




# Aneurysm of the Ulnar Artery and Hypothenar Hammer Syndrome

## *Aneurisma de arteria cubital y síndrome del martillo hipotenar*

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### Abstract

Hypothenar hammer syndrome is an uncommon vascular condition that causes aneurysmal degeneration of the ulnar artery as it passes through the Guyon canal. It usually appears in workers exposed to repeated microtrauma to the hypothenar eminence; therefore, some authors consider it an occupational disease. The symptoms vary according to the size of the aneurysm and the instability of its contents. Diagnosis requires an adequate clinical history and a high index of suspicion. Its treatment ranges from conservative medical management to reconstructive surgery, depending on the patency and vascular integrity of the palmar arch. Herein, we present a clinical case of a 67-year-old man with a painful pulsatile tumor in the hypothenar eminence after carrying out renovation work. Magnetic resonance angiography confirmed the clinical suspicion, leading to aneurysm resection with subsequent arterial reconstruction.

### Keywords

- ▶ artery
- ▶ ulnar
- ▶ hypothenar
- ▶ hammer

### Resumen

El síndrome del martillo hipotenar es una patología vascular poco frecuente que produce una degeneración aneurismática de la arteria cubital a su paso por el canal de Guyon. Se suele dar en trabajadores expuestos a microtraumatismos de repetición en eminencia hipotenar; por ello, algunos autores lo consideran una enfermedad profesional. La clínica varía según el tamaño del aneurisma y la inestabilidad de su contenido. Para el diagnóstico, es necesario realizar una adecuada anamnesis y exploración física del paciente, así como tener un elevado índice de sospecha. Su tratamiento varía desde el médico conservador hasta la cirugía reconstructiva, dependiendo de la permeabilidad y de la integridad vascular del arco palmar. Se presenta un caso clínico de varón de 67 años con aparición de tumoración pulsátil dolorosa en eminencia hipotenar tras realizar trabajos de reforma. Mediante angiorresonancia, se confirmó la sospecha clínica, y se procedió a la resección del aneurisma parcialmente trombosado con posterior reconstrucción arterial.

### Palabras Clave

- ▶ arteria
- ▶ cubital
- ▶ hipotenar
- ▶ martillo

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## Introduction

Symptomatic ischemia of the upper extremity may indicate a wide variety of conditions, including atherosclerosis, arterial embolism, vasculitis, diabetic arteriopathy, neurovascular compression, Raynaud syndrome, sepsis, and arterial trauma.<sup>1</sup> Some of these etiologies are surgically correctable, and their early identification avoids consequences.

Although rare, aneurysmal conditions of the ulnar artery are one of the most frequent causes of digital ischemia. Guattani described the first case of hand aneurysm in 1772, but only in 1970 did Conn et al.<sup>2</sup> call it *hypothenar hammer syndrome*. This strange condition can be seen in people who use the palm of their hand to strike repeatedly as if it were a hammer, hence this terminology. Its symptoms range according to the size of the aneurysm and the instability of its contents. In the case herein reported, the patient presented with a pulsating tumor with progressive increase and pain in the wrist, with no other associated clinical symptoms.

## Clinical Case

A 67-year-old retired male used to be an office worker. He was referred for consultation due to an increase in the size of a pulsatile mass and pain in the ulnar region of the left hand with progressive growth.

As far as history, it is worth noting that he had quit smoking nine years before and had been carrying out renovation work in previous days with repetitive microtrauma to the palmar aspect of the left hand.

The physical examination revealed palpated pulses at all levels. The patient had a pulsating tumor in the hypothenar eminence of the left hand measuring 1 cm to 2 cm, with elongation of the ulnar artery at the level of the wrist. He presented good perfusion of the left hand, and the Allen test was positive.

An arterial Doppler ultrasound showed ulnar artery ectasia (measuring 13 mm) with a mural thrombus occupying 80% of the arterial caliber. The test ruled out aneurysms in other locations (aorta and femoropopliteal sector).

A magnetic resonance angiography study confirmed the presence of a saccular aneurysm (measuring 13 mm x 9 mm) at the ulnar artery, patent, and a small band of luminal thrombosis in its distal wall with good distal flow (► **Figures 1 and 2**). The test also revealed important signs of rhizarthrosis and nodules compatible with incipient Dupuytren disease in the palmar region of the third and fourth fingers.

We indicated surgery due to the abundant mural thrombus resulting in a high risk of distal embolization and digital necrosis and the symptoms (pain and functional disability). We also requested venous mapping with Doppler ultrasound of the left upper limb in case the arterial reconstruction required grafts.

