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Abstracts

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Epidemiology of rotator cuff injury in the athlete

Dr. Jason Brockwell

Rotator cuff tears in the overhead / throwing athlete are not uncommon. The vast majority of these rotator cuff tears are partial thickness, articular side tears. Full thickness rotator cuff tears, while more common in the older recreational athlete, are exceedingly uncommon in the young overhead/throwing athlete. Superior labral anterior to posterior (SLAP) lesions were first described by Snyder et al. in 1990. In a retrospective review, Morgan, Burkhart, et al. revealed a strong association between SLAP lesions and rotator cuff tears in the overhead athlete. In 53 throwing/overhead athletes with documented type 2 SLAP tears, there were 10 concomitant partial thickness, articular side, rotator cuff tears and 1 full thickness rotator cuff tear. Full thickness rotator cuff tears in the young athlete are uncommon, but may be associated with a traumatic dislocation of the shoulder. Full thickness rotator cuff tears are more common in the middle-aged recreational athlete. The commonest involved tendon is the supraspinatus. Symptoms of a full thickness rotator cuff tear include pain, weakness and loss of normal function of the shoulder.

Imaging of rotator cuff injury in the athlete

Dr. Gregory Antonio

Rotator cuff injury forms a substantial portion of referrals for shoulder imaging. This lecture will cover the findings, strengths and weaknesses of the different imaging modalities used for evaluating the rotator cuff. Illustrative examples will also be shown to cover the range of injury to the rotator cuff and related structures.

Sonography:

- currently the most widely used method for imaging rotator cuff tears

	Practical	Technical
Strengths:	Radiation-free	Dynamic scan
	Non-invasive	High spatial resolution
	No side-effects	
	Quick	
	Cheap	
Weaknesses:	Images difficult to read	Operator-dependent
		Limited field of view
		Problems quantifying tear (oblique planes and blind areas under acromin)
		Unreliable muscle bulk assessment

Magnetic Resonance Imaging

- the "golden" standard for imaging rotator cuff tears

	Practical	Technical
Strengths:	Radiation-free	Large field of view
	Non-invasive	Good for quanification (tear gap and muscle bulk)
	No side-effects	
Weaknesses:	Expensive	Static scan
	Longer waiting time	Low spatial resolution
	Uncomfortable scan	Poor for partial thickness vs. intra-substance tears

Magnetic Resonance Imaging Arthrography:

	Practical	Technical
Strengths:	Radiation-free	Large field of view
	Non-invasive	Good for quanification (tear gap and muscle bulk)
		Better for articular sided tears
		Information on intra-articular structures (labrum, ligaments)
Weaknesses:	Invasive	Potential infection/dislocation
	Expensive	Static scan
	Longer waiting time	
	Uncomfortable scan	
	Recovery time	

