Fratura Traumática da Apófise Coracoide e do Colo da Omoplata em Atleta de Rugby

Traumatic Fracture of the Coracoid Process and the Neck of the Scapula in a Rugby Athlete: A Case Report

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Resumo

Introdução: A fratura da apófise coracoide concomitante com fratura noutra localização da omoplata raramente é descrita na literatura.

Caso Clinico: A presente descrição relata o caso de um paciente de 22 anos, sexo masculino, que apresenta uma fratura da base da apófise coracoide em associação com fratura do colo da omoplata na sequência de traumatismo de alta energia sobre o membro superior, aquando a prática desportiva de *rugby.* Neste contexto, foi submetido a procedimento cirúrgico, que consistiu em redução aberta e colocação de material de osteossíntese. Subsequentemente, na avaliação inicial de medicina física e de reabilitação, apresentava: amiotrofia muscular na região do ombro; com limitação da amplitude ativa e passiva do movimento, em todos os eixos de movimento; com dor associada ao movimento. O doente realizou tratamento de reabilitação visando a correção do ritmo escapulotorácico, recuperação da força muscular e recuperação funcional, com bons resultados.

Conclusão: Os autores destacam a importância do diagnóstico precoce e o papel da reabilitação na recuperação clínica e funcional do atleta.

Palavras-chave: Articulação do Ombro/reabilitação; Escápula/lesões; Traumatismos em Atletas.

Abstract

Introduction: *The fracture of the coracoid process associated with a fracture in another location of the scapula is rarely described in the literature.*

Case Report: *The authors present a case report of a 22-year-old male patient that suffered a fracture of the coracoid process with concurrently neck scapular fracture, in the context of a high-energy trauma of the upper limb during a rugby match. He was submitted to a surgical procedure that consisted in open reduction and placement of osteosynthesis material. Subsequently, in the initial assessment of physical medicine and rehabilitation (PMR), he showed: muscle amyotrophy in the shoulder region; active range of movement (aROM) and passive range of movement (pROM) limitation, in all axes of movement; and pain associated with movement. The patient underwent rehabilitation treatment aimed at correcting the scapulothoracic rhythm, recovering muscle strength and functional recovery, with good results.*

Conclusion: *The authors highlight the importance of early diagnosis and the role of rehabilitation in the athlete's clinical and functional recovery.*

Keywords: *Athletic Injuries; Scapula/injuries; Shoulder Joint/rehabilitation.*

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Introduction

The coracoid process, often referred as the “lighthouse of the shoulder”, is a small hook- like structure on the lateral edge of the superior anterior portion of the scapula. The coracoid process is palpable in the deltopectoral groove between the deltoid and pectoralis major muscles. Together with the acromion, the coracoid process serves to stabilize the shoulder joint.[1]

Its anatomical position, in proximity to major neurovascular structures such as the brachial plexus and the axillary artery and vein, makes it a landmark for other important structures in the shoulder, namely in guiding surgical approaches.[2] The coracoid is the structure of many tendinous and ligamentous attachments, including the tendons of the pectoralis minor, coracobrachialis, and short head of the biceps brachii muscles, and the coracoclavicular, coracohumeral, coracoacromial, and transverse scapular ligaments.[3] Therefore, it is no surprise that the coracoid process and its associated structures are linked to numerous shoulder pathologic conditions.

Fractures of the scapula represent about 3%-5% of all scapular girdle fractures and about 0.7% of all fractures,[4] but isolated fractures of the coracoid process are uncommon, representing 8% of all scapular fractures.[5,6] In fact, fractures of the coracoid process are usually seen in association with other scapula or shoulder fractures.[5]

This report describes a clinical case of a coracoid process fracture, associated with a scapula fracture.

Case Report

A 22-year-old male professional rugby athlete, with no relevant personal and family medical history, was observed in a PMR consultation for a postoperative evaluation of a 6-week right coracoid base fracture associated with an ipsilateral scapular neck fracture.

