Traumatic ulnar artery pseudoaneurysm. A case report

Emmanuel Stephano Bracho Ruiz M.D.
Carlos Alberto Nungarai M.D.
Jose Eduardo Rosales Jimenez M.D.
Mariano Tovar Ponce M.D.
Erick Gerardo Martinez Martinez M.D.
Carlos Roberto Perez Garcia M.D.
Mauricio Martinez Hurtado M.D.
David Gonzalez Garcia M.D.

Mexico City, Mexico

Case Report

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Background
Vascular disorders of the upper extremity are uncommon and far less common than those of the lower extremity; nonetheless, they can cause significant morbidity. Aneurysms and pseudoaneurysms of the upper extremities are exceedingly rare lesions, and when they do occur, only 3.8% of cases involve the radial and ulnar regions. An ulnar artery aneurysm is typically caused by trauma to the palmar portion of the ulnar artery, typically as a result of occupational or athletic activities involving repetitive microtrauma to the heel of the hand. Clinical findings may include pain, cold sensitivity, numbness, and symptoms of ulceration and/or gangrene correlating with inadequate flow in the ulnar territory. The gold standard for treating a large aneurysm is surgery. Technically, the aneurysm could be resected, and vascular reconstruction could be accomplished via direct anastomosis of the distal and proximal ulnar arteries or a procedure involving a saphenous vein graft. Hypothenar hammer syndrome is the most common cause of arterial trauma leading to aneurysm formation.

Keywords: Hand trauma, Pseudoaneurysm, Ulnar artery, Hand Injury, Hypothenar hammer syndrome.

An arterial aneurysm is a condition where a specific area of a blood vessel becomes permanently enlarged, expanding by 50% or more compared to the normal diameter of the artery wall. The ulnar artery is a frequently affected location for both true and false aneurysms in the upper extremity. Aneurysm formation occurs due to two primary physiological events: arterial wall weakness and mechanical stress. These factors contribute to the expansion of the arterial wall, which is further exacerbated by turbulent arterial blood flow. Hypothenar hammer syndrome is a condition that often leads to ulnar artery aneurysms in the hand. It is more commonly observed in males, with a ratio of 9:1 compared to females. Typically, the right hand, which is usually dominant, is more frequently affected. This is primarily due to repetitive trauma caused by manual labor and certain sports activities that involve repetitive hand pounding. The pathophysiology of hypothenar hammer syndrome is rooted in the distinct vascular anatomy of the hand. The ulnar artery is located in front of the hamate bone and is primarily protected by the skin and subcutaneous tissue. It is situated between Guyon's canal and the palmar aponeurosis. The ulnar artery can be susceptible to injury due to its limited protection above and only bony protection below. Tobacco smoking has been observed to have negative effects on our arteries, leading to the deterioration of the arterial wall and causing vasospasm in the digital arteries. These effects can potentially increase the likelihood of developing symptomatic ulnar artery aneurysms. The positive diagnosis is typically confirmed through the use of medical imaging techniques such as US Doppler, Magnetic Resonance Angiography (MRA), or Computed Tomography Angiography (CTA). These imaging methods help healthcare professionals gather detailed information about the condition and make an accurate diagnosis. Delayed care can result in serious complications related to vascular health, such as thrombosis (blood clot formation), rupture, and the occurrence of remote emboli (blood clots that travel to other parts of the body). Additionally, nerve compression syndrome can also arise as a consequence. It is important to seek timely medical attention to prevent these potentially severe complications. It is crucial to prioritize the management of vascular complications, particularly when there is a thrombosis in the arterial ulnar pseudoaneurysm and a lack of anastomosis network between the radial artery and the superficial palmar arch. The neurological complications arise as a result of nerve compression caused by the pseudoaneurysm. Currently, the recommended method for treating ulnar artery aneurysms is through a surgical procedure known as open exploration of the palm, followed by the removal of the affected segment of the artery.

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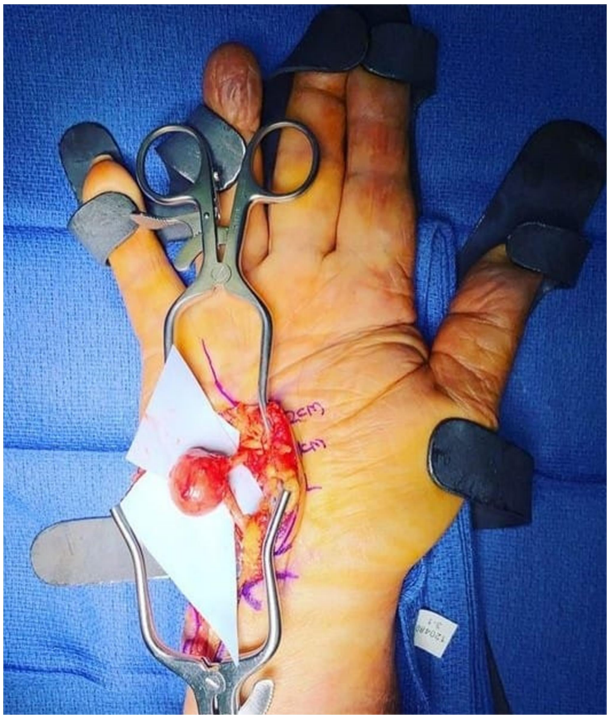