Treatment of rotator cuff injury in the athlete

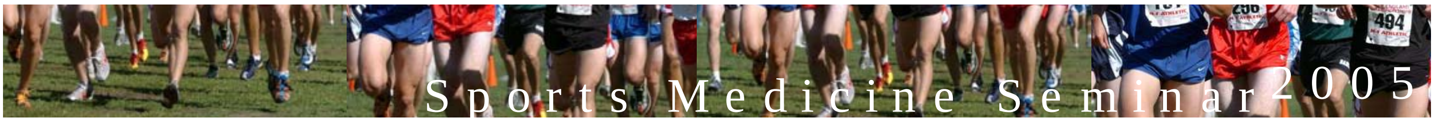
Dr. Christopher Tong

Rotator cuff tears affecting athletes fall into two broad categories. For young overhead/throwing athletes, usually it is a partial thickness rotator cuff tear. These are often associated with additional intra-articular pathology such as a superior labral anterior to posterior (SLAP) lesions or shoulder instability. Full thickness rotator cuff tears tend to affect older recreational athletes. The clinical presentation of rotator cuff tears are pain, weakness and loss of full function of that arm. Various physical examination tests are available to test for shoulder impingement, rotator cuff tears, SLAP tears. These include the Hawkin and Neer impingment signs; supraspinatus stress test and lift off test for the rotator cuff; Speed test, O*rien test and Jobe relocation test for SLAP tears. It is especially important in the young overhead/throwing athelete with rotator cuff tear to determine whether there is additional intra-articular pathology e.g. SLAP lesion / shoulder instability which may have contributed to the rotator cuff injury. The investigation of choice for imaging rotator cuff injuries is MRI scanning. The treatment of patients with rotator cuff injuries is initially non-operative with non steroidal anti-inflammatory drugs, physiotherapy. If these measures fail to relieve symptoms and regain full function, then operative treatment is recommended. Small partial thickness rotator cuff tears less than 50% in tendon thickness were traditionally debrided arthroscopically. But there is an increasing trend to repair these lesions by a transtendon repair technique. Full thickness rotator cuff tears are repaired either by a mini-open technique or all arthroscopic technique. SLAP lesions which commonly accompany partial thickness articular side tears in the throwing athlete are similarly repaired arthroscopically with a suture anchor technique.

Epidemiology of talar osteochondral injury in the athlete

Dr. David Hughes

Talar osteochondral injury must be considered in all cases of ‘ankle sprain’ where symptoms persist. It can be difficult to diagnose such injuries from clinical examination and plain radiography alone. Advent of arthroscopy and MRI has enabled quality research into the incidence of these injuries. This presentation will review the current literature regarding the frequency of talar osteochondral injuries, particularly in association with other ‘common’ athletic injuries such as sprain of the lateral ligament complex.



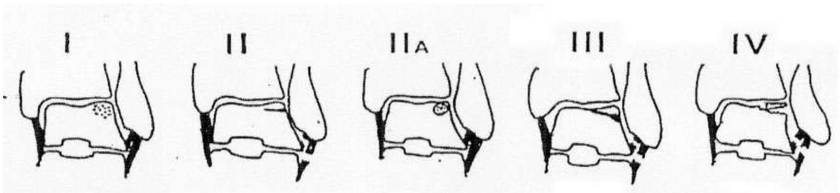
Imaging of talar osteochondral injury in the athlete

Dr. Iain Stewart

The problem ?
Talar osteochondral injuries frequently occult on plain x-rays. Untreated lead to long term sequelae.
33 % occult fractures on plain x-rays in 92 patients with osteochondral talar dome lesions: even in retrospect not seen.
Average time from injury to diagnosis-36 months[1]
Plain x-rays may contain clues to significant but occult injury. Look for effusion[2].If effusion greater than 13 mm (anterior and posterior joint) 33% have occult fracture.
Three views more sensitive to fractures than 2 views (AP, lateral and mortise)

Classification
Berndt & Harty classification of osteochondral lesions[3]

Stage I	Bone bruising
Stage II	Incomplete separation of osteochondral fragment
Stage IIA	Subchondral cyst
Stage III	Undisplaced, unattached fragment
Stage IV	Displaced fragment



Stages I & II are x-ray negative—but may have an effusion
Stages III & IV x-ray positive

Bone Scan
Use three phase technique (perfusion, blood pool and delayed imaging)
Sensitive to bone oedema (x-ray negative) but not specific
Said to have poor resolution, but not if familiar with anatomy and question being asked.

Computed Tomography
Excellent resolution for bone, not so good for soft tissues.
Multi-detector CT (MDCT) allows multiplanar reconstruction
Not sensitive to bone oedema or cartilage damage (Stage I)
Excellent for associated small avulsion fractures

MRI
Excellent for bone oedema (stage I) and subsequent stages.
Good choice for the persistently painful ankle[4]
Sequence Sagittal T1 & T2 SPIR,
Coronal T2 & T2 SPIR
Axial T2
add
Small field of view coil T2 3D WATS for cartilage definition[5]
Excellent for associated ligamentous damage (syndesmosis, Anterior talofibular ligament, etc)[6]
Difficult for small avulsion fractures and displaced fragments.

