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Case Report

Gunshot-related giant brachial artery pseudoaneurysm: Case report

Jhon Jairo Berrio-Caicedo^{a,b,c,*}, Cristhian David Arroyave^b,
Hugo Alejandro Burgos-Rueda^b

^a Department of Vascular Surgery, Fundación Hospital San José de Buga, Buga, Colombia

^b Department of General Surgery, Universidad del Valle, Hospital Universitario del Valle, Cali, Colombia

^c Department of General Surgery, Clínica Imbanaco Cali, Colombia

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ABSTRACT

Pseudoaneurysms are late and rare complications in the upper limbs due to penetrating vascular trauma. Although endovascular management is offered as the ideal approach, there are some anatomical conditions to consider surgical treatment. An 18-year-old patient was admitted into our hospital two months later after suffering a single gunshot on the left arm. The arteriography showed loss of most of the brachial artery (BA) course, which was replaced by an unusual 14 * 10 cm pseudoaneurysm. The increasing deformity within the anterior compartment of the arm generated neuropathic and ischemic symptoms (NIS) that were resolved after the drainage and reconstruction of BA. An autologous, ipsilateral basilic vein (BV) graft was used for this purpose. After 26 months, the normal hemodynamic conditions of the treated limb allowed the patient to remain asymptomatic.

Introduction

Vascular trauma of the extremities is a rare condition that implies a high risk of mortality and loss of the limb. Penetrating wounds are at the top of the list of upper limb arterial injuries [1]. Patients may present with situations of extreme urgency or with dormant clinical pictures. Pseudoaneurysms as a consequence of vascular trauma usually manifest lately, and they may need endovascular management. However, some typical anatomical conditions incline the approach towards conventional surgery. We described the treatment carried out to a patient who had a giant BA pseudoaneurysm by using a BV graft, two months after receiving a gunshot wound.

Case description

An 18-year-old man was admitted for presenting a painful, deforming mass in his left arm with progressive growth, which prevented the extension of the forearm (Fig. 1). Also, frequent paresthesia with periods of paleness and coldness in the ipsilateral hand was presented. Two months ago, he had been attacked with a firearm, receiving a single shot that caused a wound transfixing in the middle

* Corresponding author at: Departamento de Cirugía Vascular, Fundación Hospital San José de Buga, Carrera 8 # 17 - 52, Guadalajara de Buga, Valle del Cauca, Colombia.

E-mail address: jhon.berrio@correounivalle.edu.co (J.J. Berrio-Caicedo).

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Fig. 1. Arm with distal dilation and continuous flexion due to exacerbation of pain with the extension.

third of the affected arm. During the clinical examination, constant flexion of the left forearm was found without the possibility of extension due to pain; a 14-centimeter-long, non-pulsatile deforming mass occupied the anterior and medial region of the arm. The absence of distal pulses, without threatening ischemic manifestations of tissue viability in the hand was also found.

The arteriography showed absence of flow in most of the BA. It also showed a giant pseudoaneurysm that occupied arterial territory, thrombosis in the distal arterial segment, and flow reconstitution before bifurcation by present collateral branches in the elbow, which originated in the deep BA. Therefore, the flow originated allowed the visualization of the arteries of the forearm with thinned flow, which disappears in the distal third of the forearm without reaching the hand (Fig. 2).

The open surgery allowed a direct visualization of the pseudoaneurysm and the distribution of its content towards the anterior region of the arm, generating a lateral displacement of the biceps.

The compression on the median nerve was located between the segment with the largest diameter of the pseudoaneurysm and the subcutaneous tissue. The procedure was performed through a wide incision in the medial region of the arm, the dissection of the brachial vessels was brought off in the usual way, ensuring proper control in the proximal and distal segments of the drainage area.

A complete drainage of the blood collection was possible through an incision made over the tense capsule in its medial region. This decompression would allow functional recovery of the upper limb then allowing the pathway reconstruction of the BA.

The reconstruction of the BA was performed using a segment of the adjacent, inverted, and dilated BV (Fig. 3).

The patient was discharged three days after surgery, at that point we had ruled out infectious involvement and the patient claimed resolution of NIS.

