



## Case Report

# Brachial plexus injury secondary to pseudoaneurysm of axillary artery after glenohumeral dislocation: case report<sup>☆</sup>



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### ARTICLE INFO

#### Article history:

Received 6 May 2016

Accepted 18 July 2016

Available online 20 June 2017

#### Keywords:

Axillary artery

Aneurysm, false

Brachial plexus/injuries

Shoulder dislocation

#### Palavras-chave:

Artéria axilar

Falso aneurisma

Plexo braquial/lesões

Luxação do ombro

### ABSTRACT

Lesions of the axillary artery and consequent compression of the brachial plexus are extremely rare in patients with glenohumeral dislocation and may have greatly varying clinical manifestations. This joint is one of the most affected by dislocation in the human body, accounting for approximately 45% of cases. Less than 1% of patients with shoulder dislocation have vascular complications; however, when there is damage in the axillary artery, the incidence of associated brachial plexus injury is 27% to 44%. The authors report on a case of brachial plexus compression by an axillary artery pseudoaneurysm after a glenohumeral dislocation, aiming to highlight the existence of this association, in order to make an early diagnosis and avoid serious complications, such as neurologic injury.

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### Lesão de plexo braquial secundária a pseudoaneurisma de artéria axilar após luxação glenoumeral: relato de caso

### RESUMO

As lesões de artéria axilar e consequente compressão de plexo braquial são extremamente raras em pacientes com luxação de glenoumeral e podem ter manifestações clínicas bastante variadas. Essa articulação é uma das mais acometidas por luxação do corpo humano, representando cerca de 45% dos casos. Menos de 1% dos pacientes com luxação de ombro apresentam complicações vasculares; no entanto, quando há lesão da artéria axilar, a

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<http://dx.doi.org/10.1016/j.rboe.2017.06.004>

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incidência de lesão de plexo braquial associada é de 27% a 44%. Relatamos um caso de compressão do plexo braquial por um pseudoaneurisma de artéria axilar após uma luxação glenoumeral. O objetivo é lembrar a existência dessa associação, a fim de diagnosticá-la precocemente e evitar complicações graves, como a lesão neurológica.

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## Introduction

Among the major joints in the human body, the glenohumeral joint is the most affected by dislocation, representing approximately 45% of cases.<sup>1-3</sup> Less than 1% of shoulder dislocation patients present vascular complications, and less than 4% show neurological damage.<sup>3</sup> In 1911, in the French literature, Guibe<sup>4</sup> was the first to describe axillary artery injury secondary to shoulder dislocation, citing 57 cases. Sparks et al.<sup>5</sup> conducted a study that included 1565 cases of dislocations of the upper limb, detecting arterial injury in only 0.97% of cases.<sup>1,2,5,6</sup>

This article reports a case of brachial plexus injury secondary to an axillary artery pseudoaneurysm formed after a glenohumeral dislocation, aiming to bring light to the existence of this association, to allow early diagnosis and avoid severe complications, such as neurological injury.

## Case report

A 43-year-old male patient, a blue-collar worker who had suffered a cart accident on his right upper limb, was admitted to the emergency room with pain and functional disability in right shoulder mobilization. After imaging exams, an antero-inferior dislocation of the glenohumeral joint was diagnosed. In the emergency room, the patient underwent traction and counter-traction maneuvers; the control radiograph disclosed reduction of the dislocation and absence of interposed structures in the joint (Fig. 1). After motor and sensory changes of the radial, median, and ulnar nerves were discarded, the patient was dismissed with a sling. Seven days later, he presented major pain in the upper limb after removing the sling for showering. He returned to the same hospital, where a considerable edema of the entire right upper limb and a glenohumeral diastasis were observed (Fig. 2). The patient was treated with enoxaparin for 18 days, due to a possible deep venous thrombosis of the right upper limb. He was discharged from that institution and was referred to our hospital due to symptoms persistence. On admission, he presented grade 0 strength of the entire musculature of the right upper limb (deltoid, biceps, brachial, triceps, and flexor and extensor muscles of the forearm, hand, and pectorals); tricipital, brachioradialis and bicipital areflexia; anesthesia of the entire upper limb; and paresthesias proximal to the acromion (are of the suprascapular nerve), as well as pain in the entire limb that did not improve with common analgesics; and presence of a pulsatile mass in the right axilla. An arteriography and magnetic resonance imaging of the limb were performed