Summary
Untreated lesions cause significant morbidity
Can be occult on plain x-rays: not seen doesn't mean absent !
Different stages
Plain x-ray, NM , CT and MRI all show lesions to a greater or lesser extent
Best imaging modality? MRI as able to show all stages and associated soft tissue lesions at all stages

	Plain X-ray	NM	CT	MRI
Stage I	Negative	Positive	Negative	Positive
Stage II	May be positive	Positive	Positive	Positive
Stage IIA	May be positive	Positive	Positive	Positive
Stage III	Positive	Positive	Positive	Positive
Stage IV	Positive	Positive	Positive	Positive

[1]Loomer et al: Am J Sports Med 1993:21:13-19
[2]Clark et al : AJR: 1995: 164: 1185-1189
[3]J.Bone & Joint Surgery 41-A: 988-1020; 1959
[4]Magee et al: AJR 1998 170: 1227-1230
[5]Antonio, Griffith et al :Small field of view MRI of the knee & Ankle. AJR:2004 183:24-28
[6]Brown et al : MRI findings associated with distal tibiofibular syndesmosis injury :AJR 2004:182:131-136

Treatment of talar osteochondral injury in the athlete

Dr. Brendan Klar

OCI in the athlete is potentially a career and income threatening development. Diagnosis is often delayed and the patient complains of a spectrum of symptoms from a non-specific or vague ache in the ankle, to frank locking and inability to walk. Arthroscopic procedures allow the surgeon to address the majority of injuries and newer technologies are emerging which show promise in the years ahead. A summary of the surgical options currently available and some that are on the horizon will be presented and the pros and cons of each discussed.

Epidemiology of TFCC injury in the athlete

Dr. Raymond Yip

1. Introduction: Function to stabilize distal radioulnar joint. Anatomy meniscus homolog, dorsal and palmar radioulnar ligaments ulnolunate ulnotriquetral and ulnar collateral ligaments. Peripheral 20% vascular with supply from palmar and dorsal radiocarpal branches of the ulnar artery and also from the anterior interosseus artery via the dorsal and palmar branches. Central portion is avascular.
2. Lesions divided into degenerative and traumatic. Causes of traumatic lesions include axial loading from a fall, with or without rotation, pure rotational type injuries, or wrist distraction. May occur with other injuries and fractures. Degenerative causes include overuse syndromes with excessive ulnocarpal impaction, relevance ofulnar variance and age.
3. Symptoms are of ulnar sided wrist pain, swelling, pain on movement especially those involving gripping and forearm rotation, crepitus, snapping are common.
4. Physical Examination shows tenderness over ulnar part of the wrist, the TFCC itself and often also the distal radioulnar joint and ulnar carpal bones. Specific tests include TFCC grinding, shuck and Lunotriquetral ballotment, Pisotriquetral shear test, DRUJ stability testing in supination and ECU stability are noted.
5. X rays including PA zero rotation views to assess any ulnar variance. Clenched fist ulnar deviation view to assess any impingement. Arrthrography now rarely used to assess for tears as MRI is becoming the norm.
6. Classification: Palmar Class 1 traumatic: 1A central, traumatic tears of the articular disc dorsal to palmar 1B ulnar medial, distal ulna avulsion injuries, 1C distal, traumatic disruption of the ulnolunate or ulnotriquetral ligaments 1D radial, traumatic avulsion from sigmoid notch of radius. Palmar Class 2 spectrum from mild cartilage bruising to full thickness perforation and impaction. 2A chrromdromalacia of articular disc. 2B chrondromalacia of disc and ulnar head or lunate. 2C full thickness perforation. 2D as 2C with lunotriquetral ligament disruption. 2E end stage with advanced ulnocarpal arthritic changes.
7. Differential Diagnosis for ulnar sided wrist pain: In addition to TFCC problems, ECU subluxation, LT ligament injury, ulnar lunate or midcarpal chondral lesion, pisotriquetral arthrosis, ulnar artery thrombosis, dorsoulnar sensory neuritis, Guyon canal ulnar neuropathy.