Twenty-six months later, the autologous graft remained patent; the Doppler spectrum and picosystolic velocities detected were similar to those found in the contralateral BA. The left ulnar and radial arteries also showed normal hemodynamic parameters (Fig. 4). The patient remained asymptomatic, and his left upper limb was fully functional.

Discussion

Traumatic vascular wounds that manifest acutely are treated promptly. In this case, the disruption of the brachial artery produced a late pseudoaneurysm complication, subsequently with functional loss due to nerve compression and compartment syndrome; two situations that potentially threatened the limb.

This vessel is the most frequently affected by trauma [2]. A retrospective analysis reported that BA injury accounted for 28% of all vascular traumas, and established a higher prevalence in men (91%), with firearm and stab wound etiology of 29% and 57% respectively [3].

Pseudoaneurysms of this artery are rare clinical situations that occur as a consequence of penetrating or blunt traumatism, iatrogenic injury in the reduction of a fracture and access for endovascular procedures. The clinical manifestations are linked to the mass effect generated progressively on the adjacent vascular, neurological, and muscular structures, with severe complications such as rupture, massive hemorrhage, peripheral neurological deficit, skin erosions, or ischemia [4]. The extensive collaterals that the BA generates, specifically the deep BA, give the upper extremity greater tolerance to ischemia, causing manifestations to appear late and intermittently as in this case, in which the perfusion generated was insufficient.



Fig. 2. Arm arteriography showing: Giant brachial pseudoaneurysm (A), flow reconstitution through collaterals (B), thin distal outflow (C).

Although endovascular treatment is offered as the ideal treatment for this type of lesion, the decision should be done based on the clinical manifestations produced by local compression, size, and location. In this case, the organized drainage of the coagulated content was performed by opening the pseudoaneurysm with a direct incision. The capsule was dissected and the median nerve was identified

