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Case Series

Upper extremity arterial thrombosis, experience at the General Hospital of Mexico Dr. Eduardo Liceaga: case-series

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ABSTRACT

The upper extremity arterial thrombosis has a low frequency of presentation, which is why they have been little studied and their therapeutic alternatives can be controversial with a high risk of limb loss, which represents a crucial factor in the quality of life of patients. In this investigation, cases of upper extremity arterial thrombosis are reported, evaluated and treated by the Department of angiology, vascular and endovascular surgery of the General Hospital of Mexico Dr. Eduardo Liceaga in Mexico City during the period of March 2022 to March 2023.

Keywords: Upper extremity arterial thrombosis, Arterial thrombosis, Arterial insufficiency, Upper extremities, Critical ischemia, Limb salvage

INTRODUCTION

Among the peripheral vascular pathologies are arterial thrombosis that must be treated by the vascular surgeon, with arterial thrombosis in the lower extremities being more frequent than in the upper extremities. Regarding acute arterial thrombosis in the upper extremities, they have a frequency of less than 5% with an incidence of 1.2-3.5 per 100,000 people/year. Among the signs and symptoms that these patients present are pain, pallor, cold, absent pulses, and paralysis.[1,2] Arterial insufficiency of the thoracic limbs can be classified as acute and chronic according to its evolution time, anatomically according to the affected vessels (large vessels or small vessels), according to its cause (vasospastic or occlusive) where the literature describes the presence of systemic conditions such as: atherosclerosis, autoimmune diseases, myeloproliferative disorders, thrombotic causes such as hypercoagulable states, thrombosis in situ, embolism, trauma, iatrogenic injury, cold injuries, vibration injuries, cytotoxic drugs and other causes such as fibromuscular disease, and recent reports of SARS COV-2 infection and after the application of a vaccine against this virus. Among the toxic antecedents that have been associated with this entity is smoking.[2,3] The diagnosis is made by clinical history, physical examination and doppler ultrasound, linear ultrasound, digit-brachial index (DBI), angiotomography, angioresonance, arteriography, depending on the characteristics of the patient and availability of resources.[3] The treatment is related to the salvage of the extremity with the restoration of blood flow by means of vasodilator drugs, anticoagulants, antiplatelet agents, catheter-directed thrombolysis with recombinant tissue plasminogen activator (rtPA), pharmacomechanical thrombolysis, conventional thrombectomy or bypass.[3,4]

CASE SERIES

Methods

An investigation was carried out on the treatment in the different cases of arterial thrombosis of the upper extremities at the General Hospital of Mexico Dr. Eduardo Liceaga during the period of March 2022 to March 2023, by the angiology, vascular and endovascular surgery service. Variables of age, sex, affected thoracic limb,

affected arterial territory, existing comorbidities, toxic habits, time of evolution of care, stage of arterial insufficiency, preoperative diagnostic study, therapeutic management (conservative, open surgical or endovascular) were collected and surgical success or need for amputation. In this work we used the Rutherford classification for acute arterial insufficiency, in order to stage our patients.[5]

Eleven patients with arterial thrombosis of thoracic limbs were evaluated, of which 7 were men and 4 women. The average age of presentation was 55 years, in 54.5% of the cases they occurred between 31-60 years. With a predominance of appearance in the left thoracic limb in 8 of the patients (72%). Of the patients with arterial thrombosis, the comorbidities that were found were diabetes mellitus (19%) and arterial hypertension (19%), in addition, in 13% the presence of myeloproliferative diseases, prothrombotic state and infection by SARS COV-2 (6%) was evidenced, in 12% of patients there is no evidence of comorbidities. The associated risk factor was smoking (31%) (Figure 1).

