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Case Report

Axillary artery injury secondary to proximal humerus fractures: a case report and literature review

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Abstract: Axillary artery injury associated with proximal humerus fractures was rare clinically, which exhibited varying clinical manifestations. In this study, an 80-year-old woman suffered from axillary artery injury secondary to proximal humerus fracture was presented. This case exhibited large ecchymosis in the left upper limb and chest skin. A left 4-part proximal humerus fracture dislocation inferior to the glenoid cavity was observed. After the repairation of axillary artery, hemiarthroplasty was successfully performed. The postoperative recovery of this patient was well, while no long term follow-up data was revealed. Our findings aimed to highlight the risk of axillary artery injury in patients with proximal humerus fractures-dislocations, and review the pathogenesis and treatment decisions.

Keywords: Proximal humerus fractures, axillary artery, injury

Proximal humerus fracture is a kind of common fracture in elderly people, which account for 5% of all long bone fractures [1]. In clinic, axillary artery injury is always caused by blunt trauma in shoulder, while it is not common in patients with proximal humerus fracture [2]. In this study, a rare case of patient with axillary artery injury secondary to proximal humerus fracture was reported and analyzed.

Case report

An 80-year-old woman suffered from fracture dislocation due to falling to the ground was presented to the Emergency Department. This patient had history of hypertension, diabetes, arrhythmia and cerebral infarction. He had complaints of pain during moving the left upper limb and roughly observation showed edema, hematoma, and large ecchymosis in the left upper limb and chest skin (**Figure 1**) (as large ecchymosis after injury was not awared before operation, the picture was taken at one day after operation). The left upper limb was revealed to be normal by neurological examination, and strong distal radial pulse and warm well-perfused limb were also revealed. Then a left 4-part proximal humerus fracture dislocation inferior to the glenoid was observed through radiography (**Figure 2**). After 8 days of optimization according to multiple comorbidities, this case was taken to the operating room and left shoulder hemiarthroplasty was performed.

Before the operation, the fracture was firstly treated by a standard deltopectoral approach. Simply, a base angle of scarf bandage was tied on forearm, and another base angle pulled on the opposite side of the shoulder along the back of arm. The injured limb was wrapped by the point angle, and two base angles were knotted until forearm curved to chest (the injured limb was finally suspended by scarf bandage). Copious bleeding induced by the mobilization of humeral head from axilla was inhibited by pressure. For active bleeding of axillary artery laceration, it was controlled by gentle pressure of proximal axillary artery. Then an Axillary Langer's lines incision was made and approximately 0.3 cm contused segment was found in axillary artery (**Figure 3**). As vascular clamp could not be applied in restricted surgical incision, wide rubber tissue was used to prevent blood loss. Meanwhile, the crevasse of axillary artery was directly sutured with 6-0 polypropyl-

Figure 1. Large ecchymosis in the left upper limb and chest skin (as existed large ecchymosis after injury was not awared, the picture was taken at one day after the operation).

Figure 2. Plain radiographs of the left shoulder showed proximal humeral fracture dislocation inferior to the glenoid cavity.

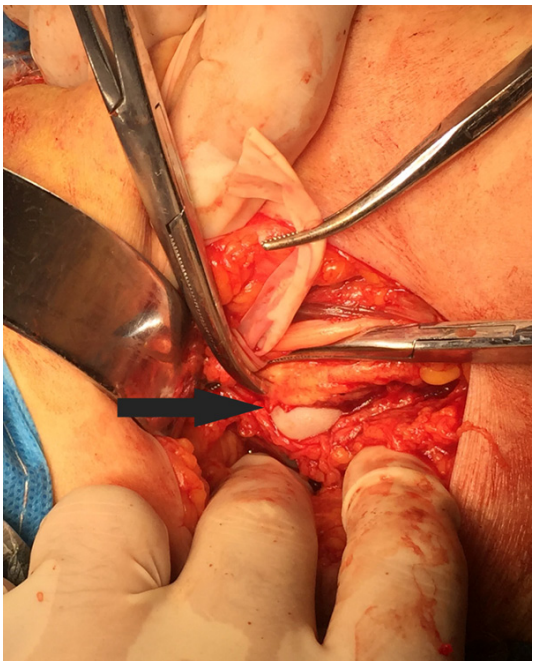

Figure 3. Axillary Langer's lines incision showed that approximately 0.3 cm segment was contused in axillary artery. Black arrow point to the crevasse of axillary artery.

ene sutures. After repairation of axillary artery, hemiarthroplasty was successfully performed. The total operation time was approximately three hours, including repairation of axillary artery and shoulder hemiarthroplasty

The post-operative situation of this patient was stable. The radial pulse remained palpable during 4 days of monitoring in intensive care unit. In order to identify the state of postoperative axillary artery, arteriography was recommened to this patient before discharge. However, this patient refused to do this check because of the invasive role of this examination. After discharged with a sling, this patient was not regularly reviewed. As we could not get in touch with this patient, no follow-up data was revealed.