Imaging of TFCC injury in the athlete

Dr. James Griffith

TFCC tears present clinically as ulnar wrist pain and imaging is directed along this line. The three most common causes of ulnar wrist pain in the athlete are:
1. Tendinosis of the extensor carpi ulnaris tendon
2. Impaction injury
3. TFCC tears

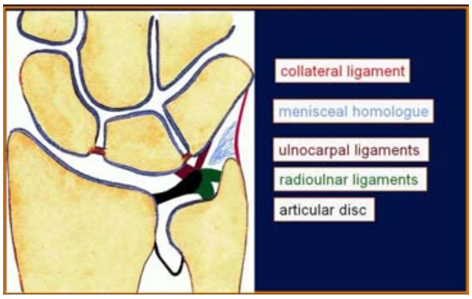
Tendinosis of the extensor carpi ulnaris tendon (ECU) usually occurs over a short segment from the level of the wrist to the insertion at the base of the 5th metacarpal. Ultrasound will reveal a thickened tendon with a lesser degree of synovial thickening. MRI will reveal similar features with a comparable accuracy. Tendinosis is the most common ECU pathology seen affecting this tendon. Tenosynovitis or macroscopic tears are not that commonly seen. With very mild degrees of tendinosis, both MRI and ultrasound may be normal and similarly patients may have quite advanced tendinosis with only mild or minimal symptoms. Comparison with the opposite side is a fundamental part of the ultrasound examination.

Impaction injury is common sports that involve gripping the pronated hand such a cycling and tennis. Impaction can occur in three main instances:
(a) between the distal ulna and the lunate when the wrist is in ulnar deviation and particularly when the wrist is flexed and pronated as this action relatively elongates the ulna. This type of impaction is greatest with a positive ulnar variant.
(b) between an excessively long styloid process (>6mm) or a fractured stylod process and the triquetrum
(c) between the tip of the hamate and the lunate (in those subjects-about 1 in 2 people-whose lunate articulates with the hamate).

Impaction leads progressively to cartilage injury, ligament injury, TFCC injury and subchondral bone injury. While radiographic changes are common in chronic ulnar impaction syndromes. MR imaging allows a more specific and earlier diagnosis though is not as accurate as arthroscopy in this respect. .

TFCC tears. The TFCC stabilizes the ulnocarpal and distal radioulnar joints.

The TFCC is composed to the articular disc and its supporting ligaments. The main supporting ligaments are the radioulnar ligaments. These arise via Sharpeys fibres from a broad area on the ulnar fovea and a smaller area at the base of the ulnar styloid. There is no origin from the tip of the ulnar styloid. The fibres from the fovea and the base of the ulnar syloid first coalesce, than arch towards the radius and bifurcate to enclose the proximal portion of the articular disc.
The TFCC is secondary supported by the ulnocarpal ligaments (i.e. the ulnolunate and ulnotriquetral ligaments). These ligaments (which help prevent dorsal migration of the distal ulna) are misnamed since they originate not from the ulna but from the palmar side of the TFCC.



On the dorsal side, Sharpey's fibres firmly connect the floor of the extensor carpi ulnaris tendon sheath to the fovea of the ulna.
The meniscus homologue is a conglomatation of loose connective tissue between the main bulk of the TFCC, the tip of the ulnar styloid and the weak ulnar collateral ligament (a thickening of the ulnar aspect of the capsule). Fluid pools normally between the menisceal homologue and the articular disc.

The central portion of the articular disc is avascular. Degeneration (attrition) of the central avascular portion of the TFCC occurs with increasing age. Degeneration of the TFCC begins by about the age of thirty and is present in most people over 50 years. At this age, perforations will be present in almost one in two articular discs. Traumatic tears also involve the articular disc centrally as well as the margins (junction of the articular disc and the radioulnar ligaments) while the ulnar attachments at the fovea and base of ulnar styloid.

MRI is accurate at depicting degeneration and central tears but is less accurate at depicting peripheral tears or insertional tears. Because the periphery of the TFCC has good blood supply, tears in this region can be repaired. In contrast, tears in the central avascular area must be debrided, as they have no potential for healing.

