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Case Report

Axillary Arterial Thrombosis Secondary to Re-Fracture of the Humerus

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Key words: acute thrombosis; axillary artery; fracture of the humerus; Neer's 2-part displaced fracture; revascularisation.

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Abstract

In the presented case report, we evaluated mechanism of axillary artery thrombosis in cases of repeated fracture of the shoulder**.** A 73-year-old female fell down on an outstretched hand. Radiographs demonstrated a Neer's 2-part displaced fracture of the proximal humerus and open fracture of the acromion. Forty years ago, in a car accident, fractures of the same proximal humerus and clavicle occurred and were surgically treated. Two hours after fixation with Kirschner wires, thrombosis of the axillary artery was quickly diagnosed and rapid treatment allowed revascularisation of the arm without any consequences.

Introduction

Fractures of the proximal part of the humerus account for 5% of all fractures, and are therefore considered to be common injuries. Proximal fracture of the humerus results from high-energy trauma (e.g. traffic accidents) in young patients and low-energy trauma (falls) in older patients. It is important to be aware of the fact that brachial plexus and axillary artery are near to the proximal humerus, and could be lessoned as a complication of shoulder injuries [1]. Traumatic lesions of the axillary artery account for about 15-20% of arterial injuries of upper limbs. Penetrating wounds cause ninety-four per cent of traumatic lesions of axillary artery, while 6% are caused by blunt traumas with consequent shoulder-fracture dislocation [2, 3]. Axillary artery and brachial plexus injuries are mutually traumatized with an incidence rate of 27–44% (4), followed by venous and musculoskeletal injuries [5]. There is a broad spectrum of clinical presentations of axillary artery injury. On the one hand, there is acute arm ischemia with palpable pulses and normal capillary refill time secondary to extensive anastomotic network of collateral vessels around the shoulder [6]. On the other hand, considering that the brachial plexus and the axillary artery lie within a common fascial sheath, the axillary artery injury is often followed by brachial plexopathy caused by swelling and compression of the arm [7].

We report the case of acute thrombosis of the axillary artery developed after the re-fracture of the proximal humerus and open fracture of the acromion.

Case Report

A 73-year-old woman presented with severe pain on her left shoulder after falling down on an outstretched hand. No distal neurological or vascular deficiencies were noted. Radiographs demonstrated a Neer's 2-part displaced re-fracture of the proximal

humerus and open fracture of the acromion. Forty years ago, in a car accident, fractures of the same proximal humerus and clavicle occurred, and were surgically treated. She underwent open reduction and fixation with Kirschner wires. Two hours after the fixation, left brachial, radial, and ulnar pulses were impalpable and the capillary refill time was <4 seconds. Neurological examination revealed sensory deficit on the left upper arm, and flaccid paresis. MultiscanCT angiography of the left hand arteries was performed, and it showed complete occlusion of the axillary artery at the level of the fracture without collateral blood supply of the forearm (Figure 1).

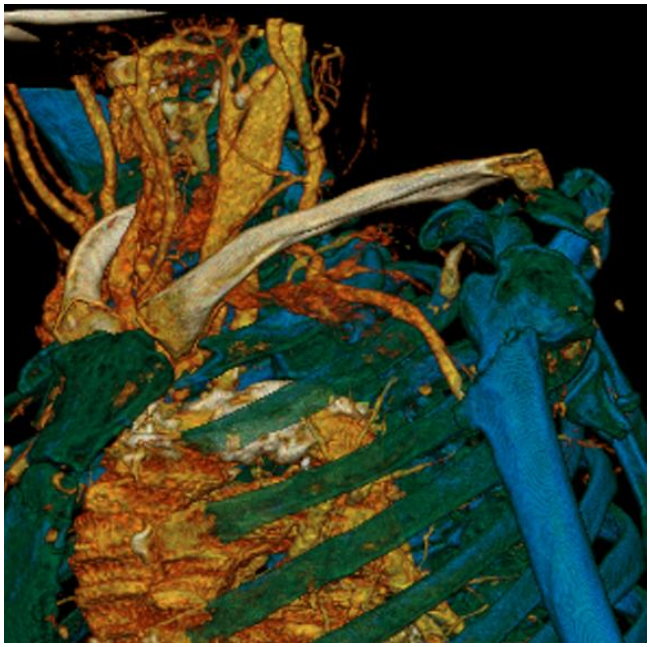

Figure 1: Multiscan CT angiography before orthopaedic procedure.

Surgical explorations of the axillary artery and brachial plexus were performed under general anaesthesia. The intraoperative findings showed a massive fibrous tissue which surrounded the stretched axillary artery, without any active bleeding or laceration of the brachial or axillary arteries, except the axillary artery thrombosis. Within the common sheath of the axillary artery and brachial plexus, no hematoma was diagnosed. Macroscopically, cords of the brachial plexus were intact.

After an adequate exploration and deliberation of the axillary artery, the injured part was resected. Revascularization was re-established by Dacrone tubular graft (7 mm), anastomosed in an end-to-side fashion from the axillary artery site, and in an end-to-end fashion to the distal part of the brachial artery.

Pathohistological examination (haematoxylin-eosin stains) of the resected artery showed a small laceration of the endothelium followed with bleeding into the arterial wall, and intraluminal thrombosis of the artery. The artery was surrounded with mature acellular and almost avascular connective tissue.

In further follow up, a successful revascularisation of the left arm was noticed with Doppler ultrasound scanning on the next day after the surgery, and the neurological symptoms disappeared instantly after the surgery. The Doppler ultrasounds were performed at discharge from hospital, as well as in the first and third month after the injury, and they all showed bypass patency in absence of any complication.