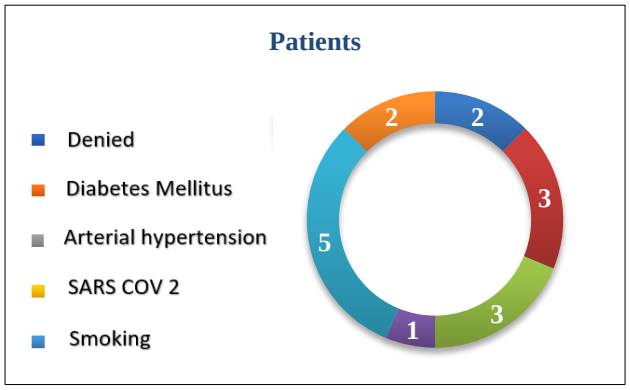

Figure 1: Presence of comorbidities and toxic habits in patients with arterial thrombosis of the upper extremities.

Cases

The most common etiology of arterial thrombosis in our group of patients was thrombotic in 63.6% and embolic in 27.2%. In relation to the distribution by most affected arterial territory, the subclavian and brachial arteries (25%), axillary (17%) and radial (17%) arteries are found in equal proportion, the ulnar artery being the least affected (Figure 2). It was evidenced that those who presented more than 1 comorbidity, and with an evolution time of more than 6 hours, culminated in amputation regardless of the limb salvage procedure with an amputation rate of 27.2% (n=3). The most frequent comorbidities were diabetes mellitus and arterial hypertension, the most associated risk factor was smoking. In relation to the preoperative diagnostic method, angiotomography was used in 36.3%, followed by arteriography. The initial management in most cases was surgical with thrombectomy (54.5%), through open thrombectomy.

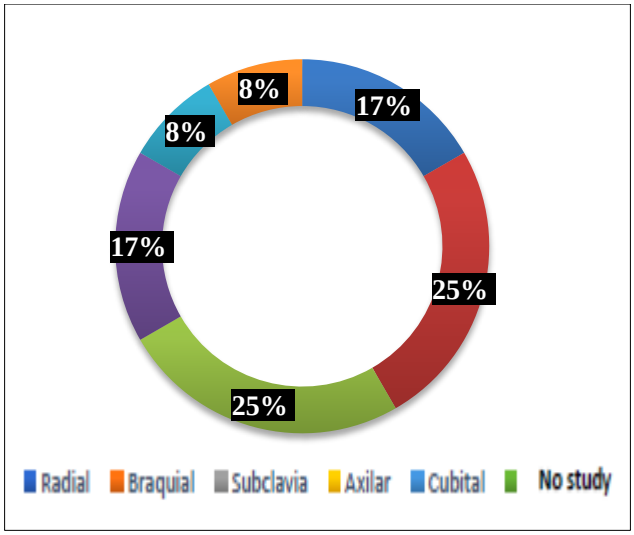

Figure 2: Distribution by affected arterial territory.

Case 1

A 51-year-old female patient, with no chronic history or toxic habits, was admitted with a diagnosis of acute upper limb ischemia (stage IIA Rutherford) of the right thoracic limb, with 5 days of evolution. Preoperative CT angiography was performed, showing partial subclavian artery stenosis and complete artery stenosis. axillary, for which vascular exploration with open thrombectomy was performed. Surgical success was reported, completely reestablishing the flow. No need for reoperation (Figure 3).

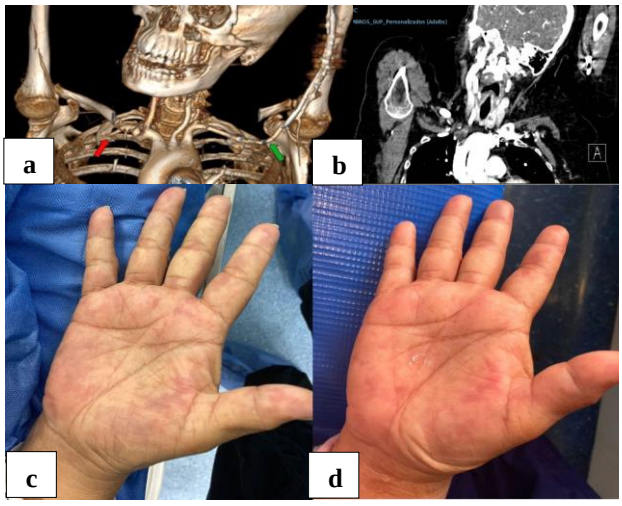

Figure 3: (a) 3D reconstruction red arrow: complete stenosis in the axillary artery green arrow: adequate flow; (b) CT angiography of the right thoracic limb: we observed complete stenosis in the axillary artery, partial stenosis in the subclavian, brachial, and ulnar arteries with recanalization through collaterals, presence of thrombus in the subclavian artery; (c) hand in the preoperative period with data of arterial insufficiency; and (d) hand in the postoperative period at 24 hours, with data on the restoration of flow.