TFCC tears may be associated with DRUJ instability. Avoid diagnosing DRUJ subluxation on inspection of a single wrist alone as appreciable degrees of 'subluxation' can subsequently be found to be normal. Although there are many measurements one can apply, I find the most useful and practical test is to examine both wrists simultaneously with CT in the neutral, fully pronated and fully supinated positions.

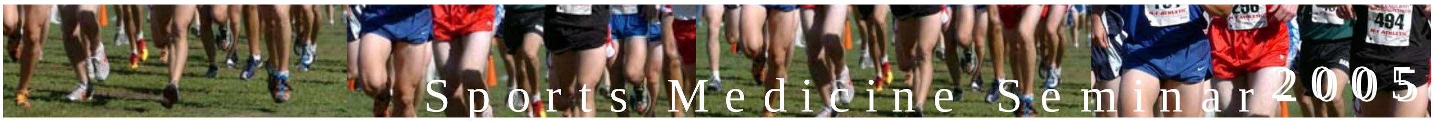
Arthrography is is very sensitive at depicting TFCC tears. Triple injection wrist arthrography in isolation is not that good a teat at sorting out chronic wrist pain. The test is not specific, with a high incidence of positive findings on the contralateral asymptomatic side. Positive findings are present in a quarter of asymptomatic adults. We do not currently perform MR arthrography. Instead we use MRI to broadly assess TFCC morphology, wrist morphology and help exclusion of other injury as a prelude to arthroscopy.
In conclusion, radiography is the first line investigation in patients with ulnar wrist pain seeking in particular signs of osteoarthritis, reactive changes of ulnar impaction and noting the configuration of the distal ulna and ulnar styloid. If clinical examination, suggests a superficial aetiology of for wrist pain, ultrasound should be the next investigation. If ultrasound is negative or if clinical examination suggests that there may be a deeper component to the pain, proceed to MRI examination.

References

Cerezal L, del Pinal F, Abascal F, Garcia-Valtuille R, Pereda T, Canga A. Imaging findings in ulnar-sided wrist impaction syndromes. Radiographics 2002;22:105-21.

Yoshioka H, Ueno T, Tanaka T, Shindo M, Itai Y. High-resolution MR imaging of triangular fibrocartilage complex (TFCC): comparison of microscopy coils and a conventional small surface coil. Skeletal Radiol 2003 ;32(10):575-8.

Nakamura T, Takayama S, Horiuchi Y, Yabe Y. Origins and insertions of the triangular fibrocartilage complex: a histological study. J Hand Surg [Br] 2001 ;26(5):446-54.



Treatment of TFCC injury in the athlete

Dr. PC Ho

The triangular fibrocartilage complex (TFCC) is one of the important linkages between the forearm and the prehensile hand unit. It is the major static stabilizer of the distal radio-ulnar joint as well as focal point for load transmission over the ulnar side of the wrist. Its complex anatomical composition allows tremendous functional adaptation over different parts of the complex, which help to counteract the wide variety of tensile, compressive and shearing stress and loading to the wrist. It is therefore prone to injury in high performance athletes and this constitutes the most common cause of so-called "sprain wrist" in athletes. Lack of clinical awareness and inadequate initial treatment frequently converts the injury into chronic debilitation which has devastating effect on the athletic career.

A methodical wrist examination remains as the most important tool to establish a clinical diagnosis of TFCC injury. Differentiation of central and peripheral tear is generally feasible basing on clinical assessment alone. Lack of substantial wrist pain upon passive prono-supination of forearm can confidently rule out significant peripheral tear of the TFCC. Important clues to TFCC injury include positive ulno-carpal grinding test, piso-triquetral shear test, DRUJ ballottement test and luno-triquetral ballottement test. X ray of wrist taken in neutral rotation PA position should be mandatory to rule out fracture and allow proper assessment of the ulnar variance, which bears significant influence on the prognosis and surgical management of the injury. Wrist arthroscopy is currently considered as the golden standard in establishing the diagnosis. Arthroscopic diagnosis should be classified according to Palmer, though a new pattern of dorsal peripheral tear has recently been described by us. Recent advance in MRI technique especially the use of specific coil has largely increased the diagnostic sensitivity and specificity. Wrist arthrogram is falling out of favour because of the relative invasiveness and the high false positive rate especially related to age.

