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ORIGINAL ARTICLE

Boxer's elbow: internal impingement of the coronoid and olecranon process. A report of seven cases

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Background: Boxer's elbow has been described in the literature as an extension and hyperextension injury. However, in our experience, there is a coexisting impingement lesion in the anterior compartment of the elbow that has not previously been described. We report a series of professional boxers with elbow disease treated arthroscopically. The aim of the paper was to accurately describe the pathoanatomy of the condition, the key points in its diagnosis, and the outcomes of surgical treatment.

Methods: Seven professional boxers were treated for symptomatic elbow disease. Clinical evaluation included range of motion and Disabilities of the Arm, Shoulder, and Hand score. The arthroscopic findings and procedures were documented.

Results: Symptoms were mainly those of anterior and posterior impingement; 6 elbows had an anterior impingement lesion and 6 had a posterior impingement lesion. Postoperatively, the mean Disabilities of the Arm, Shoulder, and Hand score was 2.7 (range, 0-13.3) at a median of 15 (range, 6-36) months postoperatively. All boxers returned to their previous level of competition and 5 won their next bout. All of the boxers used an orthodox stance, and in all but 1 case the left elbow was the pathologic elbow.

Conclusion: Boxers are prone to development of anterior and posterior elbow impingement. The side of the pathologic process is related to the boxer's stance, with the lead arm being more vulnerable. Arthroscopic débridement is an effective treatment, enabling return to a high competitive level. Surgeons, sports medicine physicians, and physiotherapists should be aware of the condition.

Level of evidence: Level IV; Case Series; Treatment Study

Keywords: Boxer's elbow; elbow; boxing; arthroscopy; sport; impingement

Upper limb injuries are common among boxers, and these injuries represent a major disruption to training and competition.[3,6,10] Elbow problems have a low incidence of 3.6%,[7] 1.1%,[1] and 3.1%[6] of all body injuries but account for a significant time out of boxing,[3] and very little is written about the diagnosis and management. The condition known as boxer's elbow has previously been described in the sports

The study took place at Wrightington Hospital, Appley Bridge, Wigan, Lancashire, UK.

Ethics committee approval was not required. All patients gave consent to have prospective follow-up after surgery and for their arthroscopic images, clinical scores, and demographic data to be included in this study.

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medicine literature as an extension and hyperextension injury of the elbow, resulting in pain and extension deficit.[2,8] However, nothing is written about the coexisting hyperflexion lesion observed in these patients. In this paper, we describe the condition boxer's elbow and its pathoanatomy, diagnosis, and arthroscopic management; we present a case report of 7 professional boxers treated by arthroscopic débridement.

Materials and methods

Clinical findings

Mechanism of injury

The mechanism of posterolateral impingement is repetitive trauma from forced hyperextension of the elbow with a pronated forearm while throwing a punch. It is hypothesized that during a missed punch, the elbow joint sustains hyperextension trauma, straining its bone stabilizers more than the surrounding soft tissues.[9] Forced hyperextension causes microtrauma, resulting in chondromalacia and subsequent hypertrophic spur and osteophyte formation. Mechanical abutment of bone and soft tissues in the olecranon fossa leads to osteophyte formation, which is also closely associated with loose bodies. This repetitive elbow hyperextension injury is common in handball goalkeepers, gymnasts, and weightlifters.[4,5]

It is hypothesized that anterior impingement in boxers is a result of the repetitive forced flexion of the elbow that occurs during "clinch" or push-off maneuvers. The body weight of the opponent against the arms held in a flexed guard can lead to anterior hyperflexion impingement. Forced hyperflexion may also occur when defending a punch. The glove or forearm is struck with force while the elbow is in a flexed guard position. The forearm may be either pronated or supinated. The elbow can be forced into further flexion, causing anterior impingement of the coronoid in the coronoid fossa of the humerus.