He suffered a high impact trauma in a rugby match, after being tackled by an opponent player, which clashed his knee against the anterior part of the shoulder. The patient described that he adopted a position with the ipsilateral upper extremity adducted against the body and protected from movement. The emergency report stated a pain intensity (in the numeric pain scale) of 4/10 in rest and 8-9/10 while moving the shoulder joint. The patient presented with swelling, ecchymosis and crepitus shoulder. The active ROM (aROM) of the shoulder was limited, namely: 40º of flexion, 30º of abduction and 20º of external rotation; internal rotation was not possible. The passive ROM (pROM) of the shoulder was 50º of flexion, 40º of abduction and 30º of external rotation; internal rotation was not possible. Either in aROM and in pROM the pain felt during the movement limited the ROM. The remaining neurologic and vascular examination was normal. Surgical treatment was proposed to the patient, which was accepted and conducted a day after the accident.

At this initial assessment the Shoulder Pain and Disability Index was 83.

After surgery, his shoulder was immobilized with a sling for five weeks (where the use of the elbow, wrist and hand was allowed).

At our observation, he showed amiotrophy of the shoulder blade stabilizer, external rotators, humeral head depressors and shoulder abductors. The aROM was 100º in the flexion, 95º in the abduction, internal rotation behind the fourth lumbar vertebra (L4) and 30º in the external rotation. Passive ROM was 120º in the flexion, 110º in the abduction, internal rotation behind the first lumbar vertebra (L1) and 50º in the external rotation. The majority of clinical tests specifically used for the shoulder showed moderate pain, namely: Jobe, Speed, Palm Up, Yergason, Gerber, Lift-off, Patte, Yocum and Hawkins- Kennedy. All segments of the upper limb performed active movements against moderate resistance except at the 90º abduction/ anterior flexion, whose strength only overcame weak resistance with associated pain and persisting tenderness over the coracoid process. Moderate pain was also reported in all degrees of active movement, even without resistance (between 3 to 5/10). Neuro-vascular examination showed no changes in the right upper limb.

Investigations

The radiologic study, consisting in a plain radiography (Fig. 1), CT (Fig. 2) and the 3D-CT reconstruction (Fig. 3) show ipsilateral complete right coracoid base fracture and longitudinal incomplete fracture of the neck of the scapula (Ideberg Classification of Glenoid Fracture type III).[7] Surgical exploration with open reduction and osteosyntethesis of the coracoid process was performed, which allowed the confirmation of the previous fracture.

Treatment

After 5 weeks of immobilization, a neuro-motor and functional rehabilitation program for the right upper limb was instituted, including shoulder joint kinesiotherapy techniques with Codman exercises and polysegmental mobilizations to the threshold of pain, such as isometric muscle strengthening exercises privileging the serratus anterior, middle and lower trapezius, rhomboid, latissimus dorsis, pectoral major, infraspinatus muscle, deltoid muscle and teres minor muscles, with a focus on functional tasks, with appropriate scapular positioning. The rehabilitation program also included massage therapy for muscle relaxation of the