Almost all acute TFCC injuries will respond to conservative treatment of splinting and rest for 4-6 weeks.
Indications for earlier surgical intervention include: i) overt DRUJ instability; ii) acute on chronic injury; iii) markedly positive ulnar variance. Arthroscopic treatment is the current standard of surgical intervention. At our institute, most arthroscopic procedures can be accomplished under portal site local anaesthesia. For central tear of TFCC in the absence of ulnar positive variance, arthroscopic debridement of the tear to stable peripheral rim can be effective. Fail to respond cases particularly when associated with positive ulnar variance frequently require ulnar shortening osteotomy to obtain long term relief. Peripheral tear of TFCC in the presence of subtle or overt DRUJ instability should be repaired either arthroscopically or openly. Published reports on arthroscopic repair of peripheral TFCC tear mainly deal with Palmer type 1b TFCC tear, with success rate ranging from 70% to 90%.
Repair of type 1d tear is still considered as controversial. The author has also developed technique of repairing type 1c tear over the ulno-carpal ligament complex as well as the dorsal tear with promising early results. Various techniques have been described. Poehling described the use of 18G epidural needle while Terry Whipple developed a special TFCC repair kit to repair ulnar or dorsally based tear.

From Jan 1997 to December 2002, 35 TFCC repair procedures have been carried in our institution, including 22 male and 13 female patients. Average age was 33.5, ranging from 13 to 51. The average duration of symptom was 8.8 months, ranging from 1 week to 37 months. At an average follow up period of 39.4 months (ranging from 4 to 82 months), 26 patients (74.3%) achieved excellent to good result according to modified Mayo wrist score. There were 4 fair and 5 poor cases. Average ranges of motion compared to opposite unaffected side were: extension 88.9%; flexion 85.4%; pronation 95.2% and supination 95.7%. Grip strength improved from 57.7% to 84.1% of the opposite hand. There was significant reduction of exertion pain and improvement in wrist function score. No correlation of primary outcome was note with respect to age, gender, hand dominance, work compensation, delay of surgery and type of TFCC tear.

Until recently, there has been great controversy toward the best surgical reconstruction for chronic painful DRUJ instability caused by disruption of TFCC. It was now recognized that the most important stabilizers of the DRUJ were the palmar and dorsal radio-ulnar marginal ligaments which exhibited their tautness during the various phase of prono-supination. Damage to either or both of these ligaments generated pain and instability during forearm rotational movement. Extensive biomechanical study had been performed by Adams et al and they proposed the anatomical reconstruction of the distal radio-ulnar ligaments as the ultimate solution for this difficult condition. They reported good result of open reconstruction using palmaris longus tendon graft in 12 patients with post-traumatic DRUJ instability at 1 to 4 year's follow up evaluation. We have been successful in performing this operation entirely under arthroscopic control in 5 patients between August 2000 and September 2001.

The average follow-up was 19 months (range 12-26 months). There were improvements in all clinical parameters under evaluation. Functional wrist score increased from 23.6 to 33.6 out of a 40 points scale. Pain score decreased from 11.6 to 2.8 out of a 20 points scale. Average grip power increased from 59.3% to 76.7% of the opposite non-affected hand. Wrist extension/flexion range increased from 71.8% to 86.1%. Radial/ulnar deviation range increased from 64.4% to 94%. Forearm prono-supination range increased from 90.7% to 95.1%. All patients were satisfied with the procedure. Complication included transient numbness of ulnar nerve dorsal branch in one patient and recurrence of DRUJ instability in one. We concluded that arthroscopic anatomical reconstruction of TFCC using tendon graft is technically feasible and is a preferred treatment option in symptomatic peripheral destabilizing TFCC lesions not amendable for repair either due to its chronicity or presence of sizable defect. Its ultimate benefit needs to be evaluated in longer-term follow up study and larger patient cohort.

