



# Traumatic Pseudoaneurysm of the Superficial Palmar Arch: A Clinical Case

## *Pseudoaneurisma traumático del arco palmar superficial: A propósito de un caso clínico*

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### Abstract

#### Keywords

- ▶ palmar arch
- ▶ pseudoaneurysm
- ▶ angiotomography
- ▶ ligation
- ▶ resection

### Resumen

#### Palabras Clave

- ▶ arco palmar
- ▶ pseudoaneurisma
- ▶ angiotomografía
- ▶ ligadura
- ▶ resección

**Introduction** Pseudoaneurysm of the palmar arch is an uncommon condition, with a controversial diagnostic and therapeutic management.

**Case Report** We herein present the case of a 39-year-old man who, after a blunt and penetrating lesion to the thenar eminence of the left hand, developed a pseudoaneurysm of the superficial palmar arch. We decided to perform a computed tomography angiography exam and proposed the treatment: ligation and resection of the vascular pathology.

**Discussion** Vascular trauma requires monitoring for possible complications. The combination of physical examination and high diagnostic suspicion enable the therapeutic management of the injury. So far, the surgical treatment provides the best short- and long-term results.

**Introducción** El pseudoaneurisma traumático del arco palmar es una patología poco frecuente, con un manejo diagnóstico y terapéutico controvertido.

**Reporte de Caso** Presentamos el caso de un varón de 39 años que, tras una lesión incisocontusa en la eminencia tenar de la mano izquierda, desarrolló un pseudoaneurisma del arco palmar superficial. Se decidió realizar un estudio con angiotomografía y se planteó el tratamiento quirúrgico: ligadura y resección de la patología vascular.

**Discusión** Los traumatismos vasculares requieren un seguimiento de sus posibles complicaciones. La unión de la exploración física y de la alta sospecha diagnóstica permite el manejo terapéutico de la lesión. Hasta ahora, el tratamiento quirúrgico es el que aporta mejores resultados a corto y largo plazos.

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## Introduction

Pseudoaneurysm of the palmar arch is a rare pathology in daily clinical practice.<sup>1-4</sup> Due to the low diagnostic suspicion, it usually goes unnoticed if it does not present any symptoms. Its pathogenesis is related to a wide variety of possible etiologies, although within them we want to highlight the traumatic one.

After a clinical assessment of the pathology, the study must be expanded through complementary tests. The ligation of the nutrient vessels of the aneurysm and its subsequent surgical resection is usually the general treatment of these lesions.<sup>3,5</sup>

We herein present a clinical case in which the diagnostic and therapeutic managements of a traumatic pseudoaneurysm of the palmar arch were developed.

## Clinical case

We report the case of a 39-year-old male patient, without drug allergies, and with a history of liver cirrhosis of alcoholic etiology and hypertension, who was admitted due to a decompensation of his underlying pathology; he reported having a 3-month-old wound on his left hand, caused by a sharp object during an attack.

During the physical examination, a blunt and penetrating lesion, with a granulomatous appearance, was observed on the volar region of the left hand, measuring 2 × 2 cm. The wound was located at the level of the thenar eminence, distal



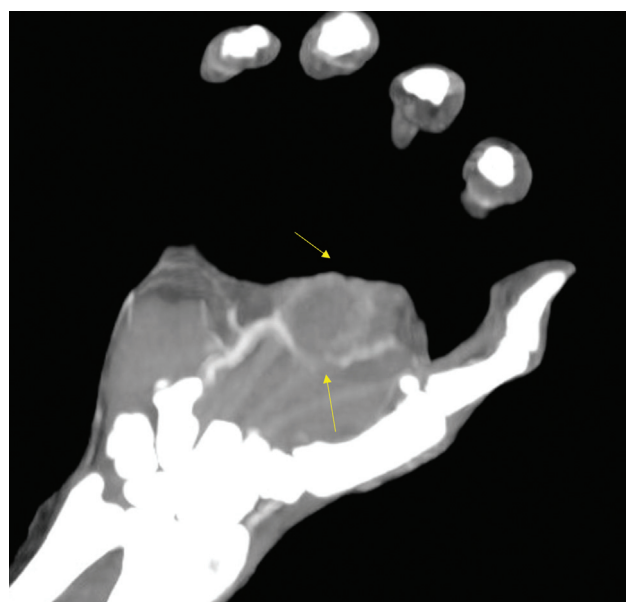
**Fig. 1** Image of the pseudoaneurysm prior to surgical treatment. Z incision design.

to the Kaplan line. (► **Figure 1**). At the time of the examination, a pulsating mass was located in the central area of the lesion without active bleeding, although the patient did spontaneously describe episodes in the past, without being able to specify their number or duration.

The patient maintained full functionality of joint balance in both flexion and extension, which also led us to rule out tendon involvement; No distal abnormalities were detected in the neurological and vascular examinations. The patient did not present signs or symptoms of infection, and was in good general condition and afebrile the previous days. Similar lesions were not evident in other locations on the body, nor did he present constitutional syndrome, which suggested localized pathology in relation to the traumatic history. After the anamnesis and physical examination, we decided to complete the study using CT angiography (CTA) (► **Figure 2**).