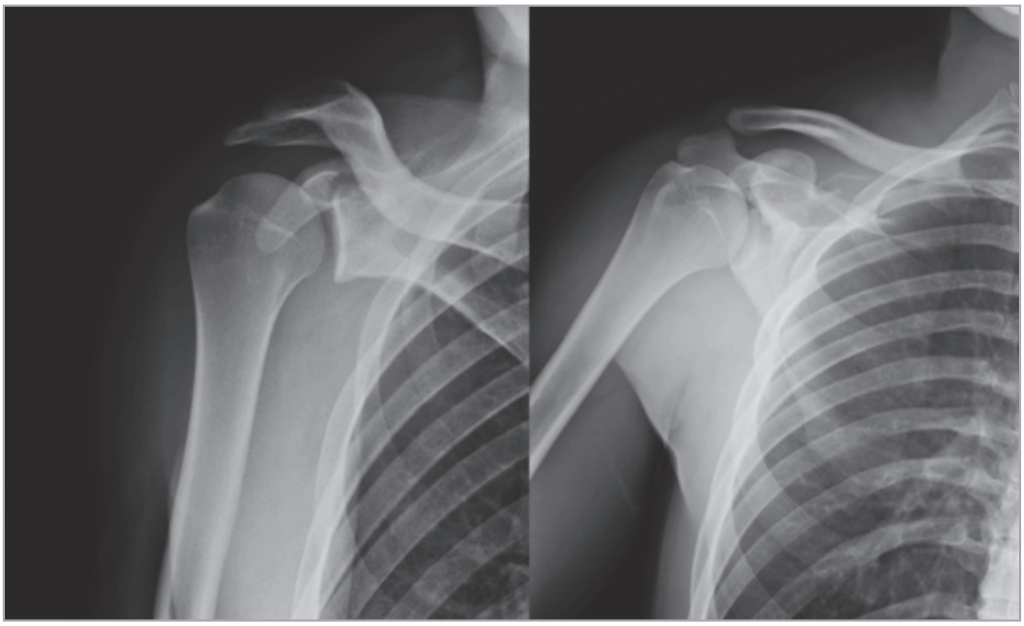

Figure 1 - Pre-surgery plain radiography of the injured shoulder.

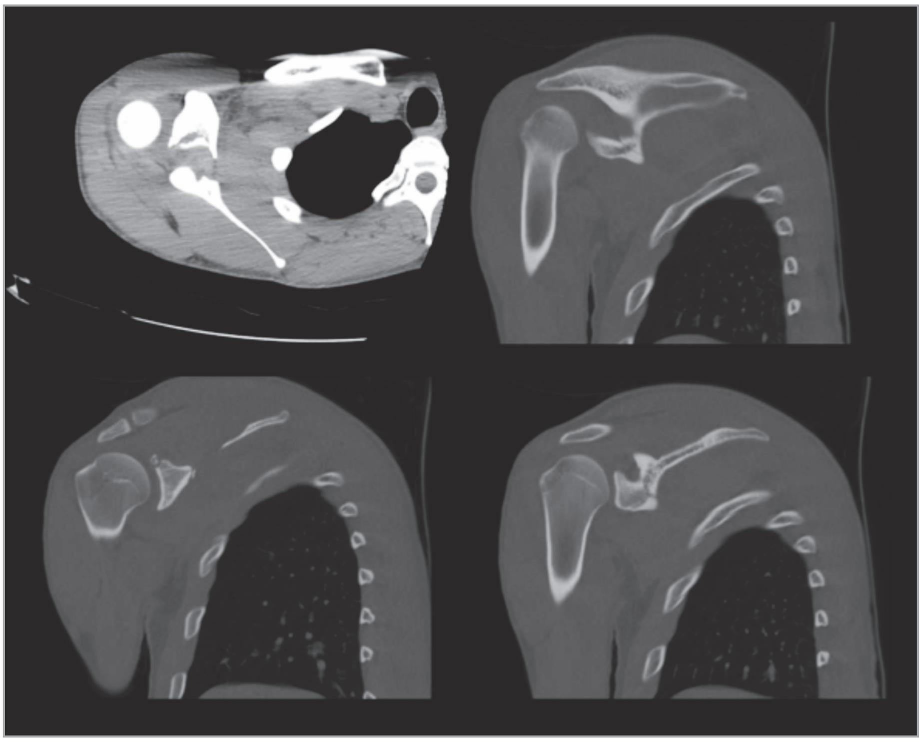

Figure 2 - Pre-surgery CT of the injured shoulder.

