Axillary Artery Injury Following Inferior Dislocation of the Glenohumeral Joint

Glenohumeral Eklemin İnferior Çıkığını Takiben Gelişen Aksiller Arter Yaralanması

Özett
Bu yazında, primer travmatik inferior omuz çıkığını takiben oluşan aksiller arter yaralanması olgusu sunulmaktadır. Ekstremiteyi tehdit eden bu yaralanmanın klinik muayene esnasındaki patognomonik triad temelinde oluşan bulgulara saptanmasına yönelik şıpheyi artırmak ve bunu izleyen tedavi ve sonuçlarla ilgili güncel düşünceyi pekiştirmek amaçlanmıştır. Bildiğimiz kadarıyla, İngilizce literatürde genç erkek bir hastada primer travmatik inferior omuz çıkığında vasküler yaralanma yaratan tek yayındır.

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Abstract
In this paper, we described a case of axillary artery injury following a primary traumatic inferior shoulder dislocation. It is aimed at raising the index of awareness for identifying this limb threatening injury based on its pathognomonic triad of findings during clinical examination, and to consolidate current thinking on its subsequent management and outcome. To our knowledge, this is the only report in the English literature describing vascular injury in primary traumatic inferior shoulder dislocation in a young man.

Keywords
Axillary Artery Injury; Inferior Shoulder Dislocation; Surgery
Introduction
Injuries to the axillary artery are a relatively rare occurrence, representing 15-20% of arterial injuries to the upper limb [1]. Ninety-four percent of such injuries are due to penetrating trauma, with only 6% being caused by blunt trauma. Fracture-dislocation of the glenohumeral joint accounts for the majority of blunt injuries [2], and less than 1% demonstrate dislocations without an associated fracture [1]. Inferior dislocations of the shoulder (luxatio erecta) are rare occurrences, accounting for an estimated 0.5% of shoulder dislocations [3]. Such dislocations occur when the shoulder is forced into hyperabduction while the proximal humerus is levered over the acromion process [4]. It may also result from direct axial loading on a fully abducted arm. During physical examination, the affected side is held above the head while the shoulder is abducted and rotated externally. Any attempt to passively abduct the shoulder will cause severe pain. It is estimated that 60% of these patients have some form of neurological deficit of the upper limb prior to reduction, usually deltoid “badge patch” numbness; however, any such deficit usually resolves following reduction. It is essential to look for clinical evidence of brachial plexus injury in patients with inferior dislocation of shoulder, as it is these injuries that engender the resultant morbidity rather than the dislocation itself.

This paper describes a case of axillary artery injury following a primary traumatic inferior shoulder dislocation. It is aimed at raising the index of suspicion for identifying this limb threatening injury based on its pathognomonic triad of findings during clinical examination, and to consolidate current thinking on its subsequent management and outcome. To our knowledge, this is the only report in the English literature describing vascular injury in primary traumatic inferior shoulder dislocation in a young man.

Case Report
A 35-year-old man presented to our center 3 days after a left shoulder dislocation caused from falling onto an outstretched left arm, complaining of pain in his left shoulder. The dislocation had been reduced in another center. The patient had not suffered any previous shoulder-related problems in his left shoulder. His previous x-rays showed inferior shoulder dislocation (Figure I), and newly performed X-rays confirmed the dislocated shoulder to be reduced with an associated tuberculum majus fracture (Figure II). Physical examination revealed tenderness and swelling over the left shoulder, with a marked limitation of motion. The patient had preserved motor function in the hand, with loss of sensation to fine touch. The remaining part of the patient’s physical examination was normal. Radial and ulnar pulses were absent. Dysesthesias, coolness and cyanosis were present on the 3rd and 4th fingers of the left side (Figure III). It was difficult to perform a through and accurate neurological examination on the patient due to severe pain.

The patient was referred for magnetic resonance angiography. The angiography revealed disruption of the third portion of the axillary artery beyond the pectoralis minor (Figure IV). The patient was then taken for vascular surgery. Exploration of the axillary artery was performed through an infraclavicular approach by separating the pectoralis minor muscle. Exploration
revealed complete transection of the axillary artery distal to the subscapular branches, with thrombi in the divided ends. Following systemic and local heparinization, reconstruction was performed with a synthetic graft (Figure V). Restoration of blood flow was confirmed with the appearance of palpable radial and ulnar pulses, and an intraoperative arteriogram demonstrated intact anastomoses and patent distal vasculature. Exploration of the brachial plexus revealed no macroscopic disruption. Tuberculosis majus fixation was also performed during the same surgery. Post-operative neurological examination revealed no abnormalities.

The left arm was immobilized in a sling for 3 weeks, and both active and passive range of motion exercises were prescribed for the patient. Follow-up at 12 months revealed good shoulder function, with normal neurovascular examination showing duplex evidence of patent vascular synthetic graft.

Shoulder dislocations are rarely associated with vascular complications, but the axillary artery or its branches may also become damaged [5], often at the outer boundary of the first rib. The axillary artery nominally ends at the lower border of the teres major muscle, where it becomes the brachial artery. The pectoralis minor crosses the vessel and divides it into three parts, the first part being proximal, the second posterior, and the third distal to the muscle. The first part is enclosed together within the axillary vein and the brachial plexus in a fibrous axillary sheath, continuous with the prevertebral layer of the deep cervical fascia. This close association renders the brachial plexus vulnerable in axillary vascular injuries.

Recognized predisposing factors are recurrent dislocation and age [6]. Over 90% of reported cases of vascular injury following shoulder dislocation occur in patients over the age of 50 [7]. An older individual is more likely to experience a fall. However, several authors have described pre-existing atherosclerotic changes in the axillary artery, suggesting that an inelastic atherosclerotic vessel may be more predisposed to damage during shoulder dislocation [8]. Our report describes that this type of injury can possibly occur in younger patients as well.

Several theories have been proposed to explain the propensity for arterial injury in the third portion. Milton [9] suggested that the artery is fixed in that location by the anterior and posterior circumflex arteries, as well as by the subscapular artery. The artery is then exposed to direct injury by the hyperabducted humeral head. Brown and Navigato [10] and Gibson [11] speculated that the margin of the pectoralis minor acts as a fulcrum against which the humeral head bends the axillary artery. In most of the patients, there is a history of previous dislocation, suggesting that the initial injury may cause the artery to become fixed by inflammatory tissue within the torn shoulder joint capsule. This renders it more susceptible to injury with subsequent dislocations [12]. In the current case, the patient had no history of previous dislocation.

Brachial plexus injury is associated with as many as 60% of cases of subclavian and axillary arterial injury, and is the most important determinant of long-term disability. Patients with axillary artery injury following blunt trauma are significantly more likely to have associated complete brachial plexus injury than patients presenting with penetrating trauma. This clearly explains the need for routine exploration of the plexus at the time of vascular repair. In our case, brachial plexus exploration during the vascular surgery revealed no abnormalities.

Although end-to-end reconstruction has been used in the majority of cases reported in the literature [8], we felt that using this approach would have required sacrificing the potentially important collaterals. Therefore, we chose a synthetic graft as our method of reconstruction. In the event that the reconstruction failed, there would be less chance for critical ischemia within the arm.

This case report presents a very rare but now classical presentation of axillary artery rupture in its third segment following an inferior dislocation of the shoulder joint. It is a unique case since it was an inferior type first dislocation occurring in a person of younger age.
Competing interests
The authors declare that they have no competing interests.

References

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