and an axillary artery pseudoaneurysm was observed (Fig. 3). On the 12th day of hospitalization, with joint intervention of the shoulder surgery and vascular surgery groups, the aneurysm in the mid-third of the axillary artery was resected through an infra-clavicular approach with end-to-end anastomosis of the axillary artery. It was decided not to explore the brachial plexus because the patient did not present neurological impairment after joint reduction in the initial trauma; therefore, the main hypothesis for the cause of the neurological symptoms was the compression of the brachial plexus by the pseudoaneurysm. Postoperatively, the patient presented significant improvement of limb pain and decreased edema; nonetheless, he did not recover mobility and sensitivity. The patient was discharged on the 45th day of admission, and an outpatient follow-up visit was scheduled. He was reassessed 30 days later, whereupon he presented recovery of sensitivity in the posterior aspect of the forearm and posterior aspect of the right hand, between the thumb and the forefinger; he presented grade 0 strength for the limb and grade 1 strength for the pectorales and deltoid muscles.

## Discussion

Complications associated with shoulder dislocation are not uncommon and are usually musculoskeletal, such as fractures, glenohumeral instability, and osteoarthritis.<sup>7</sup> Vascular injuries are rare and have signs and symptoms that may appear early or late in the initial care. Late complications, such as the formation of a pseudoaneurysm, occur due to injuries of the intimal or middle arterial layer, and can easily go unnoticed, as the initial symptoms are minimal or transient; at the moment of dislocation, the earliest sign would be the change of the radial or brachial pulse before reduction.<sup>1</sup>

The axillary artery originates anatomically from the subclavian artery and it is divided into three portions as it passes above the first rib: the first portion is defined between the first rib and the pectoralis minor muscle, the second portion is underneath the pectoralis minor muscle; the axillary artery then turns into the brachial artery in the border of the teres major muscle (Fig. 4). Most (90%) axillary artery injuries occur in the third portion.<sup>3,8-10</sup> This last segment of the vessel is relatively fixed due to the anchoring of the anterior and posterior subscapular and circumflex arteries, which makes this portion more prone to injury. Furthermore, due to its proximity to the humeral head, the entire axillary artery is susceptible to damage during shoulder dislocation, especially in cases where there is concurrent fracture of the humeral head.<sup>2,3,8,10</sup> Nonetheless, vessel wall rupture may result from excessive force applied during manipulation and reduction

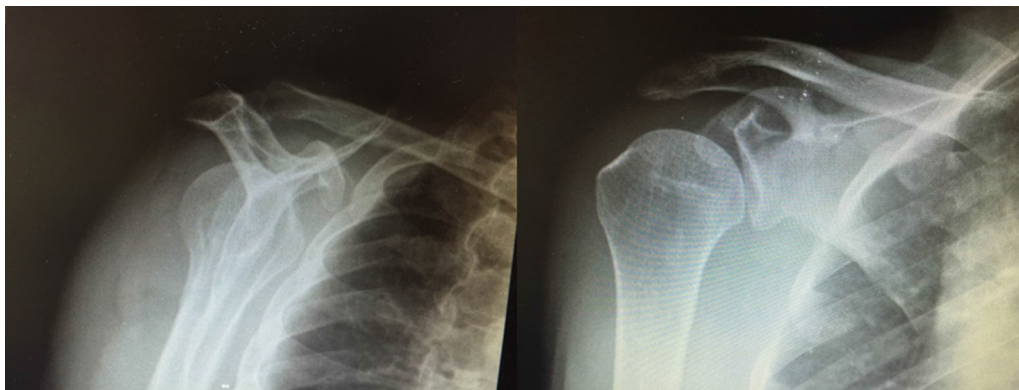


Fig. 1 – Control radiograph of the right shoulder in anteroposterior and lateral views after reduction of an antero-inferior dislocation of the glenohumeral joint.