Case 2

A 56-year-old male with no known chronic history, toxic history denied, was admitted with a diagnosis of Rutherford I arterial insufficiency of the left thoracic limb with 20 days of evolution. Diagnostic arteriography was performed, where the absence of contrast medium advancement at the level of the left radial and ulnar arteries was evidenced. Intra-arterial prostaglandins were administered for 24 hours and pharmacomechanical thrombolysis was performed, recovering distal blood flow through the ulnar artery with formation of the palmar arch. Surgical success was reported without the need for reoperation (Figure 4).

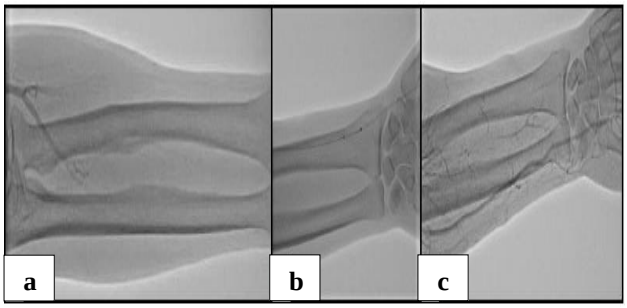

Figure 4: (a) Diagnostic angiography showing absence of passage of contrast medium at the level of the radial and ulnar arteries of the ITN; (b) performance of pharmacomechanical thrombolysis, radiopaque marks of the thrombolysis catheter are observed; and (c) restoration of the ulnar artery with formation arc at hand level.

Case 3

A 44-year-old male with a history of diabetes mellitus and smoking, with a diagnosis of Rutherford IIA acute arterial insufficiency of the left thoracic limb, presented 24 hours of evolution for which diagnostic arteriography was performed, evidencing a stenotic occlusive lesion that compromised 70% of the diameter of the lumen of the axillary artery with limitation of the advance of the contrast medium towards distal areas, for which a brachial vascular exploration and selective retrograde/antegrade thrombectomy were performed. Surgical success was reported without the need for reoperation (Figure 5).

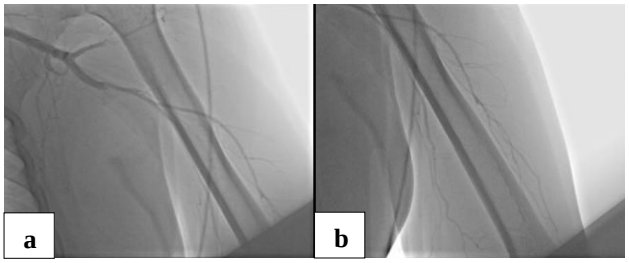

Figure 5: Arteriography: occlusive lesion of the axillary artery compromising the distal flow of the extremity.

Case 4

A 46-year-old female with a history of arterial thrombosis of the left thoracic limb in 2020, presented with a diagnosis of Rutherford IIA acute arterial insufficiency of the same limb with 24 hours of evolution, an angiotomography was performed in which thrombosis was evidenced at the level of the origin of the thrombosis. subclavian artery. Brachial vascular exploration of the left thoracic limb was performed with selective retrograde and antegrade thrombectomy, recovering distal flows. Surgical success was reported without the need for reoperation (Figure 6).

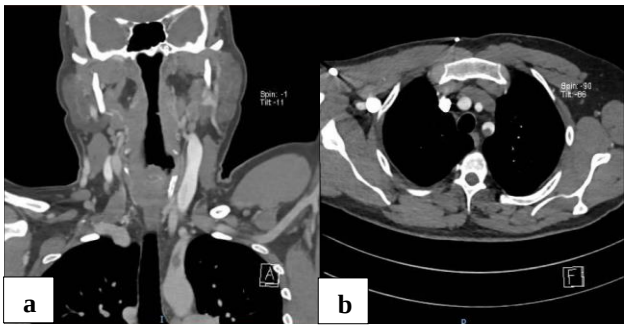

Figure 6: Angiotomography (a) coronal section, (b) axial section showing the presence of thrombus at the level of the proximal 1/3 of the subclavian artery.