Functional instability of ankle joint - Management

Dr. Patrick Yung

Sprain of the lateral ankle ligaments is one of the most frequent sports injuries. Residual instability, following acute ankle sprain, is not uncommon, including mechanical as well as functional instability. It has been estimated that approximately 20-40% of athletes with a lateral ankle sprain will suffer from chronic instability, and more than 50% of patients who suffer from chronic instability does not have clinical/radiological evidence of mechanical instability (increased laxity). This group of patients is classified to have functional instability, which can be defined as a feeling of incapacitating, recurrent disability during physical activity. Several research have provided significant insight into the understanding of this complex clinical disorder. It has been suggested that impaired proprioception, decreased muscle reaction time, loss of balanced posture, and muscle weakness after acute ankle injury, may all be contributing factors in "Functional Instability". The functional imbalance is believed to be the result of damage to the mechanoreceptors in the lateral ligaments, muscles and tendons, with subsequent differentiation of the proprioceptive reflex. Indeed, the ankle joint positional sense does have inputs from all the proprioceptors in the skin, joint capsule, ligaments, and muscle stretch receptors, however, the relative contributions of these proprioceptors are not clear from various studies.

Regarding management of ankles with functional instability, the majority of this group of patients does not have demonstrable evidence of mechanical instability, i.e. increased laxity and they would accordingly not be benefited from surgical reconstruction or repair. On the other hand, many studies have proved that improvement of neuromuscular control is the correct principle of management for this disorder. Delayed peroneal muscle reaction time was noted in ankles with functional instability, while pre-activated, trained musculature of the lower limb shortened the electromechanical delay of eversion movement of ankle joint upon sudden inversion. Strengthening and training of the peroneal muscle group is recommended as one of the major rehabilitation protocols in the treatment of functional instability of ankle joint. The trained peroneal muscles indeed can provide five-fold greater eversion moment than the brace, tape or protective shoes against ankle sprain.

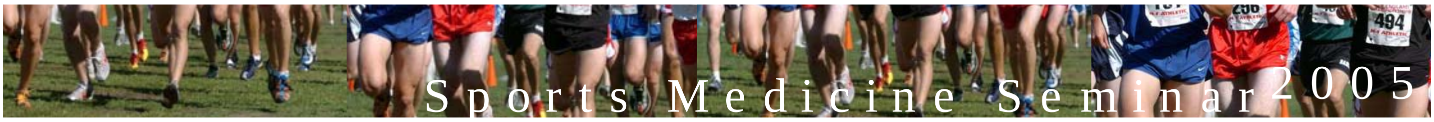
Passive supportive devices, including brace and tape, can reinforce proprioceptive input, thus decrease the peroneal muscle reaction time. In addition, they can also increase isometric eversion sprain, compared with taping or bracing. Taping has been shown to reduce the incidence of recurrent instability, however, is not as effective as bracing. Regrettably, there is no consensus about the optimal method of application of tape.

Wobble board or ankle disc training appears to be the most effective rehabilitation tools, which improves balance, strength, coordination, and proprioception, and thus reduces symptoms of functional instability.

Due to the limited number of well-controlled randomized clinical trials, it is difficult to draw a consensus on the most optimal treatment for functional ankle instability. What is apparent is the importance of improvement of the neuromuscular control (proprioception, coordination balance and posture control) in these patients. More future research is required in order to improve our knowledge about the management of this disorder.