History

In posterior impingement, boxers complain of an acute onset of elbow or arm pain after a missed punch. This pain can be so acute and severe that it renders the arm useless momentarily, and boxers may complain of the arm "going dead." The pain of posterior impingement is felt dorsally and may be accompanied by swelling. Repeated injuries present with the same symptoms, leading to the chronic condition. In the chronic phase, there is posterior elbow pain, stiffness, and loss of extension. This leads to an inability to train and to compete.

In anterior impingement, the boxer complains of a severe anterior elbow or forearm pain, particularly with forced flexion. This occurs during close quarters fighting or when pushing off from a clinch. Similar to posterior impingement, the boxer can complain of the arm "going dead" with a momentary loss of function. Loss of flexion may also be noted by the patient.

Loose bodies associated with the degenerative joint changes may lead to episodes of "locking" or mechanical symptoms that may or may not be painful. Mechanical symptoms include clicking, catching, and sticking (locking) of the elbow in certain positions. The patient may need to maneuver the elbow into certain positions to "unlock" it and resume elbow motion.

The patient may also complain of the arm "going dead" after an episode of forced flexion or after a missed punch leading to forced hyperextension.

Examination

Examination may reveal posterolateral joint line tenderness to palpation; there may also be swelling and an effusion in the acute or chronic stages. However, there may be no areas of tenderness. There is a restriction of both active and passive flexion and extension. Forced passive flexion and extension at the end of range are painful. Pronation and supination are not usually affected.

Radiologic findings

Radiography

The anteroposterior view shows osteophytes at the posterolateral olecranon and corresponding olecranon fossa. Osteophytes may also be appreciated at the coronoid tip. The joint space is preserved.

The lateral view may show osteophytes at the tip of both the olecranon and coronoid. There may also be reciprocal osteophytes in the olecranon and coronoid fossae.

Computed tomography and magnetic resonance imaging

Osteophytes are seen at the posterolateral tip of the olecranon and the corresponding part of the olecranon fossa. These will also be seen at the coronoid tip and in the coronoid fossa. Loose bodies may be seen and are best diagnosed by magnetic resonance imaging (MRI) or computed tomography arthrography.

MRI will also highlight areas of synovial thickening and synovitis, particularly in the olecranon fossa and coronoid fossa.

MRI allows evaluation of the biceps and triceps tendons as well as the collateral ligaments. Both computed tomography and MRI arthrography will enable evaluation for chondral injury. Bone edema will be best seen on MRI.

Figure 1 demonstrates an osteophyte at the tip of the coronoid in the anterior compartment. In the posterior compartment, a loose

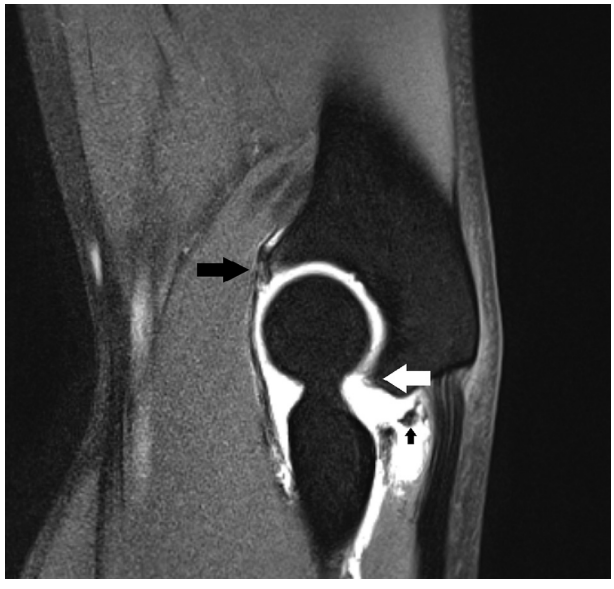

Figure 1 Magnetic resonance arthrography demonstrating an osteophyte at the tip of the coronoid in the anterior compartment (*large black arrow*). In the posterior compartment, a loose body can be seen (*small black arrow*), and there is an impingement lesion at the tip of the olecranon (*white arrow*).