A thrombosed pseudoaneurysm was reported in the superficial palmar arch region (► **Figure 3**) at the level of the arch between the digital artery of the second space and the digital artery of the first space. It was defined as a rounded lesion measuring 14 × 17 mm (measured axially), without contrast enhancement and underlying the skin. The patency of all interosseous branches, collateral branches, and the rest of the segments of the superficial palmar arch was also studied, including the integrity of the deep palmar arch. After the diagnosis of pseudoaneurysm of the superficial palmar arch, surgical treatment of the injury was chosen.

In the operating room, locoregional anesthesia was used, along with elevation ischemia. The edges of the wound were expanded using a Z incision, and the slough of the wound was debrided. Once the superficial palmar arch and the neurovascular bundle were located through plane dissection, the nutritional vessels on the first/second ray and the vessels of



**Fig. 2** Computed tomography angiography image in axial projection: thrombosed traumatic pseudoaneurysm.



**Fig. 3** Three-dimensional (3D) computed tomography angiography image: superficial palmar arch.

the ulnar collateral bundle of the second finger were ligated using hemoclips, respecting the collateral nerves. After ligation, the pseudoaneurysm was resected. Despite the good condition of the palmar region after surgery, and without evidence of perilesional pathological tissues, we decided to send the sample to Pathological Anatomy.

A 1-cm skin defect was left exposed in the suture for secondary healing. Correct distal capillary refill was evident after removal of the ischemia, and the presence of bleeding vessels was ruled out.

The result of the histopathological study of the sample defined a lesion of soft consistency composed of numerous vascular structures of variable size, tortuous and with thin walls, covered by monolayer flat endothelium, without associated atypia. It had a leukocyte count per field lower than 5, and the bacteriological culture was negative after 15 days of incubation in the laboratory. The patient continues with a regimen of ongoing wound care in outpatient consultations, showing a correct evolution.

## Discussion

The vascularization of the hand is a double-flow system due to the participation of the radial artery and the ulnar artery after passing through the wrist: the radial artery runs through the pulse channel (delimited ulnarly by the tendon of the brachioradialis muscle and radially through the flexor carpi radialis), and the ulnar artery passes through the Guyon canal (next to the ulnar nerve).<sup>1</sup>

The ulnar artery is the vessel that most frequently develops aneurysms and pseudoaneurysms.<sup>2-5</sup> Moreover,

the phalanges (digital arteries) are described as the anatomical region most prone to developing aneurysms and pseudoaneurysms.<sup>4</sup>

There is no “typical patient” in whom to suspect such pathology;<sup>6</sup> in fact, it can occur in the elderly, adults, and children, with no difference regarding gender.<sup>7</sup> The great variability, combined with its low incidence, sometimes causes a delay in diagnosis.

Aneurysms present a joint involvement of the three walls of the vessel (intima, media and adventitia), generating, in most cases, a fusiform morphology that maintains a continuous and turbulent arterial flow.<sup>4</sup> On the other hand, pseudoaneurysms are due to an incomplete lesion of the architecture, localizing the involvement in the internal wall.<sup>6</sup> The vascular defect of the intimal layer generates the formation of a cavity parallel to the arterial lumen, which increases in size until its distension causes its rupture. Unlike true aneurysms, “false aneurysms” present a higher rate of rupture and, therefore, spontaneous active bleeding, such as the case herein presented.<sup>6</sup>

The etiology of pseudoaneurysms is very broad and, in many cases, unknown. Within the traumatic etiology, different direct and indirect mechanisms are described,<sup>5</sup> with direct trauma being characteristic, both single and external.<sup>3</sup>

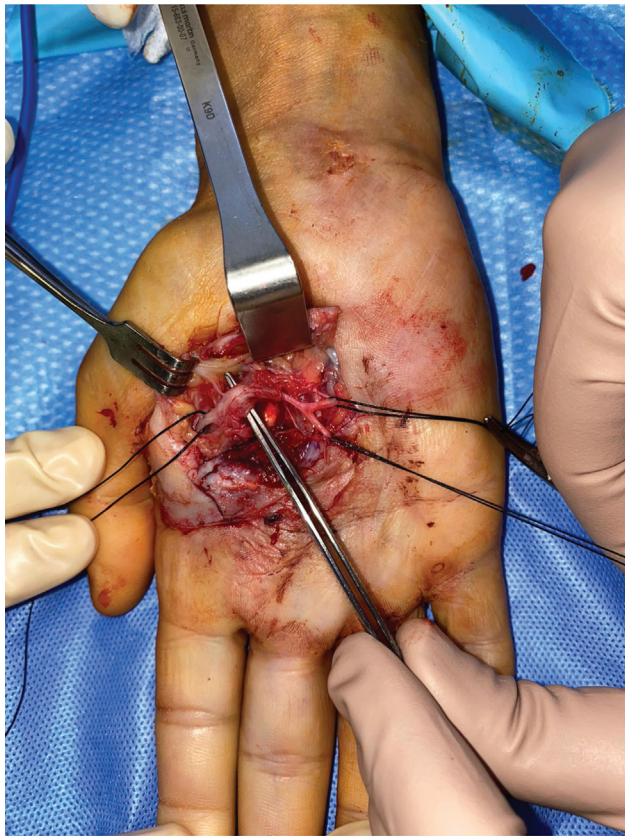
Cases secondary to surgery have been described. Gull et al.<sup>4</sup> reported a case in which, in the immediate postoperative period of carpal tunnel decompression, a tension pseudoaneurysm developed, which was ultimately treated endovascularly. On the other hand, González Martínez et al.<sup>7</sup> presented a pseudoaneurysm of the ulnar artery after the same intervention, although in this case, with a surgical resolution.

