

# ELBOW ARTHROSCOPY FOR OSTEOCHONDRAL LESIONS IN ATHLETES

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Several sports specific injuries of the elbow have been well-described. For example, the prevalence of medial elbow instability is high in throwing athletes such as baseball players. Similarly, javelin throwers, volleyball players and tennis players are frequently complaining about elbow pain. This can be the result of intensive training or chronic overuse which results in an acute or chronic injury. Some of these injuries can be osteochondral lesions such as osteochondral defects, osteochondrosis of the capitulum humeri or osteochondritis dissecans (OCD).

## OSTEOCHONDRAL DEFECT

### *Definition and symptoms*

Osteochondral defect is a detachment of bone and cartilage in a joint that can cause pain. The clinical presentation is characterised by an acute or chronic onset of symptoms. The majority of patients with osteochondral defects of the elbow complain of pain. In some patients the defect is associated with a loose body, and the patient presents clinically with pain, giving way, swelling, catching, clicking, crepitus and elbow stiffness aggravated by joint movements. Standard X-rays are the initial studies of choice, but sometimes are negative. Magnetic resonance imaging (MRI) and 3D computed tomography (CT) scan can be extremely useful in establishing an accurate diagnosis and to add in pre-operative planning.



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OSTEOCHONDROSIS OF CAPITULUM HUMERI (PANNER'S DISEASE)

*Definition and symptoms*

Panner's disease, an osteochondrosis of the capitulum, is a rare disorder that usually affects the dominant elbow in individuals younger than 10 years old. Osteochondrosis of the capitulum humeri is a growth nuclei disease that begins as a degeneration or necrosis, followed by regeneration or recalcification. Most patients demonstrate good long-term results. X-rays denote fragmentation (not collapse) and alteration of the conformation of the capitulum humeri<sup>1</sup>. The aetiology is probably an over-compression injury along the lateral part of the elbow joint. It usually affects young athletes (between 7 and 12 years old) who participate in throwing sports and gymnastics during the period of ossification of the capitulum humeri epiphysis.



**Above:** Javelin throwers and volleyball players frequently complain about elbow pain.

The onset is characterised by a dull and continuous pain in the affected elbow, which usually worsens with movement or use. On clinical examination an extension deficit of 5 to 20 degrees can be constated. There may also be swelling and tenderness in the lateral compartment. Symptomatic management of Panner's disease consists of reduction of stressful activities and there is usually spontaneous resolution without recurrent episodes.

#### OSTEOCHONDRITIS DISSECANS

##### *Definition and symptoms*

Capitellar osteochondritis is defined as an inflammation of both bone and cartilage. Osteochondritis dissecans of the elbow is a localised disorder of the articular surface that is commonly seen in young athletes (aged between 10 and 15 years) and typically affects the capitulum humeri.

Osteochondritis dissecans of the capitulum humeri is characterised by a localised avascular necrosis of the subchondral bone and consequent loss of structural support for the adjacent articular cartilage. This form should be distinguished from osteochondrosis of the capitulum humeri (Panner's disease) as the osteochondritis dissecans appears after the complete ossification of the capitulum humeri. It does not always have a positive evolution, since a residual alteration of the capitulum humeri conformation persists.

The area of osteochondritis, formed by the joint cartilage and the subchondral bone either remains in situ and heals or it detaches from the capitulum humeri and forms intra-articular loose bodies. Pain in the elbow is the most common complaint and usually worsens with movement of the joint. Tenderness along the radiocapitellar joint occurs in 80 to 90% of patients. Swelling of the joint is also present. On clinical examination, there is limited range of motion, particularly a deficit of extension between 5 to 20 degrees (90% of patients). Active radiocapitellar test is positive. The appearance of an articular locking of the



**Figure 1:** X-ray showing chondral defect in the capitulum humery and loose bodies in the olecranon fossa.

elbow in the late stages of the disease usually represents a detachment of bone or cartilage fragments.

Antero posterior (AP), lateral and oblique radiographs of the elbow should be obtained in all patients. In the early stages of the disease, radiographs may be negative or highlight only radiolucencies and localised bone rarefactions. In more advanced stages, intra-articular loose bodies and irregularities of the capitellum humeri are described. MRI and CT are useful to better define the extent of the lesion and identify a subchondral bone sufferance. MRI is also helpful to provide definitive diagnosis in the early stage of the disease. Low signal changes in the superficial aspects of the capitellum on T1 images (T2 images may be normal) are the earliest changes on the MRI.

#### AETIOLOGY OF OSTEOCHONDRITIS DISSECANS

The exact cause of the capitellar osteochondritis in adolescents is unknown. There are three possible causes of OCD: ischaemia, trauma and genetic predisposition. The capitellar epiphysis has a tenuous blood supply consisting of

two vessels which enter posteriorly and transverse the cartilaginous capitellum. It was also shown by Schenck that capitellar articular cartilage is significantly softer than that of radial head which may be a contributor to the development of OCD. Some authors support the genetic cause of OCD given that it is more likely to develop in certain families. The condition often occurs among relatives and it is sometimes seen in several generations of the same family. Regarding the hypothesis of an ischaemic aetiology, the initial histological findings of the bone is an avascular necrosis due to ischaemic insult.

