Conflicts Around the Shoulder and the Importance of Dynamic Balances: Current Concepts

Conflitos à Volta do Ombro e a Importância dos Equilíbrios Dinâmicos: Conceitos Atuais

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Within the orthopedic community linked to the treatment of shoulder pathology, there has been a great deal of evolution in the concepts that try to explain the genesis of pain and, consequently, of injuries around this joint.

The change is related to the understanding that everything is dynamic, everything is the result of balances (or the lack thereof) in the kinetic chains that control and move joints, protecting or damaging the structures that surround them.

For example, those who did their residency more than 20 years ago learned that traditionally two theories explain the occurrence of rotator cuff tears: the vascular theory, which is based on demonstrating the existence of a less vascularized zone in the supraspinatus tendon, called Codman's ischemic ring, which would therefore be more susceptible to injury; the second, called the mechanical theory is based on the theories of subacromial conflict, described by Neer, and the identification of convergent forms of the acromion (classified as type III) which, according to Bigliani, would predispose to this conflict.[1]

This explains why degenerative ruptures occur predominantly on the bursal side of the rotator cuff, due to continued contact with the surface of the acromion, unlike traumatic injuries in younger people, generally affect the articular side.

However, in 1993, Burkhart described the suspension bridge theory, in which he emphasized the importance of the muscular balance between the intact forces of the

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subscapularis anteriorly and the infraspinatus posteriorly. This dynamic balance explains the fact that, even in the presence of an extensive rupture of the supraspinatus, if the integrity of the anterior and posterior cables that make up this "bridge" is maintained, the shoulder joint can maintain a good range of movement, without ascending the humeral head and therefore remain functionally active.[2,3]

From a biomechanical point of view, the rotator cuff therefore acts as a functional unit which, through the synergy of its component muscles, centralizes the humeral head in relation to the glenoid surface.

Many authors, including ourselves, have focused their research on the study of cause-effect relationships that explain the most prevalent conflicts in the shoulder, based on anatomical alterations.

As an example, on the subject of subacromial impingement, we investigated the possible correlation between the critical angle (CSA) described by Moor, usually associated with the existence of shoulder blade tears and shoulder osteoarthritis, with the extension and retraction of supraspinatus tears.[4] We carried out a retrospective study of this parameter in a series of 50 patients who underwent rotator cuff repairs at CHUSJ and the results confirmed that higher values of this angle are associated with more extensive ruptures, although not necessarily with greater retraction of the injured tendon.[5]

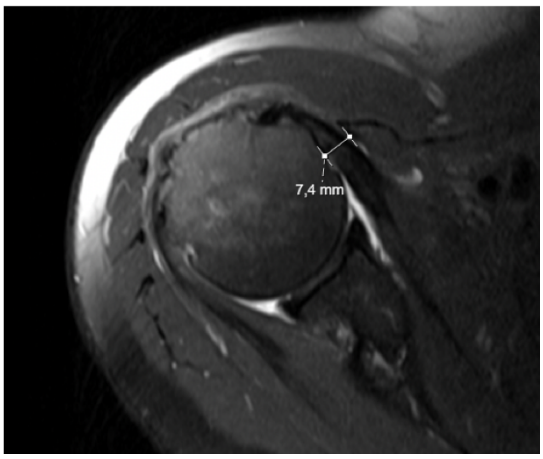

Figure 1. Evaluation of the distance between the humeral head and the coracoid in cross-sectional magnetic resonance imaging (MRI) of the shoulder with subscapular tendinopathy

Other colleagues from our unit, concerning the sub coracoid conflict, carried out a systematic review with meta-analysis, trying to find the existence of a relationship between variations in the coraco humeral distance and the overlapping of the coracoid, with the occurrence of subscapularis injuries, having found, in most of the studies analyzed, a positive correlation, especially with a decrease in the first measurement. They also studied coracoid morphology and confirmed the correlation with subscapularis lesions. Knowing this makes it possible to orient the treatment of sub coracoid conflict towards the implementation of exercises that alter the muscle balance, internal/external rotators, to promote a reduction in the internal version of the humeral head. On the other hand, the indications for performing a coracoplasty, as a procedure associated with repairing subscapular tears, could be questioned[6-9]

As for internal impingement it is described, in throwing athletes, as a result of repeated efforts in extreme abduction and external rotation. It has been a much-discussed topic in the literature, always related to "overuse" injuries of the athlete's shoulder, and also appears frequently in our clinical practice of sports traumatology. Its diagnosis requires special care in evaluating the complaints that arise when preparing the throwing motion, in the clinical examination in which a limitation of internal rotation is found, and only complementarily in the interpretation of magnetic resonance imaging (MRI) or arthro-MRI images.