References

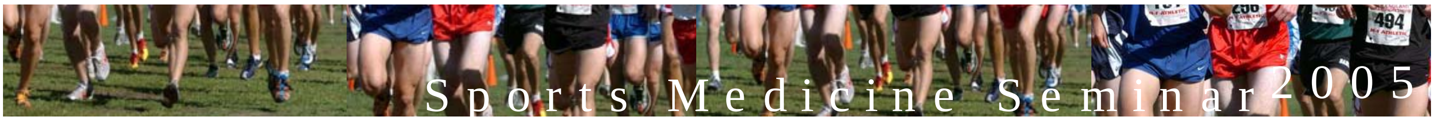
Garrick JG. The frequency of injury mechanism of injury & epidemiology of ankle sprain. Am J Sports Med 5:241-2, 1977
Mack RP. Ankle injuries in athletes. Clin Sports Med 1:71-84, 1980
Brand RL, Black HM, Cox JS. The natural history of the inadequately treated ankle sprain. Am J Sports Med 5: 248-249, 1977
Itay S, Ganel A, Horoszowski et al. Clinical and functional status following lateral ankle sprains. Orthop Rev 11:73-76, 1982
Tropp H, Odenrick P, Gillquist J. Stabilometry recordings in functional and mechanical instability of the ankle joint. Int J Sports Med 6:180-182, 1985
Vaes PH, Duquet W, Pierre-Powel et al. Static and dynamic roentgenographic analysis of stability in braced and non-braced stable and functionally unstable ankles. Am J Sports Med 26:692, 1998
Glencross D, Thornton E. Position sense following joint injury. J Sports Med 1981:21:23-37
Garn SN, Newton RA. Kinesthetic awareness in subjects with multiple ankle sprains. Phys Ther 1988; 68: 1667-71
Gross MT. Effect of recurrent lateral ankle sprains on active & passive judgement of joint position. Phys Ther 1987; 67:1505-9
Irrgang JJ, Whitney SL. Balance and proprioceptive training for rehabilitation of the lower extremity. Journal of Sports Rehabilitation 1994;3:68-83
Konradsen L, Raun JB. Ankle instability caused by delayed peroneal reaction time. Acto. Orthop. Scand 61:388-90, 1990
Lentell GL. The relationship between muscle function and ankle instability. J. Orthop. Sports. Phys Ther 1990;1:605-11
De Carlo MS. Evaluation of ankle joint proprioception following injection of the anterior talo-fibular ligament. J Orthop Sports Phys Ther 1986;8:70-6
Konradsen L. Proprioception at the ankle: the effect of anaesthetic blockage of ligament receptors. JBJS (Br) 1993; 433-6
Karlsson J, Anderasson GO. The effect of external ankle support in chronic lateral ankle joint instability: an electromyographic study. Am J Sports Med 20: 257-61,1992
Ashton-Miller JA, Ottavian RA. What best protects the inverted ankle against further inversion? Am J Sports Med 24:800-809, 1996
Greene TA, Hillman SK. Comparison of support provided by a semirigid orthosis and adhesive ankle taping before, during and after exercise. Am J Sports Med 18:498-506, 1990
Gross MT, Lapp A.K, Davis JM. Comparison of Sweedo universal ankle support and Aircast sport stirrup orthoses and ankle tape in restricting ankle eversion-inversion before and after exercise. J Orthop Sports Phys Ther 13:11-19, 1991
Hoffman M, Payne VG. The effects of proprioceptive ankle disk training in healthy subjects. J Orthop Sports Phys Ther 21:90-93,1995



Syndesmosis injuries of the ankle in professional rugby union players

Dr. David Hughes

This presentation will address distal tibiofibular syndesmosis ‘sprains’, that is, injuries to the syndesmosis where there is no diastasis. Syndesmosis injuries are often misdiagnosed as a sprain of the lateral ligament complex. There are key features of the history and examination however which distinguish these two very different diagnoses. The management and natural course of syndesmosis injuries is very different to that of lateral ligament complex injuries. Accurate diagnosis is therefore crucial for optimal treatment of the athlete. The incidence of syndesmosis injuries has increased with the advent of professional Rugby. This presentation will explore the possible reasons for this.



Global orthopaedic service delivery in the 21st century

Dr. Brendan Klar

Whilst first world countries continue to enjoy the benefits, albeit costly, of cutting edge medical and orthopaedic technology and treatment, the rest of the global population struggle to gain access to basic services. For first world governments the major issue in health care is cost-containment as newer and costlier technologies come online. In stark contrast to this in the poorer nations, governments find themselves unable to provide even basic radiology facilities let alone the expertise to treat orthopaedic conditions. This presentation takes a look at some of the contrasts between the two ends of the spectrum, and what if anything the health care industry can and should do in concert with government to correct the glaring imbalance.