#### LOOSE BODIES

An intra-articular loose body is a chondral or osteochondral fragment that can be due to a number of reasons. The body can adhere to the synovial membrane by fibrous tissue. These are referred to as 'pedunculated loose bodies'. Loose bodies are typically found in association with articular disorders of a degenerative or rheumatological basis. A loose body can grow in size by the proliferation of chondroblasts and osteoblasts or may decrease in size



due to the effects of chondroclasts and osteoclasts. If the loose body is small they can reach up to 50 in number, while larger ones (greater than 2 cm in size) usually do not exceed 10 in number. The presence of a loose body in the joint can present with a variety of symptoms including pain, swelling, limited range of motion, clicking sensation or crepitus. The symptoms may resolve if the body adheres to the synovial lining of the joint, thereby reducing the irritation of the joint.

A systematic evaluation of the elbow including inspection, palpation and range of motion testing may reveal the presence of swelling, restricted motion or a palpable body. In addition, a well-performed history and physical examination can exclude extra-articular bodies that may simulate intra-articular disease.

Elbow pain can be caused by a variety of osseous or soft tissue abnormalities and the causes of intra-articular osteocartilaginous bodies are numerous. Standard radiographs of the elbow are the initial imaging study of choice. The standard views are the AP and lateral views. Ossified intra-articular bodies are seen as radiopaque densities. However,

cartilaginous loose bodies are not visible on standard radiographs.

In addition, radiography is less sensitive in detection of loose bodies in the posterior compartment. CT of the elbow (including 3-D reconstructions) can be helpful and more sensitive in detection of intra-articular bodies. MRI, especially with osteochondritis dissecans and early stages of synovial chondromatosis, has proven reliable when correlated with effective arthroscopic findings.

No matter what imaging technique is used (X-ray, CT or MRI) careful evaluation should be taken to identify the origin and location of the loose body.

#### AETIOLOGY

Intra-articular loose bodies can be the result of a single acute trauma resulting in a chondral or osteochondral lesion. Individuals who engage in sports with high risk of direct acute high energy trauma include snowboarders, bikers and rugby players. Alternatively, repetitive microtrauma or chronic osteochondral trauma can be the cause. Sports such as weightlifting, gymnastics, baseball and

javelin expose the athletes to chronic repetitive stress and risk of developing loose bodies in the elbow.

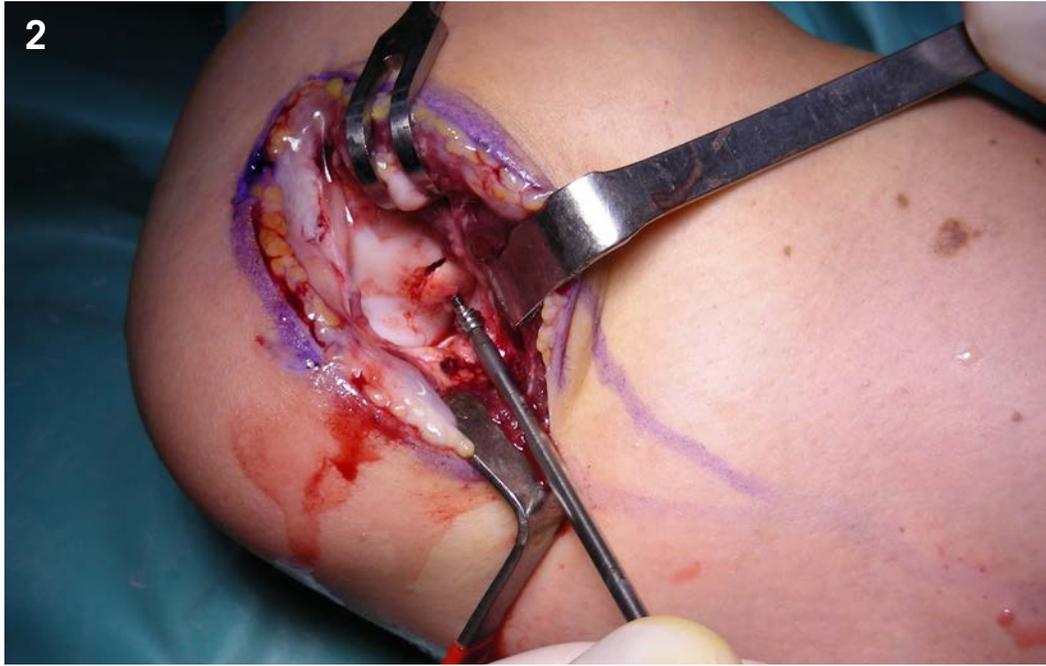
Other causes include osteoarthritis, rheumatoid arthritis, primary synovial chondromatosis or neuropathic joint. In primary synovial chondromatosis, there is benign cartilaginous metaplasia arising from the synovial membrane. Histologically, the synovial membrane has numerous lobules of cartilage tissue with high cellularity, atypia and nuclear polymorphism with mitosis that can be mistaken for chondrosarcoma. This is a benign lesion (rarely undergoes malignant degeneration) that can recur locally and therefore the appropriate treatment is surgical excision of the synovial membrane. Secondary synovial chondromatosis is a disorder that results in intra-articular loose bodies as a result of trauma, osteoarthritis or neuropathic arthropathy. Secondary osteochondromatosis is typically associated with more prominent changes of the underlying degenerative disease of the joint and the intra-articular bodies tend to be larger and less numerous than in primary synovial chondromatosis.

