

PENETRATING VASCULAR TRAUMA TO THE BRACHIAL ARTERY

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Abstract

Civilian penetrating injuries to the upper extremities are becoming seldom, with few case reports presented in the recent literature. Nevertheless, the brachial artery is the most frequently injured artery, accounting for approximately 30% of all vascular injuries.

The authors present two clinical cases of brachial artery penetrating trauma with a stab corrected with an interposition saphenous bypass graft.

Keywords: Penetrating trauma, brachial artery, stab wound.

INTRODUCTION

Civilian patients with vascular injuries account for 1% to 2% of all injuries reported in trauma patients with scarce publications in the literature. In this setting, the brachial artery is the most frequently injured artery in the upper extremity, accounting for approximately 30% of all vascular injuries¹.

The arterial injury is frequently associated with fractures of the humerus and dislocations of the elbow, being stab wound incisions scarcely described as the mechanism of lesion. The degree of ischemia and concomitant damage to the nerves predict outcome after repair.

CASE REPORT

The author's present two clinical cases, both male patients, with 28 and 24 years old admitted at a Vascular Surgery emergency department, after transportation from the street

with the emergency team. Both had an arm injury, on its medial aspect, by knife penetration.

Despite conscious and orientated, both presented slight hemodynamic instability with blood pressure of 90/40mmHg and 100/45 mmHg and tachycardia of 94rpm and 103rpm, respectively. Clinically, they presented absent radial and ulnar pulse in the injured extremity and a palpable thrill in the first case and an expanding hematoma in the second one, with pulsatile bleeding.

Associated, both presented neurologic deficit with fingers numbness, that was why plastic surgery also evaluated the patients.

Analytically they presented a haemoglobin value of 6,9g/dL and 9,8g/dL, respectively and no other analytical significant deviations.

Both patients were stabilized in the emergency room

and then, underwent imagiological study with computed tomographic angiography (angioCT) which revealed an almost complete transection of the brachial artery with contrast extravasation in the first case (Figure 1) and a stop contrast image with local hematoma in the second case. No major brachial venous injury was associated but both had significant soft tissue disruption.

In both cases, we decided for open repair reconstruction and proceeded with a longitudinally, directly over the target vessel, incision, ensuring adequate exposure and control, proximal and distal to the injury (Figure 2). A wide debridement of nonviable tissue and ligation of small disrupted veins was done. The injured brachial segment was debrided to healthy-appearing tissue before repair was made and resected. Gentle balloon catheter thrombectomy proximally and distally was conducted confirming bleeding forward and backward from the injured vessel.

Once end to end re-anastomosis was not feasible, reconstruction was made with an interposition graft with inverted great saphenous vein and the vascular repair was covered with healthy soft tissue. Associated, the plastic surgeon, intra operatively, excluded major nerve injury. After the procedure, both patients recovered radial and ulnar pulses.

Patients were discharged two and three days after the procedure. Both were put on long-term single-antiplatelet regimen.

One patient has now 18 months and the other one was lost after 7 months follow-up.

Surveillance was done at one, three and six months and thereafter indication for annually consultation with physical and ecoDoppler examination. During follow up, both maintained graft patency with palpable distal pulses and no limb claudication.

DISCUSSION

Vascular injuries to the extremities occur in 0.5 to 1% of injured patients but account for 20 to 50% of all vascular injuries and occur predominantly in young, around 30s, male patients²⁻⁵.

Considering the upper extremity, regardless of mechanism, the most frequently injured arterial level is that of the forearm vessels. AngioCT is the diagnostic method regularly used to recognize and localize extremity arterial injuries, having replaced catheter-based angiography.

Nonoperative management can be successful in up to 70% of cases when blunt and penetrating injuries occur distal to branches of the axillary or common femoral arteries⁶. Selected arterial injuries such as small, non-flow-limiting intimal defects and flaps, small pseudoaneurysms and arteriovenous fistulas may be considered for observation with conservative treatment with serial surveillance.

In cases, where the patient presents with "hard signs" of vascular trauma, intervention is required⁷.