Case 5

A 54-year-old male with a history of arterial hypertension and smoking, was admitted with a diagnosis of Rutherford IIA acute arterial insufficiency of the left thoracic limb. The patient reported 6 days of evolution. When performing angiotomography, thrombus was evidenced at the level of the emergence of the left subclavian artery. In the vascular exploration and thrombectomy, flows were recovered up to the brachial flow, treatment is given in the postoperative period with sodium heparin-based anticoagulation. The patient presented a new acute episode, so he was transferred to the hybrid operating room, where diagnostic arteriography was performed, evidencing occlusion from the bifurcation of the brachial artery, pharmacomechanical thrombolysis was performed, without recovering distal flows, during the procedure there was a complication of dissection of the the brachial artery proximal to the arteriorrhaphy site, vascular exploration is performed, new thrombectomy, obtaining clots with old characteristics, the procedure is concluded and later 24 hours after the procedure, after evidencing data of irreversibility, transhumeral amputation is performed, during hospitalization, aspirate is performed bone marrow where acute myeloid leukemia is subsequently reported (Figure 7).

Case 6

A 77-year-old female with a history of diabetes, arterial hypertension, coronary disease, SARS COV-2 infection (7

days ago), was admitted with a diagnosis of Rutherford I acute arterial insufficiency of the left thoracic limb with a 72-hour evolution. An angiotomography is performed where partial thrombosis of the left axillary artery is evidenced, it is taken to the operating room where vascular exploration with thrombectomy is performed. Recovering flows and pulses, restoring arterial flow. Surgical success was reported without the need for reoperation (Figure 8).

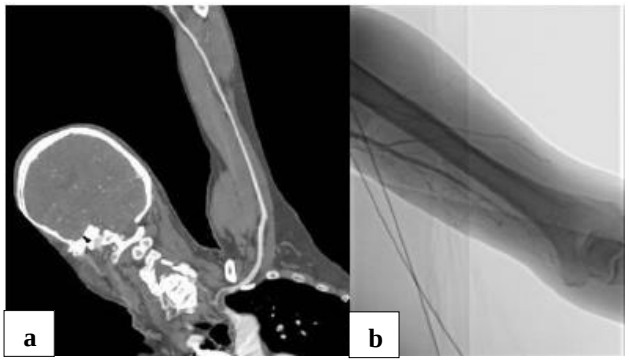

Figure 7: (a) Acute thrombosis of the left subclavian artery from its birth to its middle third, with no signs of hypoperfusion; and (b) absence of passage of contrast medium at the level of the middle 1/3 of the brachial artery after pharmacomechanical thrombolysis.

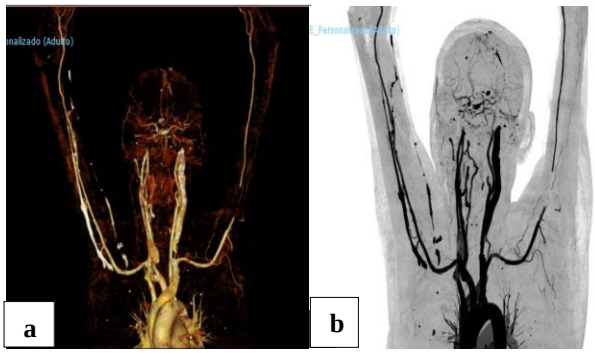

Figure 8: (a) 3D reconstruction and (b) angiotomography in coronal section, showing partial thrombosis of the axillary artery.