Surgically, it is necessary to explore both the anterior and posterior compartments as well as the posterolateral recess. It is important for the surgeon to identify the cause of the loose bodies and treat contextually to reduce the chance of recurrence.

#### OSTEOCHONDRAL LESIONS TREATMENTS

There are still doubts about the best treatment for these injuries that require surgery. Appropriate treatment of this disorder remains controversial. Often treated with benign neglect, this condition is a potential sport-ending injury for an athlete, with long-term sequel of degenerative arthritis.

From the surgical point of view, we treat these patients as if they have degenerative stiff elbow, focusing the technique on solving the osteochondral problems. It



**Figure 2:** A Herbert screw is used to fix the bone plug. This must be done by opening the joint because the screw must be inserted perpendicular to the bone plug.

**Figure 3:** Lateral decubitus and extra rotation of the hip allows arthroscopy in elbow and knee.

is very common to find loose bodies in association with osteochondral lesions.

Elbow arthroscopy can be considered the treatment of choice for these cases when performing removal of loose bodies, synovectomy and microfracture of the defect in order to stimulate a regrowth of the bone.

#### SURGICAL TECHNIQUE

##### *Excision, drilling and refixation*

We use general and brachial plexus anaesthesia. With a patient in prone decubitus position the arthroscope is introduced into the proximal anteromedial portal that is located 2 cm proximal to the medial epicondyle and anterior to the intermuscular septum.

Firstly, we assess the anterior aspect of the capitulum. Any loose bodies are removed through the proximal anterolateral portal, placed 2 cm anterior and 1 to 2 cm proximal to the lateral epicondyle. This allows us to see the coronoid fossa that often hides loose bodies. Once completed, the inspection of the anterior compartment and removal of any loose bodies, the arthroscope is moved into the soft spot portal or direct trans-triceps portal, located 3 cm proximal to the tip of the olecranon in the midline. The arthroscope inspects the posterior, medial and lateral compartment.

The excision of loose bodies is performed by grasping forceps and by shaver instrument. Synovectomy is also carried



out by shaver. Removal of osteophytes is also allowed by shaver or scalpel. If the bone plug, in the course of OCD, is still available for a possible refixation, this can be done by open surgery using absorbable or non-absorbable screws or pins.

In the case of complete detachment of the bone plug which may become a loose body, we can perform microfractures or mosaicplasty, taking a new bone plug from the homolateral knee.

#### OSTEOCHONDRAL AUTOGRAFTING

No studies on long follow-up after microfractures of the OCD are present in literature. It seems obvious that removing some cartilage from the elbow

joint could expose to later osteoarthritis and diminished activity and sports performance level.

Based on this, we have developed our technique of osteochondral autografting from the knee to the elbow. The patient is positioned on lateral decubitus, the elbow arthroscopy is performed in lateral position, while the extrarotation of the omolateral hip allows to take a bone plug from the lateral part of the knee trochlea that is inserted, fitting the elbow defect.

This procedure can be done if the defect is in the posterior part of the humeral condyle. In other cases it can be performed by mini open arthroromy of the elbow joint. Postoperatively the elbow is immobilised



**Figure 4:** Bone plug (8 mm diameter) is taken from the knee.

**Figure 5:** The bone plug is inserted press-fitting the bone defect.

**Figure 6:** Four months follow-up MRI: perfect bone incorporation of the bone plug. MRI=magnetic resonance imaging.

for 2 weeks. The passive movements of the joint is started twice a day. The elbow joint still has to be protected for another 2 weeks with back slab. An MRI is performed at the 4 month follow-up. In all cases we found a good bone incorporation of the plug at the 4 month follow-up.

#### CONCLUSION

Technological advancement in radiologic imaging and most importantly in magnetic resonance imaging has improved our diagnostic capabilities for detecting osteochondral lesion of the elbow. Arthroscopic surgery and mini open procedures such as osteochondral autografts transfer have improved our

clinical results. Still, despite first being recognised several centuries ago, both causes and preferred strategy for osteochondral lesion of the elbow remain the subject of frequent debate.

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