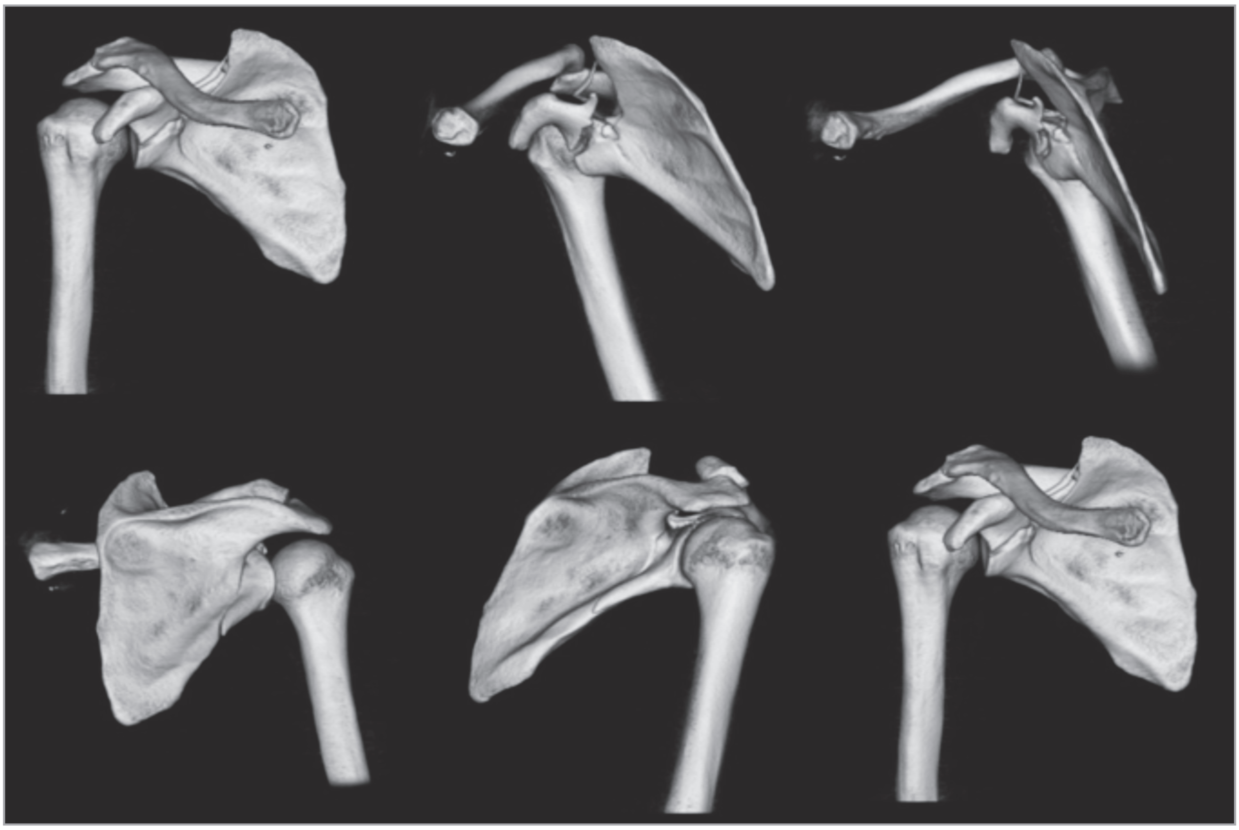

Figure 3 - Pre-surgery CT-3D reconstruction of the injured shoulder.

shoulder girdle and stretching exercises of the anterior chains.

We took precautions during muscle strengthening, namely in shoulder flexion and adduction exercises (by activation of the coracobrachialis), elbow and shoulder flexion and forearm supination (by activation of the biceps brachii) and of the shoulder blade

depression (by activation of the minor pectoralis), both with insertion in the coracoid process.

Neuro-muscular electrical stimulation was performed in posterior deltoid muscle (parameters: biphasic current, symmetrical, nonpolar, between 10-30Hz; 400 microseconds in duration; 1.6 seconds on (including 0.8 seconds ascent and 0.8 seconds as descent) + 6 seconds off; intensity capable of "visible" contraction. Duration of 15-20 minutes. Frequency: daily).

In the third week of the rehabilitation program, the gains in active and passive joint amplitudes and muscle strength were considerable. Thus, the muscle strengthening program was adjusted with the beginning of concentric and eccentric isotonic exercises of the referred muscle groups (with progression from elastic bands to free weights).

Outcome and follow-up

A favorable clinical evolution with progressive functional recovery of the right shoulder was observed since the beginning of the rehabilitation program, with an almost complete recovery of active ROM at 4 weeks of physical therapy (ten weeks after surgery), despite the fact that there was a slight asymmetry of muscle masses (Fig. 4).

The patient objectively presented 150º in the flexion and abduction, internal rotation behind the fourth lumbar vertebra (D10) and 70º in the external rotation. Passive ROM was 170º in the flexion and abduction, internal rotation behind the first lumbar vertebra (D7) and 90º in the external rotation; and without tenderness on palpation over the coracoid.