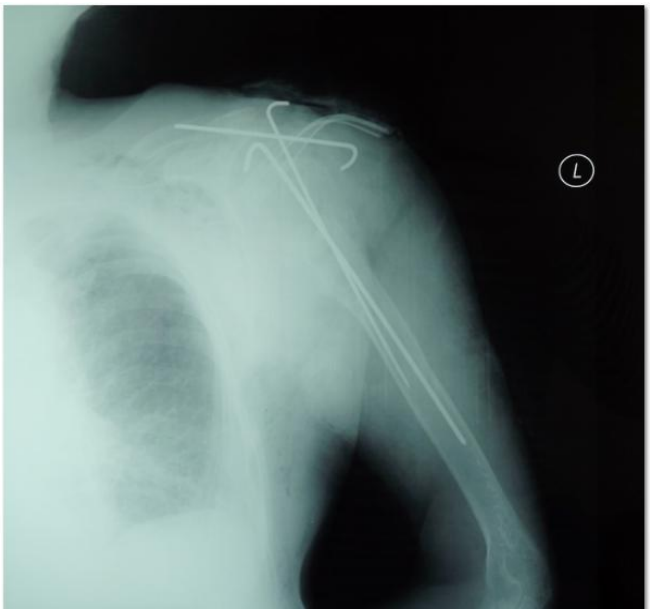

Figure 2: CT-Angio was done after fracture but before fixation, as a standard diagnostic procedure for this type of vascular disease.

Discussion

A few studies present fractures of the proximal humerus in adults with concomitant vascular or neurological injury [8, 9].

In the case being reviewed herein, the extensive connective tissue surrounded the axillary artery as a consequence of a surgical procedure of the proximal humerus performed 40 years ago. That massive fibrosis disabled adjustment of the axillary artery after the re-fracture of the bone, and caused its injury with consequent thrombosis in the region of the fracture.

Low-energy trauma to the shoulder complicated with axillary artery injuries is an uncommon complication, with an incidence in a supra-regional centre of 20 cases over 20 years [10. A total of 44 axillary artery injuries associated with proximal humeral fractures have been reported in the literature. Two of them had continuous haemorrhages detected and were treated 6 and 8 weeks after the initial injuries; remaining 3 had massive secondary

haemorrhages from false aneurysms and were treated between 8 and 16 weeks after the injury [10]. The limb salvage rate was 94% and 70% of patients regained good neurological function.

The mechanisms of injury could be direct injury by a bone spike, then violent overstretching of the artery as a result of extreme abduction, following avulsion or rupture of a branch at its origin [11]. Injuries could be divided into acute and delayed injuries. Acute injuries have a total or partial rupture of the artery wall involving all arterial layers, or they could involve only intimal layer which results in occlusion of the lumen. Delayed injuries could be presented as false aneurysm, arteriovenous fistula or thrombosis. Better functional outcome could be expected in cases which are early diagnosed [11-13]. But if there is no clear clinical presentation of the vascular injury, no neurological or vascular deficits, it is unlikely to make an early diagnosis. It is reported that only 46% of patients presented with neurological deficits, and 68% with acute ischemia of the arm [13]. Popescu D. et al., reported axillary artery thrombosis secondary to shoulder dislocation [14]. Various mechanisms have been postulated. Adovasio R. et al., [15] considered that the axillary artery, fixed between the subscapular and humeral circumflex arteries, can be pulled together with the humeral head and elongated. Other authors [16-18] thought that the pectoralis minor muscle could act as a fulcrum over which the humeral head would bend and compress the artery. In patients with recurrent dislocations, formation of a scar tissue can facilitate the occurrence of this lesion [17].

Arterial thrombosis is an emergency so it is crucial to make an early diagnosis. Outcome of the treatment is connected with its right timing and rapidity. Successful cases have been reported with intra-arterial treatment consisting of thrombolysis and stent application [19]. Blaisdell et al., [20] presented a concept of early heparinization to prevent the proximal and the distal propagation of thrombus combined with delayed intervention. At actual moment the best treating approach is an open surgery, including thrombectomy, end-to-end anastomosis, saphenous vein graft or prosthetic implant [21]. Possible avulsion of collaterals should be treated by ligature. The risk of compartment syndrome as a complication of the treatment is present. For this reason, it is preferable to perform prophylactic fasciotomies in the forearm or at least to monitor the compartmental pressure.

Pharmacologic thrombolysis and, more recently, percutaneous mechanical thrombectomy (PMT) hold potential in this regard. The introduction of catheter-directed locally-administered thrombolytic agents has challenged three decades of dominance of the Fogarty catheter thrombectomy. Thrombolysis with such agents as urokinase, rt-PA, streptokinase, and reteplase has been investigated in uncontrolled trials as a therapeutic alternative to operation for acute peripheral arterial occlusion [22-28].

In the presented case, an open surgical procedure with resection of the injured part of the axillary artery with interposition Dacrone tubular graft (7 mm) and end-to-end anastomosis was performed. We decided to go for an open procedure and this type of reconstruction because we wanted to explore the state of the brachial plexus, the patient's vein was not good to be grafted, and our experience with this type of synthetic graft is quite good.

Even though axillary artery injury is uncommon after a low-energy trauma to the shoulder, clinical suspicion must be present while treating such a patient. The serious conditions occurring as outcomes of overlooking such complication underline the importance of bearing it in mind and including it in diagnostic algorithm when facing a patient with proximal humeral fractures.

Consent

The patient and his family were informed that data obtained would be submitted for publication and a written consent was obtained from the patient and their relatives.

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