THE ROLE OF MRI OF THE ELBOW IN EVALUATION OF RACQUET SPORTS RELATED INJURIES

ESSAY

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Introduction

Racquet sports are sports that implement using a handled frame with an open hoop across which a network of strings is stretched tightly. It is used for striking a ball or shuttlecock in games such as tennis, squash and badminton. Tennis, the most popular racquet sport of all time, is one of the major global sports. It is ranked as fourth most popular sport in the world after soccer, cricket and hockey with over 75 million participants worldwide. Many more follow the Grand Slams (the French Open, Wimbledon, Australian Open and the US open), Davis Cup, Fed Cup events and the Olympics that it is estimated that more than 1.2 billion people play or watch tennis every year. **(Gill, 2016) and (Pluim et al., 2007).**

Playing tennis, at no matter what level: casual or professional play, places the participant at risk of injury. A review of the literature reveals a substantial variance in injury incidence, ranging from 0.04 to 3.0 injuries per 1,000 h played. Most injuries in tennis occur in the lower extremity (31–67 %), followed by the upper extremity (20–49 %) and the trunk (3–21 %). Acute injuries tend to occur most often in the lower extremity (e.g., ankle sprain, muscle rupture), whereas gradual- onset injuries commonly affect the upper extremity or trunk (e.g., low back pain, rotator cuff tendinopathy, tennis elbow). Some factors have been shown to increase the risk of injury in tennis. Both volume of play and playing competitive tennis increase the risk. There is no evidence that age, sex, and skill level are associated with a higher risk of injury **(Groot F and Pluim B, 2015).**

Elbow pain is a frequent presenting symptom in many racquet sports' athletes, particularly those participating in overhead throwing shots, because of the high valgus forces placed on the elbow in extension. Often, acute injuries occur as a fall onto the outstretched hand or a result of direct trauma. On the other side, chronic repetitive microtrauma to joints and their supporting soft-tissue structures can result in debilitating pain that prevents return to activity. **(Bucknor et al., 2016)**

Therefore, many imaging modalities were developed and used to diagnose and help management of different elbow injuries; especially MRI which has been found particularly useful in establishing the diagnosis of a wide variety of racquet sports related injuries such as valgus

extension overload syndrome and Posterolateral rotatory instability of the elbow. MRI has been found to be the recommended imaging modality for establishing the diagnosis of specific patterns of acute and chronic osseous and soft-tissue injuries of the elbow such as injury to the ulnar collateral ligament injury as well as the most sensitive modality for diagnosing lateral epicondylosis which is considered the most common cause of elbow pain. **(Bucknor et al., 2016)**

Aim of the work

The aim of the work is to highlight the role of MRI of the elbow in the early diagnosis and follow up of acute and chronic injuries related to racquet sports' practice.

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دور التصوير بالرنين المغناطيسي لمفصل المرفق لتقييم اصاباته الناتجة عن ممارسة رياضات كرة المضرب

رسالة مقدمة كجزء متمم للحصول على درجة الماجيستير في الآشعة التشخيصية

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مقدمة

رياضات كرة المضرب هي الرياضات التي تعتمد علي استخدام مضرب مكون من مقبض لليد متصل بحلقة مفرغة تشد عليها باحكام شبكة من الخيوط، و تستخدم لضرب الكرات المطاطية أو كرات الريشة كما في العاب التنس، الاسكواش و تنس الريشة.

و تعد لعبة التنس هي أشهر لعبة كرة مضرب و الاكثر شعبية علي الاطلاق علي مر العصور، فهي تحتل المركز الرابع في تصنيف أكثر الرياضات شهرة في العالم بعد كرة القدم، الكريكيت و الهوكي بوجود أكثر من خمس و سبعون مليون ممارس حول العالم. و أخرون كثيرون يتابعون بطولاتها المختلفة وبالأخص البطولات الاربع الكبرى: بطولات الجراند سلام (وهي بطولات فرنسا المفتوحة، ويمبلدون، أستراليا المفتوحة و أمريكا المفتوحة)، كأس دايفس، كأس الاتحاد و الاولمبياد مما بجعل عدد المتابعين للتنس سنوياً أكثر من 1.2 بليون شخص.