In the following weeks (11^{th}-14^{th} week after surgery) we increased the strengthening training of the same referred muscles to concentric isotonic exercises, as well as initiating proprioceptive training exercises. Finally, the patient started a "return to play program", which included field work and training to maintain specific muscle strength three times per week in the gym.

At the 9^{th} week of the rehabilitation program (15 weeks after surgery) the patient was reassessed in a PMR appointment and showed no limitations of the active ROM of the various

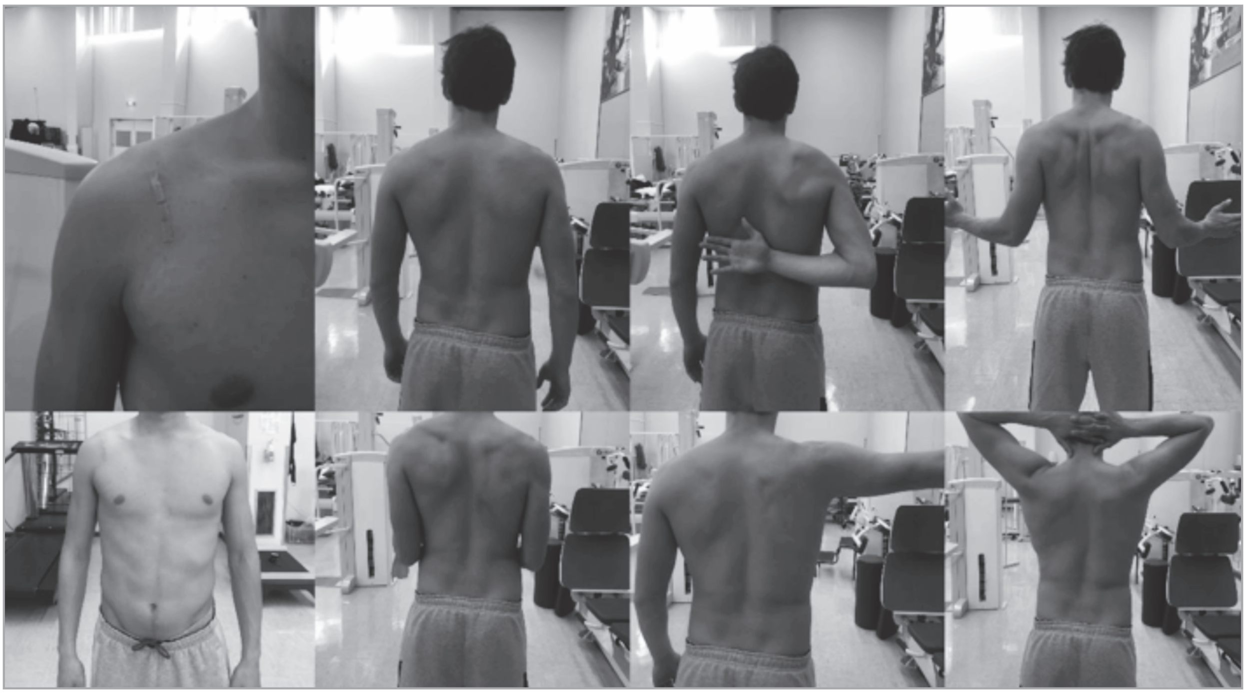

Figure 4 - Patient active ROM 10 weeks after surgery.

segments of the right shoulder and absence of amyotrophies, with the exception of the infraspinatus muscle (Fig. 5). Thus, he presented a deficit of muscle strength in the external rotation of the shoulder (against moderate resistance, MRC 4/5); all other segments presented maximum muscle strength, including the movements of the muscle groups with insertion in the coracoid process: coracobrachialis, biceps brachii and minor pectoralis.

Apparently, due to the possible vertebral scoliosis not studied, he maintained the initial posture with inclination of the trunk to the left, that could cause stretching of the latissimus dorsi muscle and asymmetry of the shoulders.