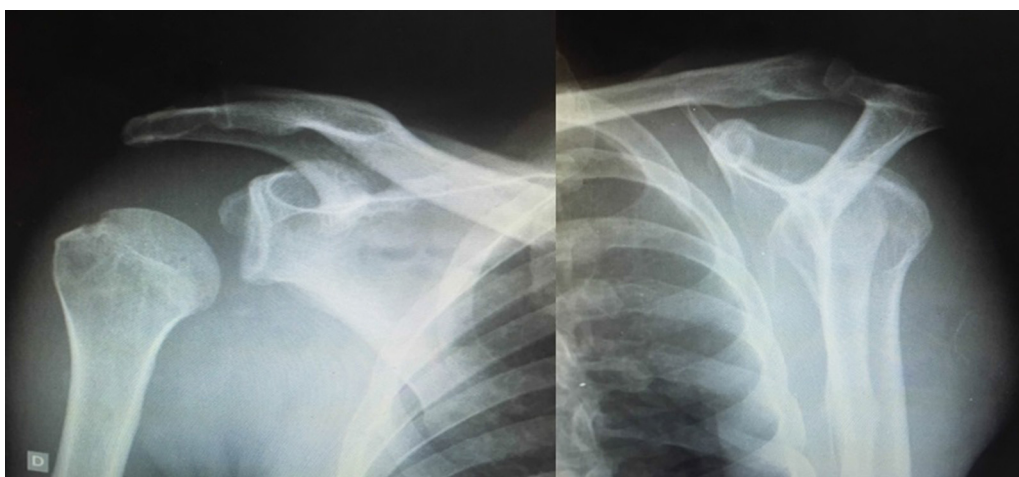


Fig. 2 – Radiographic image of the right shoulder in anteroposterior and Neer lateral views disclosing diastasis of the glenohumeral joint.

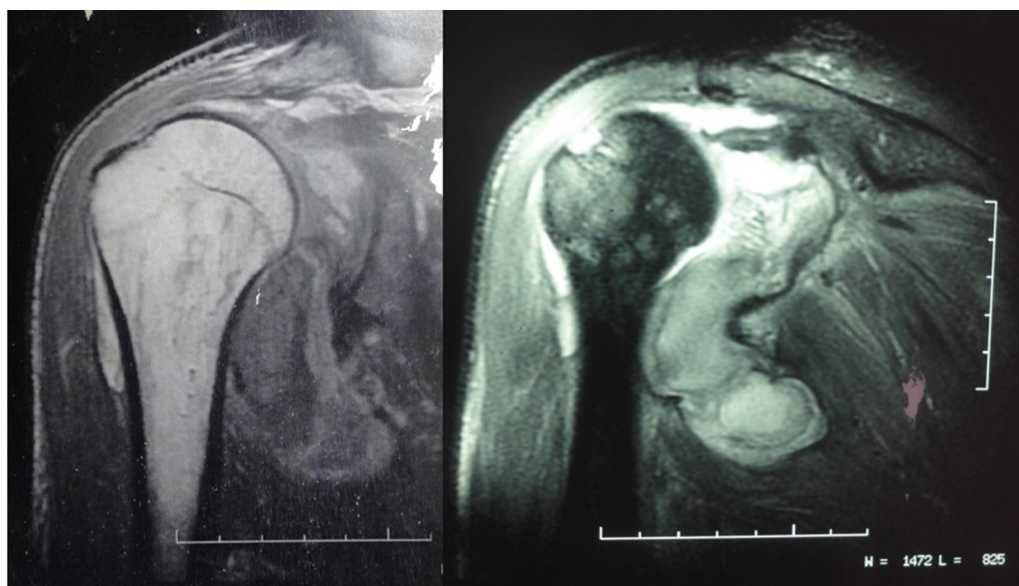
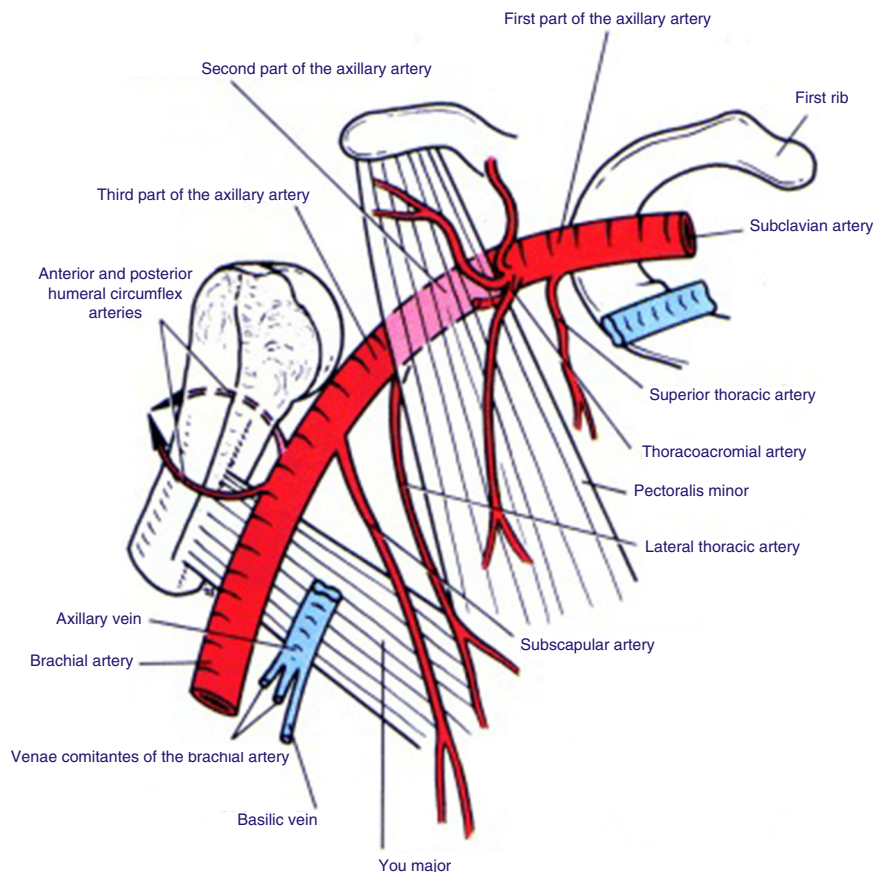