Figure 1. Ulnar pseudoaneurysm / Anterior view right hand

History and physical examination

A comprehensive assessment of the upper extremity and cervical region is warranted, encompassing meticulous examination techniques such as visual inspection, manual palpation, assessment of range of motion, evaluation of joint stability, determination of nerve irritability, appraisal of vascular integrity, and assessment of sensibility. The comprehensive evaluation ought to encompass the meticulous assessment of various dermatological parameters, including but not limited to capillary refill, turgor, skin integrity, temperature, swelling, the existence of punctuate violaceous lesions, splinter hemorrhages, ulcerations, gangrene, the presence of any discernible masses or bruits, as well as the discernment of peripheral pulse quality. The significance of a concentrated medical history cannot be overstated. Relevant factors to consider encompass the documentation of a history involving either penetrating or nonpenetrating trauma, recurrent insults, the utilization of the hand as a tool for forceful impact, substance abuse involving drugs and tobacco, occurrences of infarction or atrial fibrillation, as well as the manifestation of weakness, numbness, and alterations in skin coloration.

Allen test

The test in question was initially documented by Allen in the year 1929, with the primary purpose of diagnosing occlusive disease of the ulnar circulation specifically in cases of thromboangiitis obliterans.

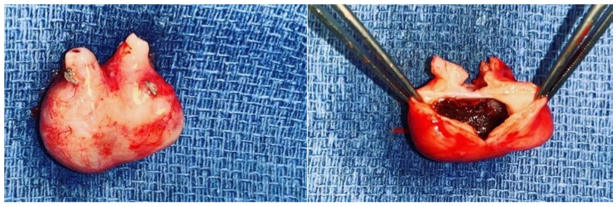

Figure 2. Ulnar Pseudoaneurysm piece.

During the course of the examination, the patient is instructed to firmly clench their hand for a duration of 1 minute or until the occurrence of blanching in all digits, while the examiner applies pressure to occlude both arteries. The patient subsequently proceeds to perform a partial extension of the fingers, followed by the deliberate release of the ulnar artery, while simultaneously maintaining compression on the radial artery. The restoration of chromaticity within the hand signifies the preservation of unimpaired ulnar blood flow. The assessment of radial circulation entails the application of occlusion to the ulnar artery in a comparable manner.

Case report

A 63-year-old male patient complained of discomfort in the right palm from a pulsatile tumor for one month. He was experiencing numbness in the ulnar nerve area. He worked as a civil engineer. A pulsatile mass of approximately 2 cm was seen in the right hypothenar area. His five fingers moved in a complete and flawless motion. The bulk shrank as we simultaneously squeezed the radial and ulnar arteries. Blood flow is decreased in the ulnar artery according to Allen testing. A diagnostic puncture was conducted, resulting in new blood draining from the tumor. A right hand X-ray revealed no abnormalities. He had untreated hypertension and smoked 40 cigarettes a day for 25 years. There were no anomalies in the laboratory data. We removed the aneurysm and rebuilt the ulnar artery. To prevent nerve injury, we employed intravenous heparin, a tourniquet, a zigzag skin incision, and bipolar electrocautery. The aneurysm was opened, and its wall thickness was 3 mm. The proximal and distal arteries had been extended and were long enough to allow for a direct microsurgery anastomosis of the ulnar artery.

Discussion

Ulnar artery aneurysms, a vascular pathology characterized by localized dilation of the ulnar artery, are an infrequent occurrence within the medical domain, with only a limited number of cases documented in the existing body of scientific literature. The etiology of the aneurysm is postulated to be attributed to manual trauma inflicted upon the hand, and subsequently, in the year 1970, it was

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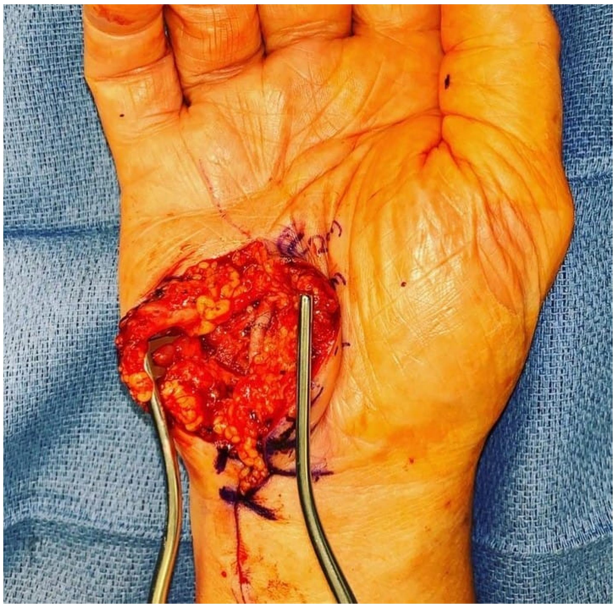