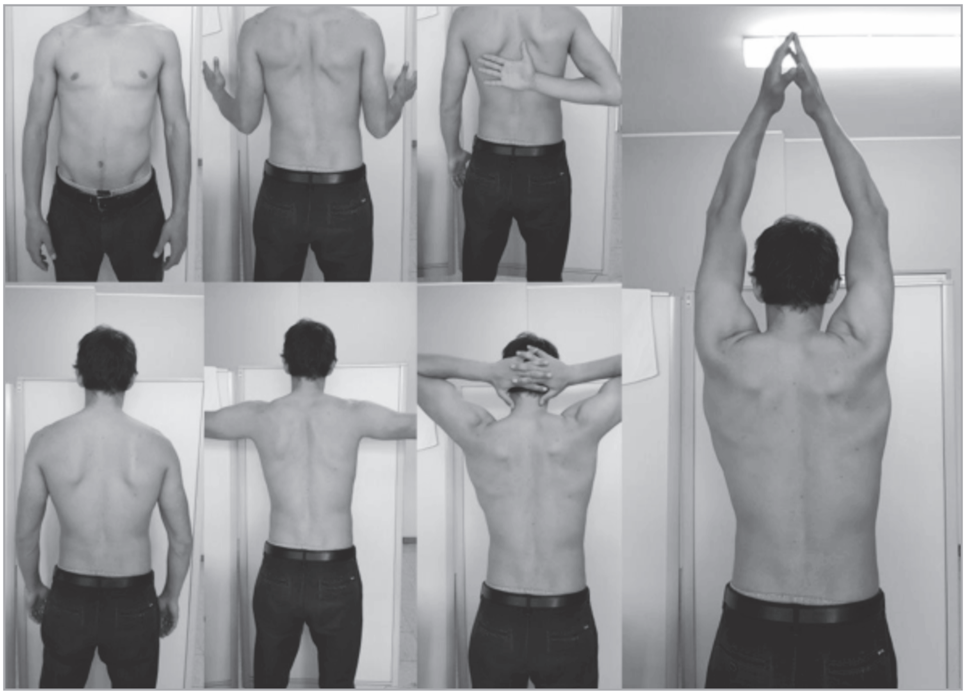

Figure 5 - Patient active ROM 15 weeks after surgery.

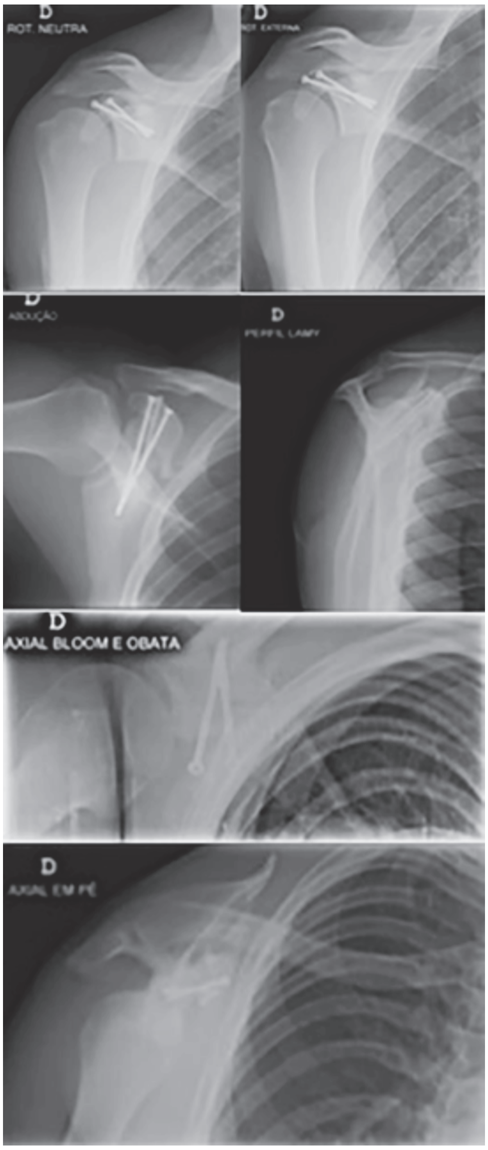

Figure 6 - Plain radiography of the injured shoulder 10 weeks after surgery.