Fig. 3 – Magnetic resonance imaging of the right shoulder disclosing pseudoaneurysm of the axillary artery.





**Fig. 4 – Schematic image of the anatomy of axillary artery, showing its three portions. (Reference: [http://www.lookfordiagnosis.com/mesh\\_info.php?term=Art%C3%A9ria+Axilar&lang=3](http://www.lookfordiagnosis.com/mesh_info.php?term=Art%C3%A9ria+Axilar&lang=3)).**

of a dislocation.<sup>8</sup> Arterial injury is more frequent in elderly patients (more than 90% of cases occur in patients aged over 50 years), due to atherosclerotic disease and arterial stiffness – which makes the vessels less resistant to stress – and in patients with history of chronic dislocation (27% of cases), due to the formation of a fibrotic scar between the joint capsule and the axillary artery.<sup>1-3,6,9,11</sup>

Traumatic pseudoaneurysm of the axillary artery in association with brachial plexus injury is extremely rare, having only being described in a few cases.<sup>12</sup> The incidence of brachial plexus injury associated with axillary artery injury ranges from 27% to 44%.<sup>9,12</sup> This can be explained by the fact that the axillary artery and the brachial plexus course in the same fascial compartment, which facilitates compression of the plexus by bleeding, as well as hematoma directly compressing the nerve fibers.<sup>10,11</sup> Isolated brachial plexus neuropraxia due to glenohumeral dislocation may also occur; it usually has a good prognosis, and should be explored through electromyography in three to four months if there is no clinical improvement or signs of improvement.<sup>1</sup> The most prevalent signs and symptoms of axillary artery pseudoaneurysm are absence of early radial and brachial pulse (especially before shoulder reduction), severe pain, edema, axillary mass, neurological deficit, and late hemoglobin or hematocrit decline.<sup>1,7-10</sup> In 71% of the cases, patients present a detectable axillary mass, and 93% have no distal pulse.<sup>8</sup> It is extremely difficult to diagnose

vascular damage early due to the excellent collateral circulation of the upper limb.<sup>2,9,11</sup> Bone erosion is a sign that indicates that the pseudoaneurysm has been present for a long time; it can be observed in the clavicle in association with the pseudoaneurysm cavity.<sup>6</sup> In cases of suspected vascular damage, the imaging test of choice to confirm the diagnosis is Doppler ultrasound, but an MRI or an arteriography should also be performed to guide the surgical procedure.<sup>8</sup> Surgery can be performed through the deltopectoral approach, with the arm in abduction,<sup>7,12</sup> or through the infraclavicular approach.<sup>1,2,10</sup> Delaying surgical intervention for plexus decompression and correction of pseudoaneurysm may worsen the prognosis of neurological injury.<sup>7,12</sup> Patients may be followed-up at one, three, and six months after surgery; if there is no neurological improvement in three to four months, brachial plexus exploration is indicated.

Glenohumeral dislocation is the most common joint dislocation and has low complication rates after its reduction; pseudoaneurysm of the axillary artery is an important complication, with the possibility of irreversible sequelae due to concomitant brachial plexus compression. To minimize the possibility of this type of complication going unnoticed, the patient's radial and brachial pulse should be palpated before and after the reduction of the glenohumeral joint; in case of alteration, investigation for arterial injury should be conducted using non-invasive imaging examinations such as

Doppler ultrasound of the upper limb. No way to avoid the formation of vascular injury during closed reduction of the dislocation have been found; however, diagnosis should be early in order to minimize the complications from the compression that the pseudoaneurysm exerts on nearby structures.

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### Conflicts of interest

The authors declare no conflicts of interest.

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