Under locoregional anesthesia, we performed a zigzag incision, dissection, and control of the ulnar artery proximal and distal to the aneurysm, followed by aneurysm resection and end-to-end anastomosis, without tensioning the ulnar



**Fig. 1** Coronal magnetic resonance angiography section at the level of the hypothenar eminence revealing a patent ulnar artery saccular aneurysm.

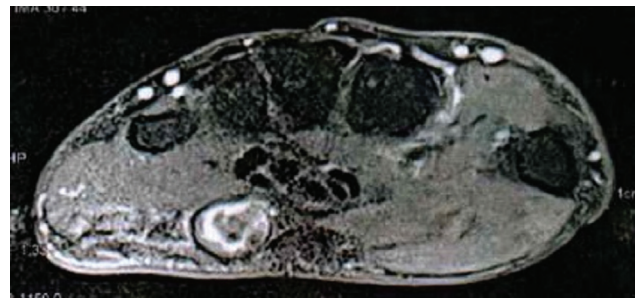
artery, since arterial elongation did not require the interposition of a venous graft (► **Figures 3, 4, and 5**).

Patient discharge occurred the day after surgery, with good perfusion of the left hand, positive radial and ulnar pulses, and a negative Allen test (► **Figure 6**).

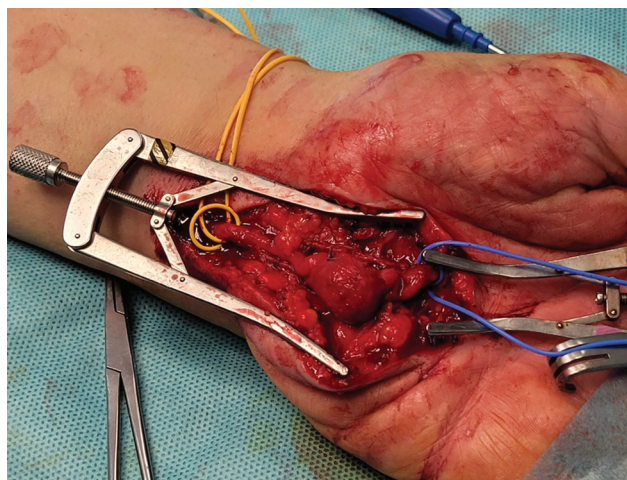
Months after the intervention, a Doppler ultrasound showed ulnar artery patency and good hand perfusion. In addition, the patient was asymptomatic.

## Discussion

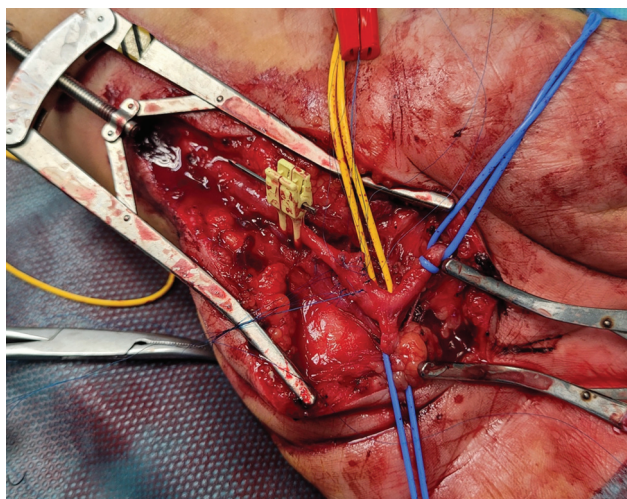
Hypothenar hammer syndrome is a rare vascular injury, with less than 200 published cases. Some authors consider it an occupational disease. It mainly affects men, in a ratio of 9:1, with an average age of 40 years. Most patients are smokers, and the disease affects the dominant hand in 75% of cases.<sup>3</sup> Patients who use the hypothenar eminence as a tool to deliver repeated blows have a high risk of developing this condition, frequently seen in workers such as mechanics, miners, machinists, and carpenters, for example. The condition has also been related to self-limited traumatic events.<sup>4</sup> In the case herein presented, the patient reported repetitive



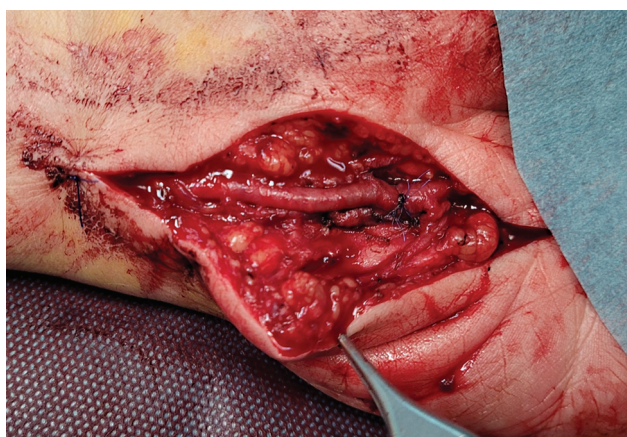
**Fig. 2** Axial section of a magnetic resonance angiography at the level of the hypothenar eminence showing an ulnar artery aneurysm.