تعرض ممارسة التنس من يمارسها لخطر الاصابة بغض النظر عن المستوي الاحترافي للممارسة. بمراجعة للاحصائيات، يتبين لنا أن كل ألف ساعة من اللعب تعرض اللاعب للاصابة بنسبة 0.04 الي 3. معظم الاصابات تصيب الطرف السفلي بنسبة 31-67 %، يليها الطرف العلوي بنسبة 20-49 %ثم الجذع بنسبة 3-21 %.

عادة ما تنتج الاصابات الحادة بالطرف السفلي كالتواء الكاحل و تمزق العضلات بينما تنتج الاصابات المزمنة بالطرف العلوي و الجذع كالام أسفل الظهر،أصابات أوتار الكفة المدورة و التهاب مفصل الكوع(أو المرفق). كما ثبت أن بعض العوامل تزيد من نسبة الاصابة مثل زمن و تنافسية اللعب بينما ان عوامل السن، المهارة و جنس اللاعب لا تأثير لها.

ألام المرفق هي أكثر الأعراض شيوعا بين رياضيي كرة المضرب، و بالأخص المؤدين لتسديدات من فوق الرأس بشكل متكرر بسبب الحمل الرؤحي الزائد علي المرفق في وضعية التمدد. الاصابات الحادة للمرفق عادة ما تحدث نتيجة اصابة مباشرة أو السقوط علي الايدي و عي ممتدة أما الاصابات المزمنة تحدث بسبب الرضح المجهري المزمن المتكرر علي المفصل و الانسجة الداعمة له مما يؤدي الي الام مبرحة تجعل الحركة صعبة و مؤلمة.

و لذلك تم تطوير وسائل تصوير متعددة لتشخيص و مساعدة علاج اصابات المرفق المختلفة. و يعد الرنين المغناطيسي أهمهم في الوقت الراهن لما له من دور في تشخبص اصابات المرفق الناتجة عن ممارسة كرة المضرب كمتلازمة التمديد الأروحي الزائد و الاختلال الخلفي الوحشي الاستداري للمرفق. الرنين المغناطيسي أصبح وسيلة التصوير الموصى بها لاثبات التشخيص في أنماط خاصة بالاصابات الحادة و المزمنة المتعلقة بأنسجة و عظام المرفق و الرباط الزندي الجانبي بالاضافة الي كونه بالغ الدقة في تشخيص أمراض و التهابات اللقيمة الوحشية و التي يعد السبب الاكثر شيوعا لالام المرفق.

الغرض من البحث

الغرض من هذا البحث هو تسليط الضوء علي دور الرنين المغناطيسي للمرفق للتشخيص المبكر و متابعة الاصابات الحادة و المزمنة الناتجة عن ممارسة رياضات كرة المضرب.

Abstract

Racquet sports are one of the most popular sports all over the globe with millions of participants and spectators with Tennis, Squash and Badminton being the most famous. Players of all ages practice these sports either in a professional or recreational way for their well-demonstrated health benefits.

Albeit being a non contact sport, racquet sports have their own risk for trauma and injury and surprisingly the rates of injury is very similar to other types of sports. Elbow injuries were found to be quite common in racquet sports and have their own characteristic mechanism of injuries.

Injured players must be thoroughly examined by a sports medicine physician whom will decide later whether to further investigate using a suitable imaging modality, proceed to treatment or refer to sports medicine surgeon.

The serve, overhead strike, forehand and backhand with or without added topspin or slice are the main strokes in racquet sports and they sustain different types of stressors on the elbow osseous and soft tissue structures like valgus and varus stresses on top of pronation & supination with flexion and extension.

The most common and specific injuries related to racquet sports are lateral epicondylosis, flexor-pronator mass injuries, valgus extension overload syndrome, osteochondral injury of the capitellum or trochlea, ulnar collateral ligament injury, medial epicondyle apophysitis and stress injury of the olecranon. Other less common injuries include olecranon and bicipitoradidal bursitis, injuries of distal biceps and triceps tendons, snapping of the medial head of triceps and others.

When examining the elbow joint, a radiologist should be wary of the high association of different injuries that may happen to different osseous and soft tissue structures in the same compartment with the ability to discriminate them. For example, in severe cases of UCL injury of the may be accompanied by flexor-pronator mass and ulnar nerve as well as medial epicondyle apophysitis in young players.

The range of injuries of the common flexor and extensor origins as well as distal biceps and triceps tendons encompasses tendinosis, partial and full thickness tears.