Plain radiograph demonstrated a correct consolidation of the coracoid and scapular fracture (Fig. 6).

The presence of atrophy the infraspinatus muscle, we considered injury of the suprascapular nerve (since the suprascapular notch is in the superior border of the scapula, just medial to the base of the coracoid process) and electromyography was requested.

An electromyography was performed showing important signs of incomplete axonal and formal signs of neurogenic atrophy of the right infraspinatus muscle, suggesting a progressive recovery / re-innervation process that could be incomplete (Fig. 8).

We completed the rehabilitation program with introduction of neuro-muscular electrical stimulation in infraspinatus muscle (with the parameters used initially in posterior deltoid muscle) in order to try to optimize the prognosis of this lesion.

The athlete returned to the competition without significant repercussions on the field game, without shoulder pain or disability.

Discussion

The coracoid is an apophysis with an anterior projection on the supero-anterior part of the scapula, whose function is to stabilize the scapular girdle (through its ligaments) and to facilitate muscular action.[3]

The coraco-clavicular ligaments (conoid and trapezoid) and the coraco-acromial ligament are inserted in the upper border of the coracoid.[8] In this context, the coracoid constitutes an anchor point to the ligaments that provide stability to the clavicle (conoid and trapezoid). Thus, the traumatic mechanism that originates a coracoid process fracture generally consists of a sudden and intensive traction

Table 1 - Evolution of shoulder's range of motion during the follow-up.

	SHOULDER							
	aROM				pROM			
	Flexion	Abduction	Internal Rotation	External Rotation	Flexion	Abduction	Internal Rotation	External Rotation
Antes da Cirurgia	40	30	0	20	50	40	0	30
5 weeks after surgery	100	95	L4	30	120	110	L1	50
10 weeks after surgery	150	150	D10	70	170	170	D7	90
15 weeks after surgery	180	180	D7	90				

Músculo (Inervação)	Interpretação	Fib	PSW	Voluntary act. Amp	Dur	Poli	IP	Recruit
Dir Infraspinatus (Supracapularis, C5 c6)	Pron subac Neur	6/10	6/10	-	+	+	---	Tarde