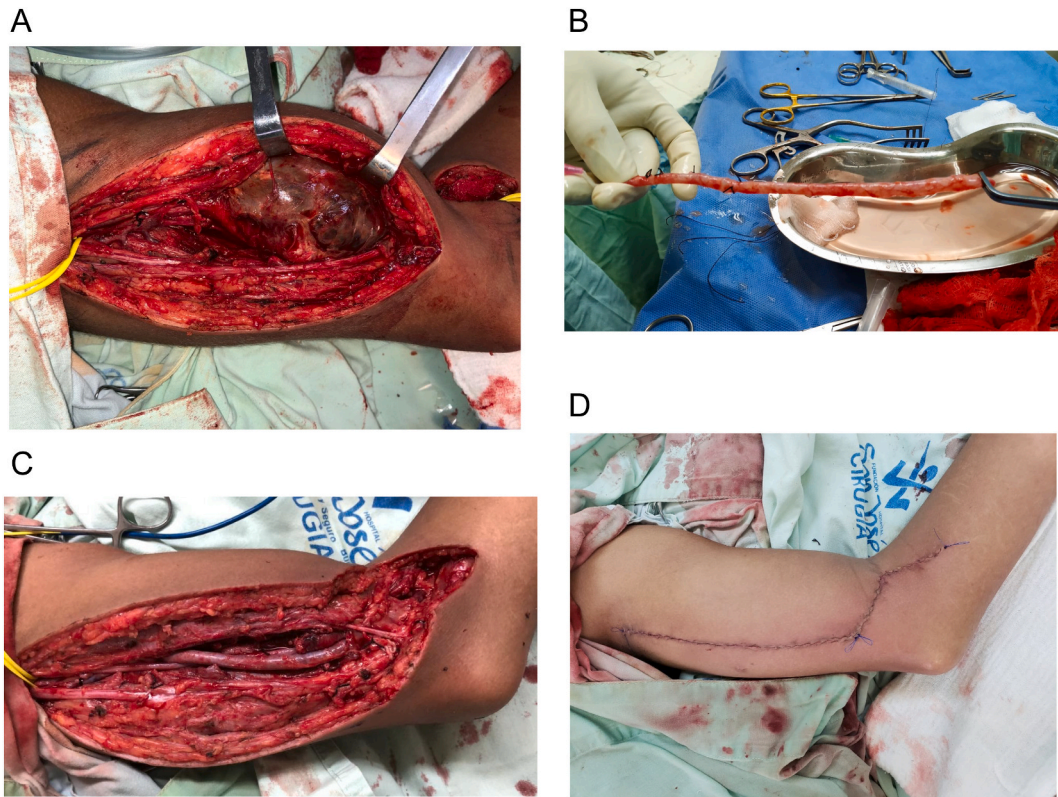


Fig. 3. Brachial pseudoaneurysm exposition (A), autologous basilic vein (B), brachial artery reconstructed (C), extension of closed incision (D).

and respected. The loss of most of the path of the involved BA in the structure of the pseudoaneurysm forced the reconstruction with interposition of an autologous graft from the adjacent BV. It is common to find that veins of the superficial system of the upper limb, are used for the creation of arteriovenous fistulas, however, in vascular trauma surgery their employability is not reported as often as great saphenous vein or synthetic grafts of polytetrafluoroethylene [5,6]. The reconstruction carried out with the BV showed the benefits of its superficial trajectory and affordable extraction through the same incision. The diameter reached after its dilation adequately fitted with the ends of the BA.

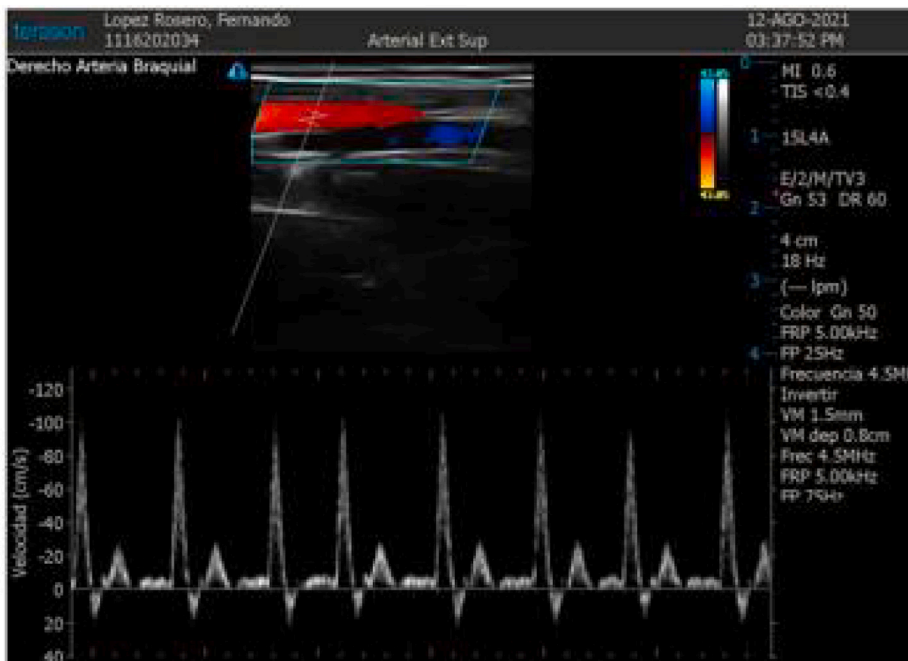
Less frequently, literature supports the use of veins from the same upper limb, with prolonged follow-ups showing 100% survival rates without any associated complications, shorter surgical time, and easy anastomosis [7]. These data take greater value when considering the additional advantages of using the BV, as in this patient: dissection through a single incision, use of regional anesthesia; cosmesis, and less risk of infection regarding prosthetic grafts.

Nowadays, our case is the first reported giant pseudoaneurysm that has been related to a penetrating gunshot trauma in the BA, in which the ipsilateral BV was used for reconstruction. For the trauma surgeon, the treatment of pseudoaneurysms is challenging, swiftness and skills are essential to save the limb and improve the patient's quality of life.

Declaration of competing interest

The authors declare that they have no conflict of interest, nor financial and personal relationship with other organizations that could inappropriately influence the work.