Ulnar and radial collateral ligaments injuries also varies from a simple sprain, partial to complete thickness tear with or without avulsion of their bony attachment and may result in

different types of joint instabilities like valgus extension overload syndrome in UCL injuries and posterolateral rotator instability in RCL injuries.

Osseous and chondral lesions that occur include medial epicondyle apophysitis, posteromedial compression, lateral radiocapitellar compression, osteochondral lesions as well as stress

Most sports medicine institutions start their investigations with conventional radiography to exclude fractures and dislocations. Computed tomography is used to assess intra-articular extension of fractures, malalignment and for postoperative follow up. Ultrasonography is used in case of suspected isolated tendon or ligament injury besides its guidance in intra-articular injection of medication.

Finally, Magnetic resonance imaging is the gold standard for routine comprehensive evaluation of elbow soft tissue and bone marrow pathologies. And due to its high resolution and capability to show different soft tissue structures, MRI gives the radiologist and the physician the insight to identify the main injury, any other associated lesion and even the etiology or the risk factors that led to the current problem. MRI also allows the follow up after treatment whether conservative or surgical.

MR arthrography is one of the best additions of MRI and used in specific situations like in case of high suspicion of subtle but clinically significant soft tissue injury especially inapparent partial ligamentous tears or in the assessment of chondral and osteochondral injuries and stability.

Keywords

MRI, ELBOW, RACKET SPORTS, VALGUS EXTENSION OVERLOAD SYNDROME

Chapter 1

Elbow Anatomy

➢ *Introduction*

The elbow is the region connecting the arm to the forearm. Its ventral aspect is called the antecubital fossa and the bony prominence at the very tip of its dorsal aspect is the olecranon process of the ulna ***(Miller, 2013).***

The elbow joint is a complex joint which provides a stable flexion and extension mechanisms combined with a wide range of rotatory movements granting a stable position for a functional hand. To fulfill all these tasks, it consists of three unique joints enclosed in a single synovial joint capsule: the radio-humeral joint (RHJ), the ulno-humeral joint (UHJ), and the proximal radio-ulnar joint (PRUJ) formed by the articulations of the distal humerus, the proximal ulna, and the radial head ***(Adolfsson, 2014).***

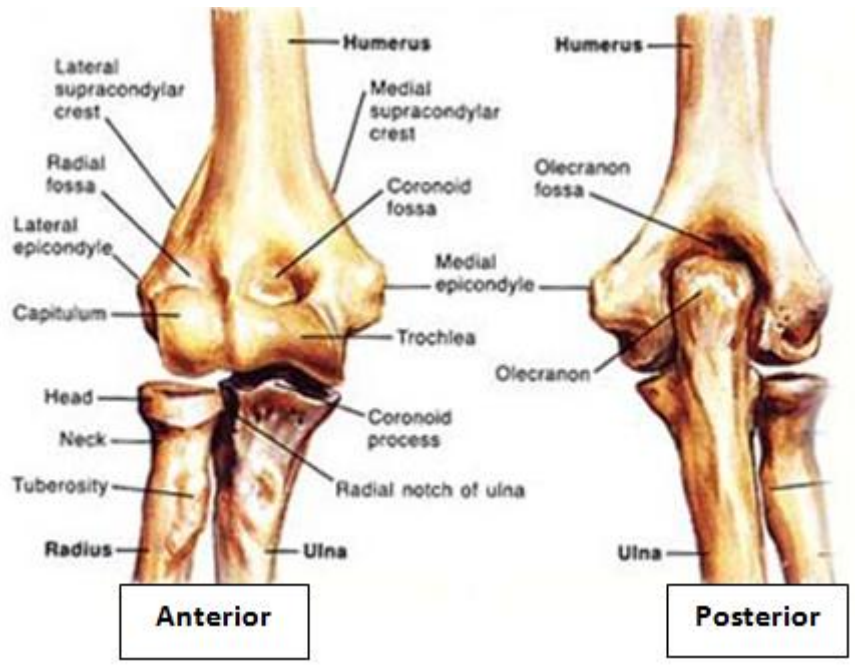

Figure1.1 The Elbow Joint
(source: http://morphopedics.wikidot.com/lateral-epicondylitis)

- ***Gross Anatomy***

Humerus

The humerus is the tubular bone of the arm that articulates proximally with the glenoid of the scapula to form the shoulder joint and distally with the ulna and radius to form the elbow joint ***(Capo et al., 2014).***