Discussion

Axillary artery injury was usually caused by blunt trauma on shoulder, while it was rare in patients with proximal humerus fractures. Until now, a total of 69 cases of patients with axillary artery injury secondary to proximal humerus fractures has been described [2, 3]. All these researches showed that the clinical treatment of axillary artery injury secondary to proximal

humerus fractures was complicated and no strict guideline could be obeyed.

Atherossclerosis was an independent risk factor of axillary injury [4]. The loss of arterial elasticity secondary to atherossclerosis could always make the axillary arterial more susceptible to injury. As atherossclerosis always occured in older people, increased age was considered to be a risk factor of vascular injury associated with proximal humerus fractures induced by blunt trauma on shoulder. This phenomenon had been identified by various researches that vascular injury always occurred in patients at age >50 [5]. Meanwhile, fracture dislocation was also reported to be more likely to lead to axillary artery injury due to fracture fragments [2]. Therefore, vascular injury was suspected to be able to increase the severity of fracture in clinic.

The clinical manifestation of axillary artery injury was always complex, especially induced by blunt trauma on shoulder. In some cases with axillary artery injury secondary proximal humerus fractures, obvious symptoms could be observed, such as absent radial pulse, active haemorrhage, and pulsating haematoma [6]. In contrast, some cases only exhibited minor symptoms, such as numbness, muscle weakness, stiffness, paralysis, pallor, pain during reduction and stabilization of the fracture, and colder injured limb than another normal limb. As collateral flow through collateral artery was sufficient to perfuse the extremity, distal ischemia was always accompanied with axillary artery injury secondary proximal humerus fractures [7, 8]. Therefore, early confirmation and location of artery injury through arteriography were necessary in diagnosis of axillary artery injury secondary proximal humerus fractures. However, arteriography was not often present in emergency rooms and trauma centers. Duplex Doppler ultrasound may be used as an alternative to evaluate arterial flow in these cases. In this study, a patient was firstly characterized by edema, hematoma, pain, normal distal radial pulse, and a warm and well-perfused limb. Meanwhile, a large ecchymosis was observed in the left upper limb and chest skin. Further researches were still needed on whether this large ecchymosis could be used as marker in the diagnosis of axillary artery injury secondary proximal humerus fractures.

Once the early diagnosis of vascular injury was made, operative intervention was required for the treatment of axillary injury [2]. It was generally necessary to repair the vascular as soon as possible, even in those with fracture stabilization and adequate distal perfusion [9, 10]. In clinic, vascular repair was revealed to be able to prevent excessive hemorrhage or amputation, which was likely to increase the long-term efficacy [11]. It has been reported that more than 70% of patients with axillary artery injury secondary proximal humerus fractures had underwent reconstruction, including end-to-end anastomosis, vascular grafts and interposition [2, 10, 15]. Meanwhile, simple primary vascular repair including intimal excision and thrombectomy also had been performed in many patients. In this case, a direct suturing technique was successfully performed to repair the crevasse of axillary artery, and an uneventful post-operative situation was achieved. As the injured limb might be alive due to the presence of extensive collateral circulation, there only 10% patients with artery injury were treated by closed reduction of proximal humerus fracture dislocations [11].

As reported, brachial plexus injury was associated with 60% vascular injury secondary to proximal humerus fractures [12, 13]. Vessels should be maintained when associated with the brachial plexus. Fortunately, the brachial plexus was intact in this case.

Traumatic injury of axillary artery secondary to proximal humerus fracture or dislocation was rare, which associated with serious complications. In clinic, surgeon should pay great attention to the risk of artery injury when patients suffered from fracture dislocations caused by blunt trauma on shoulder. Meanwhile, surgical repairation remain considered to be the golden treatment standard when arterial injury was identified.

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Disclosure of conflict of interest

None.

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