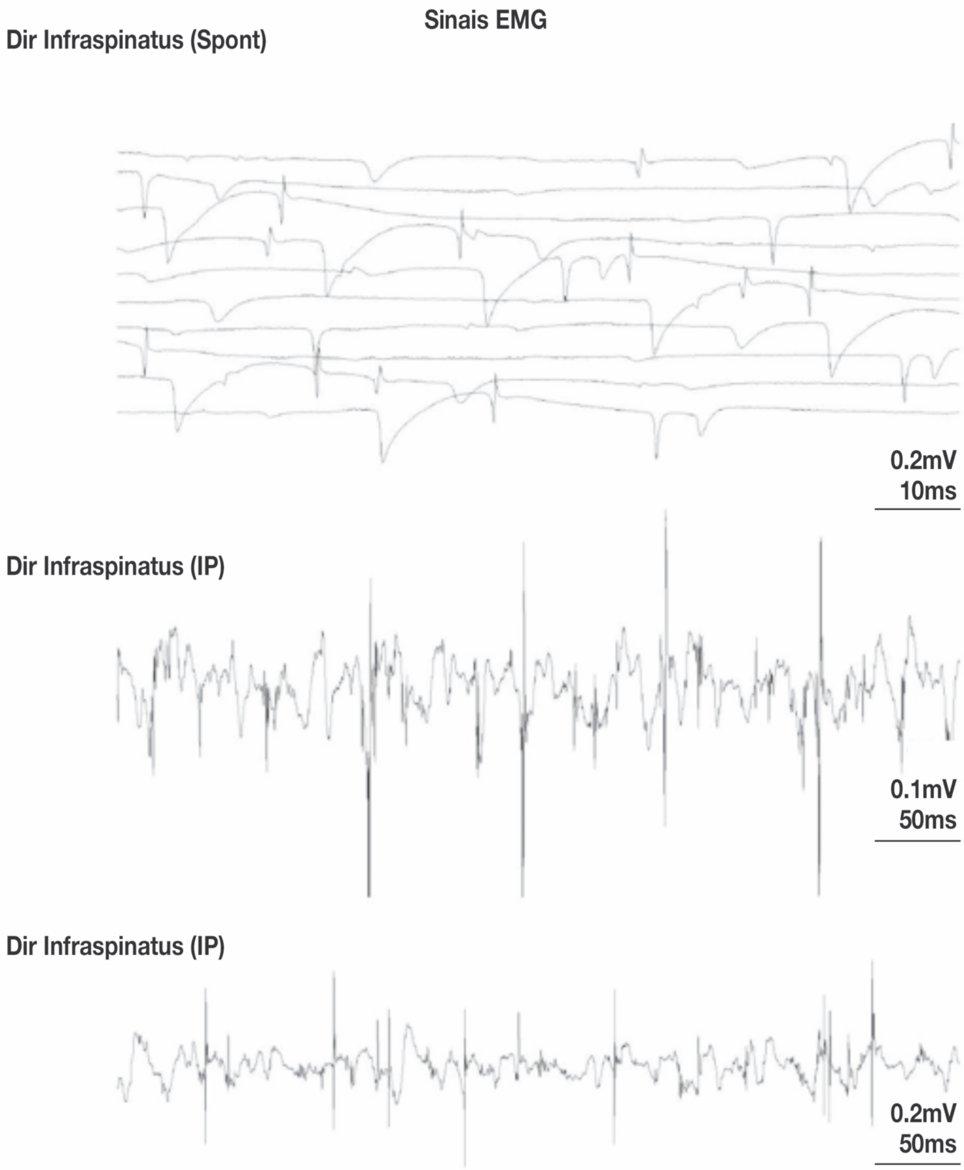

Figure 8 - Electromyography study of the injured shoulder 15 weeks after surgery.

exerted by combined force of conjoined tendons and the pectoralis minor muscles.[9] Due to the protection offered by the clavicle, the direct trauma of the coracoid process is a rare injury mechanism, which explains why the case presented here is so unusual.[10] Stability at the acromioclavicular joint and coraclavicular and corocoacromial ligament complex is maintained by static and dynamic stabilizers. The acromioclavicular joint capsule and the acromioclavicular, coracoclavicular, and coracoacromial ligaments provide static stability, whereas the deltoid and trapezius muscles function as dynamic stabilizers.[11] Besides contributing to stabilize the movement at the acromioclavicular joint, the coracoid process also serves as fixation to the short head of the brachial and the coracobrachial bicep tendons (that together form a joint tendon, at the lateral edge) and gives fixation to the pectoralis minor muscle (at the medial edge).

In the case described the patient showed also a fracture of the neck of the scapula. When isolated, the neck of the scapula does not produce instability of the glenoumeral joint.[12] Nonetheless, the disruption of the coracoacromial and acromioclavicular ligaments or the coracoacromial and coracoclavicular ligaments can lead to glenoumeral instability, altering the length of the rotator cuff muscles during certain phases of movement.[12]

Although the diagnosis is usually made by radiography (with better results in axial views) or CT, along with three dimensional reconstructions, for a better characterization of the lesion and evaluation of the bone fragments deviation, it is also possible to diagnose by ultrasound or MRI.[13,14] It is important to point out that a neurological injury, such as compression of the brachial plexus or lesion of the suprascapular nerve, is possible in fractures of the coracoid process; in these cases electromyography evaluation is recommended.[13,14]

Most of these fractures are treated in a conservative way.[15] In fact, studies advise that surgical treatment should be an option in the absence of consolidation, misalignment of the fracture edges or when the edges are separated more than 1 cm, concomitant fracture of the ipsilateral scapula (as presented in this case) or the presence of serious injuries of the upper shoulder suspension complex (double or major disruptions).[16]

Various forms of surgical treatment are described, whereas the most consensual is the open reduction of the coracoid fracture and its fixation with a screw with or without an associated acromio-clavicular transfixation.[9,16]

This case report illustrates that even though coracoid process fractures are rare, a significant functional limitation of the shoulder may result from this injury. Rehabilitation treatment can have a positive impact on the functional recovery.

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