Endovascular treatment has increased significantly over the last decades and is most appropriate when the morbidity difference between the open and endovascular procedures is greatest⁸. Nevertheless, it has been less pronounced for ex-



Figure 1

Computed tomographic angiography reconstruction with identification of the brachial artery lesion

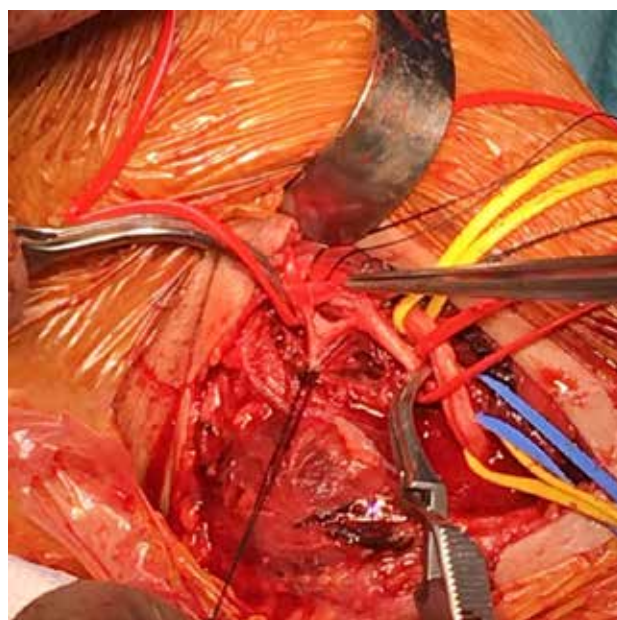


Figure 2

Intra-operative exposure of the brachial artery lesion.

tr emity injuries than for axial arterial trauma and is applied more frequently in blunt than penetrating trauma. Also, normally it requires that the traumatic vascular lesion might be safely traversed with a guide wire, which was not the case in neither of the presented clinical cases.

Open surgical control and repair remain the mainstays of the management of most extremity vascular injuries which general principals is to establish proximal and distal vascular control and restore in-line flow to a suitable outflow.

A tourniquet may be used to provide rapid control of inflow until surgical proximal arterial control can be obtained despite not being used in the clinical cases above described.

In some cases acute ligation of an injured extremity artery might be the most feasible acute option, especially when the physiologic patient status does not tolerate a revascularization intervention. If so, the extremity distal to the injury should

be observed for signs of developing ischemia⁹.

Surgical revascularization options include segment resection and spatulated end-to-end anastomosis, when the injured segment is short, but in both cases, the vessel injury extension was too long. An additional option is single arteriotomy and a patch angioplasty but in the first case, the artery presented lacerations both on the medial and lateral aspect and total disruption in the other. Once neither of these options were feasible, an interposition graft of appropriate length with great saphenous vein appeared to be the most indicated. A prosthetic graft was not considered because all open traumatic wounds are considered contaminated and the preferred conduit for repair should be autologous saphenous vein.

Temporary shunting might be accepted as a temporizing measure allowing for distal perfusion of a patient unable to undergo definitive repair acutely, which was not neither of the cases.

Frequently, depending on the mechanism and on the arterial level of injury, patients present other injured tissues with varying frequency. The presence of a peripheral nerve injury is also frequent, however can be difficult to identify in the acute phase.

Data on long-term outcomes after arterial repair of limb injuries are scarce once it is very difficult to mobilize patients for follow-up examinations, still very important because trauma victims are frequently young, with anticipated long life expectancy¹⁰.

Outcome after reconstruction is good with 30-day patency rates around 90%, with most occlusions occurring within the first week, suggesting technical problems as the aetiology. Amputation rates may reach 30%, with most amputations performed in patients with blunt mechanism. Mortality rate is below 2-5%, being it predominately associated to concomitant nonvascular injuries¹¹⁻¹².

After discharge, medical therapy is debatable with no clear indications described in the literature. Antiplatelet therapy may be beneficial to the injured vessel or the new anastomosis which is often devoid of endothelium and thus prone to platelet adhesion to the injured vessels, nevertheless the duration of this therapy is not precisely known.

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