**Fig. 3** A 13-mm ulnar artery aneurysm, proximal (yellow vessel loop) and distal (blue vessel loop) controls of the aneurysm sac.



**Fig. 4** End-to-end arterial anastomosis after aneurysm excision.



**Fig. 5** Ulnar artery with no tension after the end-to-end anastomosis.



**Fig. 6** Outcome of the hand after surgery.

microtrauma on the palmar aspect of his dominant hand during renovation work. This condition can also affect athletes who perform repeated manual actions, in activities such as karate, handball, tennis, and golf, for example.<sup>2,5</sup>

The pathophysiology of hypothenar hammer syndrome is due to the anatomy of the ulnar artery as it passes through Guyon canal. After penetrating the hand, the artery continues superficial to the hypothenar muscles, and it is covered by the palmar brevis muscle, the palmar aponeurosis, and the skin. In this area of just 2 cm, the artery extends above the uncinate process of the hamate bone, which acts as a hammer and contributes to its injury after prolonged and repetitive trauma. Mural degeneration with arterial intima compromise causes thrombus formation, and arterial media injury may lead to aneurysm formation.<sup>6</sup> Acute ischemia, atheroembolism, and neurological compression are the most frequent complications. Some authors<sup>7</sup> have suggested that trauma is not the only cause of the syndrome, and fibrodysplasia would be partially responsible for aneurysmal degeneration.

The symptoms usually begin insidiously and result from microembolizations of material within the aneurysm sac. Most frequently, pain occurs at the second, third, fourth, or fifth fingers of the affected hand, but paresthesia, numbness with hand paleness and coldness, claudication, trophic lesions from digital ischemia, and changes in the color of the fingers also appear. Our patient had pain in the hypothenar eminence and a pulsating mass, leading to his referral to our clinics. In severe cases, ulcerations, gangrene, or eschar formation may appear.<sup>3,6</sup> The unilateral symptoms and preservation of the thumb distinguish this condition from the Raynaud phenomenon.

For diagnosis, it is essential to take a detailed clinical history and have a high index of suspicion. Examination reveals coldness and distal digital atrophy; sometimes, a pulsating tumor is palpated at the level of the hypothenar eminence. The physical examination includes the Allen test to evaluate the patency of the superficial palmar arch. A positive test indicates potential arterial occlusion, stenosis, or incomplete development. Although it is not specific to this condition, an abnormal result in the Allen test would warrant more tests in a patient with a risk history. Doppler ultrasound is a first-line non-invasive diagnostic test to evaluate the ulnar artery for potential blood flow abnormalities, but it is observer-dependent and requires significant technical

skill.<sup>3,5,6</sup> Angiography has been considered the gold standard for its diagnosis. This test can identify the type and extent of the lesion, thus defining the vascular anatomy to plan the surgical treatment. However, it does not show the thrombus, only the aortic lumen. It is also invasive and not free of complications. Therefore, some authors<sup>8</sup> prefer non-invasive procedures, such as computed tomography angiography or magnetic resonance angiography. These tests not only identify the vascular lesion but define the associated bone and muscle anatomy.<sup>3,5,6</sup> In our patient, after clinical suspicion, we performed a Doppler ultrasound, which revealed ulnar artery ectasia. Next, using magnetic resonance angiography, we completed the study to plan a therapeutic approach.

Regarding management, there are no consensus guidelines on the best clinical practice. The conservative medical treatment consists in quitting smoking, avoiding repeated trauma, and the use of medications (calcium channel blockers, antiplatelets, anticoagulants, or hemorheological agents). Surgical treatment relies on the permeability and integrity of the palmar arch and the speed of the onset of symptoms; so, in an abrupt onset or presence of poor vascular compensation and a patent aneurysm, resection and subsequent arterial reconstruction are recommended.<sup>9</sup> On occasion, arterial reconstruction is necessary using a venous graft; alternatively, ligation of both ends of the artery is feasible if the palmar arch is compensated.<sup>10</sup> In our patient, we interposed a venous graft and performed an end-to-end anastomosis due to arterial elongation.

The prognosis of the syndrome is good, with satisfactory outcomes in all published cases. The medical literature

reports a single patient undergoing digital amputation due to this disease.<sup>2</sup>

#### Conflict of Interests

The authors have no conflicts of interests to declare.

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