A



B

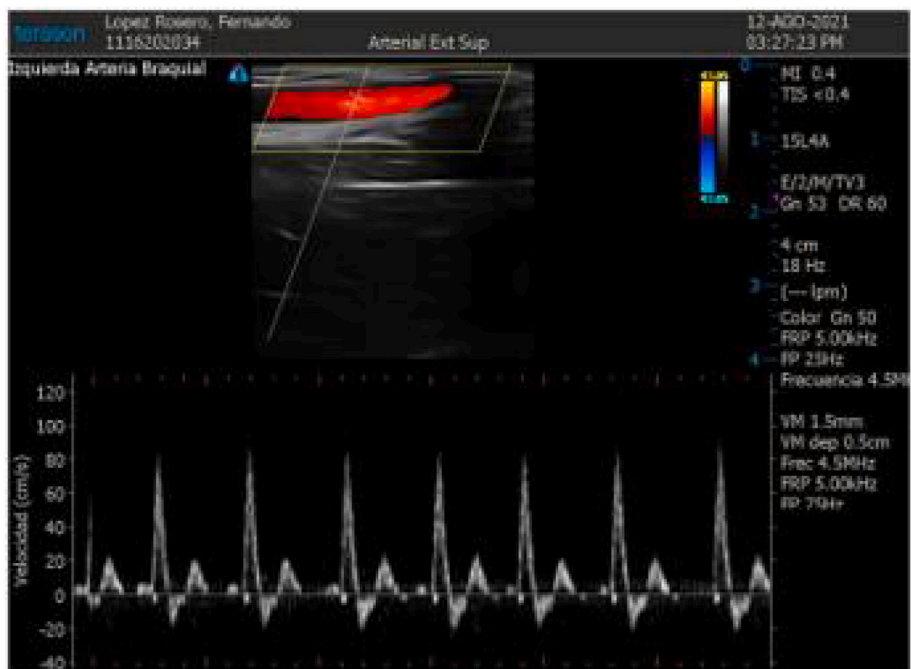


Fig. 4. Doppler ultrasound evaluation of: Right brachial artery and basilic vein (A) and reconstructed brachial artery (B).

References

- [1] T.W. Tan, F.L. Joglar, N.M. Hamburg, R.T. Eberhardt, P.M. Shaw, D. Rybin, et al., Limb outcome and mortality in lower and upper extremity arterial injury: a comparison using the national trauma data bank, *Vasc. Endovasc. Surg.* 45 (7) (2011) 592–597.
- [2] R. Shalabi, Amri Y. Al, E. Khoujah, Vascular injuries of the upper extremity, *J. Vasc. Bras.* 5 (4) (2006) 271–276.

- [3] R. Zellweger, F. Hess, A. Nicol, J. Omshoro-Jones, D. Kahn, P. Navsaria, An analysis of 124 surgically managed brachial artery injuries, *Am. J. Surg.* 188 (3) (2004) 240–245.
- [4] A.H.H. Lee, S.D. Qi, N. Chiang, Acute upper limb ischemia due to delayed presentation of a brachial artery pseudoaneurysm post-venipuncture, *Vasc. Endovasc. Surg.* 54 (1) (2020) 80–84.
- [5] B.K. Kakar, K.M. Babar, A. Khan, M. Naeem, I. Khan, Surgical experience of post-traumatic pseudo aneurysm of the brachial artery at a tertiary care hospital, *J. Pak. Med. Assoc.* 56 (9) (2006) 409–412.
- [6] J. Alvarez Garcia, I. Leblic Ramirez, T. Hernandez Cabrera, M. Gutierrez Nistal, Traumatic pseudoaneurysm with 30 years of evolution [Internet], *J. Vasc. Surg.* 58 (3) (2013) 802, <https://doi.org/10.1016/j.jvs.2012.07.040>. Available from.
- [7] M.J. Ramdass, P. Harnarayan, Brachial artery reconstruction in trauma using reversed arm vein from the injured upper limb, *Plast. Reconstr. Surg. Glob. Open* 4 (10) (2016) 1–5.