Once again, this demonstrates the importance of knowledge of joint biomechanics in the genesis, pathophysiology, and, consequently, in the therapeutic approach, in this case for rotator cuff injuries found in athletes in certain sports.[10]

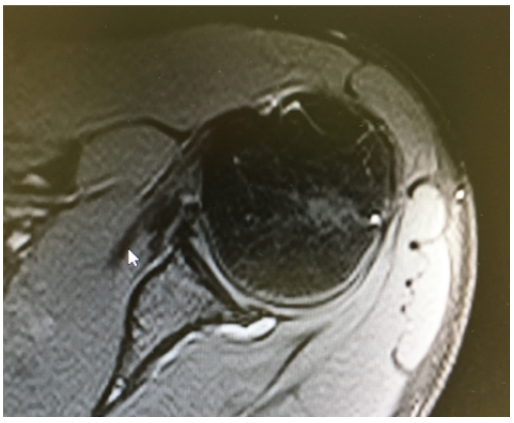

Figure 2. Edema and posterior bone cyst of the humeral head + posterior labral tear with paralabral cyst on shoulder MRI with internal conflict

Conflicts secondary to scapulothoracic dyskinesia, although underdiagnosed, are often the cause of bursitis, snapping shoulder, and rotator cuff injuries, and can appear in healthy individuals, although more frequently in overhead sports athletes. Knowing this, we wanted to study this cause-effect relationship and carried out a literature review in which we

defined the types of dyskinesia, described their most frequent causes, and, among these, the role that dyskinesia may play in periarticular conflicts and the possible evolution to rotator cuff tendon rupture. We have seen how important it is to redefine treatment strategies that include rehabilitation programs with a special focus on repositioning the scapula and normalizing the rhythm of mobility.[11-13]

To this end, training posture and strengthening the stabilizers of the scapula is key to achieving normal function of the entire upper limb. This training involves strengthening the upper/lower trapezius and anterior serratus, as well as stretching the pectoralis minor and internal rotators, counteracting the anteverted posture of the scapular girdles (rounded shoulders) and anterior inclination of the humeral head that often affects patients with rotator cuff pathology. The action of the lower trapezius is particularly important in controlling the elevation and anterior mobilization of the scapula, so strengthening it is essential for controlling symptoms.

The proprioception and neuromuscular control of the various por rotator cuff muscles are also important, as the agonist/antagonist synergistic effect plays a stabilizing and centralizing role for the humeral head, compressing it against the glenoid cavity, counteracting the sliding forces exerted by the deltoid, thus optimizing its function. This voluntary dynamic stabilization is achieved through constant neuromuscular control of the afferent and efferent impulses of the proprioceptive pathways, which generate the joint's sense of position.[14,15]

In conclusion, to diagnose most shoulder pain, it is essential to know the synergies of the dozens of muscles that act on this joint, as well as the biomechanics of the shoulder girdle and the intra-articular micro-movements of translation, which can cause inflammation, wear and tear and eventually ruptures secondary to repeated micro-trauma.

Only in this way will we be able to treat pain conditions that are sometimes unclear and which, in the light of current literature, we know are the result of dynamic alterations.

This dynamic view of shoulder pathology makes it possible to:

- Place clinical examination at the center of the diagnostic process.
- Avoid unnecessary infiltrations, whether cortisone or growth factors.
- Emphasize the need to individualize rehabilitation programs.
- Reserve surgery for structural lesions that are refractory to conservative treatments.
- Adopt a prophylactic attitude rather than merely treating sequelae.

Responsabilidades Éticas

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