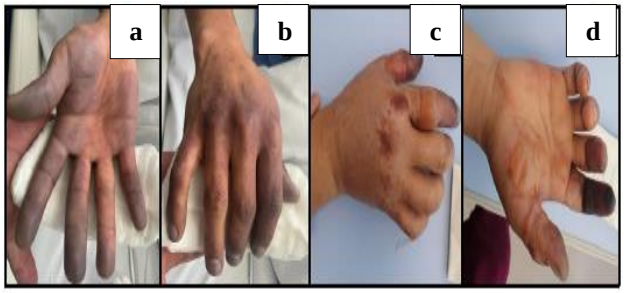

Figure 9: (a) and (b) prior to medical management; (c) and (d) limitation of the lesion confined to the 1st and 2nd finger.

Case 7

A 28-year-old male, with a chronic history of different drugs (without specifying which ones) and anxiety disorder managed by psychiatry, who, after intra-arterial infiltration of an unknown substance, presented acute arterial insufficiency of the Rutherford IIA right thoracic limb, of 1 week's evolution. Treatment with prostaglandins was started for 21 days. Recovering pulses and flows to the interdigital area, with ischemia limited to the distal portion of the 1st and 2nd fingers. No need for reoperation (Figure 9).

DISCUSSION

The most affected arterial portions in this investigation with 25% were the subclavian and brachial segment, the most recent studies that the most affected portion is the brachial artery with 63% and 2% for the subclavian portion.[6] Conservative treatment can be considered in those patients with limited life expectancy, when the risks outweigh the benefits and when the surgical process is contraindicated. Of patients treated conservatively, 50% experience residual signs and symptoms.[7,8] In our reported series, elderly patients with multiple comorbidities including current SARS COV-2 infection and seriousness were managed with conservative treatment based on enoxaparin at a therapeutic dose. Both the shoulder and the elbow are much more tolerant to ischemia due to their collateral circulation and therefore it is more common to observe ischemic symptoms below the elbow.[9] However, we found in this study that, in amputees, arterial thrombosis was above the level of the elbow. The patients with the best evolution of the extremity are those who present with less than 6 hours from the onset of symptoms, because after this period of time irreversible changes begin to appear.[2] In our patients, it was observed that 100% of the patients who were treated by the angiology and vascular surgery service had a time of onset of symptoms greater than 6 hours, with the shortest evolution time being 19 hours. Despite the evolution time in our patients, in 63.6% of the cases it was possible to salvage the limb, including those with injuries below the elbow (18.18%). Treatment with systemic prostaglandins could be reserved for small vessel disease in distal segments. If these patients do not show improvement in symptoms, a sympathectomy can be performed.[8] Open thrombectomy continues to be the most frequently performed treatment in this type of pathology, a failure rate of 8.8% is reported in the literature, with a success rate of 55% success in proximal disease and 68-99% distal success. Findings that present homogeneity with what is evidenced in this article with a success rate corresponding to 60% of the procedure.[7-10] Of the cases discussed in this article, 18% were re-operated on a 2nd occasion due to signs of rethrombosis, however, in all the cases that were re-operated, they culminated in radical amputation treatment. These data are similar to those specified in previous studies with a reoperation rate of 16%.[11]

CONCLUSION

Arterial thrombosis of the thoracic limbs is a serious problem, which is why it is essential to continue studying this pathology, for its best staging and to carry out studies with different populations in order to establish a diagnostic and therapeutic approach as soon as possible, thus avoiding possible fatal outcomes.

Recommendations

To carry out a good approach in these patients, a detailed medical history must always be taken, as well as a thorough physical examination, in accordance with Rutherford's classification of acute arterial insufficiency, the patient's condition, time of evolution, etiology causing the thrombosis and the level at which the thrombosis is found. According to the 2017 European Society of Cardiology (ESC) guidelines in collaboration with the European Society of Vascular Surgery (ESVS), after evidence of acute ischemia, treatment with anticoagulation and pain management should be started.[12] In those patients with a viable limb without neurological deficit, imaging studies should be performed. in those with the presence of a viable limb with neurological deficit, emergency revascularization treatment with thrombectomy-bypass should be performed; in those patients with data of irreversibility, amputation should be performed. In case of rethrombosis, it is suggested to reclassify the disease, in case of irreversibility, radical management with amputation is suggested, in case of being in a borderline stage, it is suggested to continue with conservative management, anticoagulation at full doses, vasodilators and analgesia. In case of poor evolution consider sympathectomy procedure.

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