush phase of Raynaud's phenomenon
  - Digital ulcers in area the supplied by the affected vessel
  - Reduced ulnar/radial pulse

## Management<sup>[2]</sup>

- Avoidance of cold.
- Possible drug treatment includes calcium channel blockers, vasodilators and platelet inhibitors, pentoxifylline and anticoagulation. <sup>[7]</sup>
- Treat underlying atherosclerotic and prothrombotic factors, eg smoking cessation and lipid management. <sup>[4]</sup>
- Urokinase has been used to clear obstruction, <sup>[8]</sup> as has prostaglandin E1 with heparin. <sup>[4]</sup>

## Surgery

There are various aims of surgery - to remove a source of embolism or a painful mass, to relieve ulnar nerve compression or to create a local periarterial sympathectomy.

Various surgical procedures may be used:

- Vascular procedures, eg ligation, vein graft or arterial graft.
- Intra-arterial vasodilators or thrombolysis
- Endoscopic thoracic sympathectomy - although this has been said to give poor results. <sup>[9]</sup>

There are arguments for and against surgical treatment as the initial management of hypothenar hammer syndrome (HHS).<sup>[10]</sup> <sup>[11]</sup> <sup>[12]</sup>

## Complications

- Ischaemic complications, eg digital ulcers or gangrene.<sup>[1]</sup>
- Interference with occupation or sport.

## Prognosis<sup>[7]</sup> <sup>[9]</sup>

Many patients improve with nonsurgical treatments (above). Results of reconstructive surgery have been shown to be variable, with fairly common recurrence.

## Prevention

- Improve work practices so as to avoid using the palm of the hand as a hammer.
- Occupational screening (where relevant) has been advocated, since some degree of ulnar arterial damage may occur preclinically.<sup>[2]</sup>

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## Further reading

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