The performance of a differential diagnosis, with tumor, dermatological and infectious pathology due to the characteristics of the lesion, is recommended. In the case herein described, the patient had analytical controls and constants in range, which is why no systemic infectious pathology was suspected. Despite this, samples of superficial exudate from the wound were analyzed, which ruled out infection and/or superinfection of the lesion. Dermatology professionals performed a detailed physical examination and a study of the lesion, ruling out dermatological tumor pathology. However, they recommended histopathological and bacteriological studies of the lesion after its definitive treatment.

After the suspected diagnosis of pseudoaneurysm, a series of complementary tests are performed. Bouvet et al.<sup>8</sup> presented a diagnostic algorithm in 2018. The authors defend that the first diagnostic step is ultrasounds, and the rest of the complementary tests depend on the symptoms and/or signs of acute ischemia that the patient presents. If they are present, they decide on arteriography. On the other hand, if there are no symptoms, the most commonly used techniques, due to their great sensitivity, discrimination and fewer complications, are nuclear magnetic resonance and CTA.<sup>8</sup>

Within the range of options, arteriography is the most sensitive technique, since it describes the anatomy in greater detail than the rest.<sup>3</sup> However, it tends to be used as a second-line imaging test due to the thrombotic





**Fig. 4** Intraoperative image of the ligation of the nutrient vessels. The pseudoaneurysm is exposed using the dissecting forceps.

complications described in the literature, which could jeopardize the viability of digital circulation.<sup>3,5</sup> There are published cases in which arteriography has greater importance, being an urgent treatment option. It consists of embolization of the pseudoaneurysm using coils.<sup>4</sup> In the clinical case herein reported, the option of arteriography as a therapeutic method was ruled out by the Vascular Surgery professionals.

The proposed treatment for the present pathology is the surgical option (►**Figure 4**). The ligation of the nutrient vessels of the aneurysm, together with its resection, would be the main treatment. In selected cases, excision can be complemented with an end-to-end suture of the resected ends, with the aim of maintaining acceptable flow of the digital arteries.<sup>9</sup> The decision to perform this surgical act depends on the collateral vascularization that the patient presents, as well as the time of evolution of the injury and its characteristics.<sup>3,5,8</sup> Due to the permeability of the collateral vascularization and the 3-month evolution of the injury, ligation was chosen without any additional steps regarding suture of the ends.

Bypass via vascular graft is also an alternative.<sup>8</sup> The option of reconstructing the vascular defect using a venous graft presents a high risk of long-term reocclusion,<sup>10</sup> which is why an arterial graft is preferred, and, in studies such as the one by Smith et al., the authors opted for an autologous fragment of the inferior epigastric artery.<sup>11</sup> In relation to

the clinical case herein reported, in the absence of involvement of the deep arch (studied by CTA) and due to the time of evolution, reconstruction of the palmar arch was not performed.

On the other hand, the ultrasound-guided percutaneous treatment is proposed by injecting thrombin derivatives into the pseudoaneurysmal sac,<sup>6</sup> presenting considerable effectiveness and safety results, although in a very small population.<sup>4,6</sup>

The evolution of the patients after resection and ligation of the pseudoaneurysm is acceptable.<sup>2</sup> In the case herein described, the patient retained sensation and motor function in all digits, without presenting symptoms at rest or related to regular hand mobility. During follow-up, the cutaneous defect closed by second intention after surgery, following proper wound care in outpatient consultations.

Regarding anticoagulation, there is controversy regarding the decision to administer anticoagulation and antiplatelet therapy after pseudoaneurysm ligation. Pilar Aparicio et al.<sup>3</sup> mentioned that the decision usually relies on the experience of each hospital center.

In the case herein presented, considering the high risk of bleeding due to the patient's history of liver cirrhosis and thrombocytopenia, we decided not to administer antiplatelet or anticoagulant therapy postoperatively.

## Conclusion

Palmar arch pseudoaneurysm is a clinical and surgical challenge. The great variety of diagnostic and therapeutic options without unified criteria explains the need for further study of the pathology.

This fact is compromised due to its low incidence and, therefore, the limited literature. Hence, differential diagnosis and high diagnostic suspicion are essential for its correct treatment.

At present, ligation of the nutrient vessels and subsequent resection of the aneurysm are the most used treatment and the one that presents the best functional results.

## Conflict of Interests

The authors have no conflict of interests to declare.

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