Figure 3. Microsurgery anastomosis of the ulnar artery.

bestowed with the appellation of "hypothenar hammer syndrome" by Conn et al. The syndrome manifests in individuals who habitually engage in manual labor tasks that necessitate the exertion of forceful pressure, repetitive striking, or rotational movements predominantly utilizing the palmar region of their hands. The phenomenon in question has been predominantly elucidated by individuals specializing in the fields of mechanics, automobile repair, lathe operation, pipe fitting, tire braiding, carpentry, and machining. The pathophysiological mechanisms underlying the hypothenar hammer syndrome can be attributed to the distinctive vascular anatomy of the hand. Specifically, this syndrome is characterized by the positioning of the ulnar artery in an anterior location relative to the hamate bone. Moreover, the ulnar artery is predominantly enveloped by the skin and subcutaneous tissue, particularly between Guyon's canal and the palmar aponeurosis. The ulnar artery is susceptible to traumatic incidents due to its limited superior protection and solely osseous inferior safeguarding. The clinical manifestations linked to the hypothenar hammer syndrome encompass a spectrum of presentations, ranging from the presence of localized tenderness specifically over the hypothenar eminence to the emergence of neurological symptoms resulting from the compression of the ulnar nerve. Additionally, patients may exhibit symptoms associated with arterial insufficiency and ischemia, which can be attributed to thrombosis or aneurysmal dilation of the ulnar artery. Manifestations of this condition may encompass the presence of a pulsatile or pulseless mass, a favorable outcome in the Allen's test, diminished refill, alterations in the nail bed, as well as the occurrence of ulceration or gangrene in the digits located distal to the site of occlusion. The

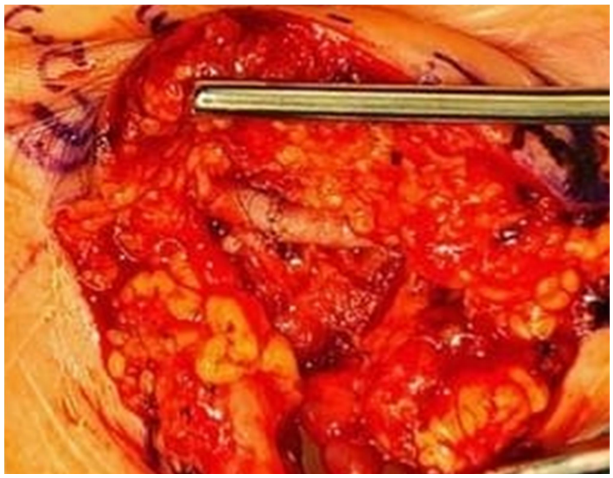

Figure 4. Ulnar artery repair.

utilization of various imaging modalities for the purpose of ascertaining the existence of an aneurysm in the ulnar artery encompasses Doppler ultrasound and color duplex scanning. Nevertheless, it is imperative to acknowledge that arteriography stands as the preeminent method due to its ability to not only detect the principal lesion, but also evaluate the magnitude of the localized impairment, identify distal emboli, and discriminate the aneurysm from alternative masses. Moreover, arteriography enables the comprehensive assessment of collateral flow dynamics, precise identification of vessels amenable to reconstruction, and seamless integration into the preoperative planning process. The hypothenar hammer syndrome predominantly manifests in the demographic of middle-aged male laborers who have a documented occupational history of utilizing their hand as a hammer. Additionally, it has been observed that individuals afflicted with the hypothenar hammer syndrome often exhibit pre-existing ulnar artery impairment due to factors such as tobacco consumption, atherosclerosis, or other collagen vascular disorders, including but not limited to Marfan syndrome and Ehlers-Danos syndrome. Surgical intervention represents the prevailing modality for the management of sizable aneurysms that exhibit an elevated propensity for deleterious outcomes, including but not limited to distal embolization or rupture. The procedure entails the surgical excision of the aneurysm, followed by the establishment of an end-to-end anastomosis, with the objective of reinstating the physiological circulation of blood. Radiological methodologies, including the utilization of endovascular embolization, have demonstrated efficacy in the management of a superficial palmar arch aneurysm subsequent to carpel tunnel decompression. Surgical intervention is frequently favored as a means to mitigate the occurrence of substantial complications, particularly in pediatric

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populations, and to avert the onset of growth retardation.

Conclusion

Although infrequent, the occurrence of post-traumatic pseudoaneurysm in the ulnar artery can cause considerable discomfort for affected individuals. In cases where a patient exhibits a pulsatile mass following trauma in the hyponer region and experiences discomfort in the ulnar region, encompassing both vascular and nerve territories, it is crucial for physicians and surgeons to be aware of the possibility of a pseudoaneurysm. Additionally, they should be aware of the diagnostic modalities at their disposal and the subsequent requirement for operative intervention.

Conflicts of interest

The researchers have disclosed no conflicts of interest.

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Emmanuel Stephano Bracho Ruiz
Plastic Surgery Service
Hospital Central Norte PEMEX
Mexico City, Mexico

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