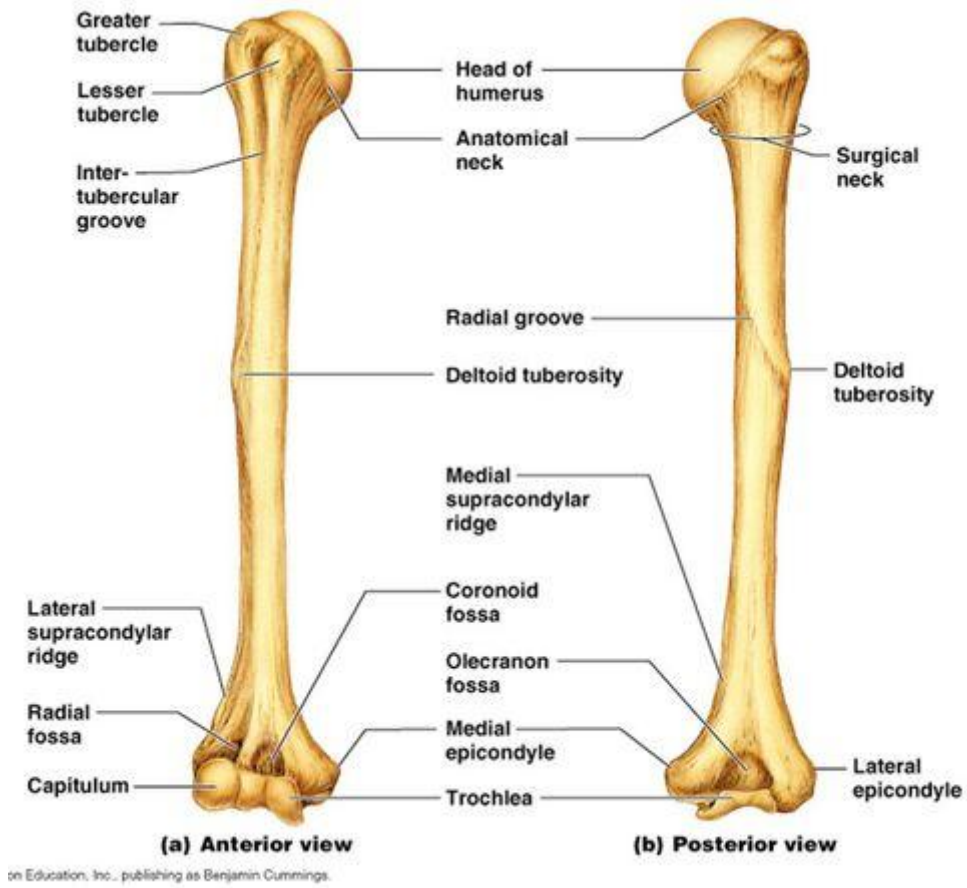

Figure 1.2 The Humerus

(source: http://nmanningstudios.files.wordpress.com/2010/11.jpg).

The humeral shaft is cylindrical proximally then flattens producing three distinct surfaces: antero-medial, antero-lateral, and posterior surfaces with three borders: medial, lateral and anterior borders, then ends in a lateral and medial ridges which form the lateral and medial epicondyles respectively. The medial epicondyle further forms the

trochlea while the anterior side of the lateral epicondyle forms the capitellum ***(Harper et al., 2013).***

Two fossae are formed between the lateral and medial ridges on the anterior aspect of the distal humerus: the coronoid fossa medially and the radial fossa laterally, preventing anterior impingement to occur during flexion of the elbow ***(konin et al.,2013).***

Posteriorly, the olecranon fossa, being located between the epicondyles, prevents posterior impingement during extension. ***(Schaeffeler et al.,2013).***

The supracondylar process or spur is a rare skeletal anatomical variant. ***(Stein-Wexler, 2015).*** It is usually located 5 cm above the medial epicondyle with its length ranging from 2 to 22 mm. Sometimes; it is continuous with Struthers' ligament beneath which the brachial artery and the median nerve run hence can be entrapped ***(MutnuRu and PeRubhotLa, 2016).***

Figure 1.3 Humeral supracondylar process
(source: https://radiopaedia.org/articles/supracondylar-spur).

Forearm bones

The ulna and Radius are the two parallel long bones of the forearm with the ulna located medially and the radius laterally in the supinated anatomic position.

The ulna is a long bone with a prismatic shape with a large proximal extremity contributing to a large bulk of the elbow joint. ***(Spies et al., 2015).***