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We would love your feedback –
Tell us what you liked about the day and what you think we could improve for next year.

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https://www.research.net/s/Orthopaedic_Updates_2012

Should you wish to receive a certificate of attendance please email
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Thank you,
The Team at Orthosports

Time	Event	Who
07:30 – 08:00	Registration	
08:00 – 08:10	Welcome Message	Dr Doron Sher
	Plantar Plate Repair	Dr John Negrine
	Forefoot Pain	Dr Todd Gothelf
	Distal Radius Fractures	Dr Kwan Yeoh
	Panel Discussion	
	Groin Pain 101	Dr Paul Annett
	The Hip – Arthroscopy to joint replacement	Dr Allen Turnbull
	Spine Surgery where is the evidence?	Dr Andreas Loefler
	Panel discussion	
10:00 – 10:45	**Morning Tea**	
10.55	Conservative management of sub acromial pathology	Dr Mel Cusi
	Rotator Cuff Tears	Dr Jerome Goldberg
	Rehabilitiation Post Rotator Cuff Repair	Dr Ivan Popoff
	Panel Discussion	
	Meniscal Repair	Dr Doron Sher
	Return to Sport after Knee Injury	Dr John Best
	Panel Discussion	
12:40	Close	

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Plantar plate repair – New information

Whilst not in the league of our oncological colleagues, foot and ankle surgery does occasionally unearth ”a game changing” advance, the solution to a previously unsolved problem.

Plantar plate repair for second MTP (metatarso-phalangeal joint) instability is in my opinion one such advance.

Originally described in 1985 by the Roger Mann as” idiopathic second MTP synovitis ”, a condition common in young male athletes as well as middle aged females has now been shown to be due to attrition and or tearing of the plantar plate.

What is the plantar plate?

The second MTP joint is where many patients “push off “in the propulsive phase of gait. The second metatarsal is the longest metatarsal and strikes the ground first. The joint is stabilized principally by the plantar plate which is a rectangular band of fibro-cartilage loosely attached to the metatarsal head, firmly attached to the collateral ligaments and inserting by medial and lateral bands into the base of the proximal phalanx. It is rectangular or trapezoidal in shape measuring 19 by 11 mm and is approximately 3 -5 mm thick. It also functions to cushion the metatarsal head where it is at its thickest.

Clinical Presentation:

Patients initially will describe a swelling on the plantar surface of the foot beneath the second MTP joint often describing it as “like walking on a stone”. As the plate begins to attenuate the second toe deviates often medially so that the patient notices a gap between second and third toes (Figure 2). Not uncommonly the condition is mis-diagnosed as a 2,3 neurona because of the presence of neuritic symptoms such as numbness at the interspace or pain radiating into the toes. Although the two conditions can co-exist plantar plate insufficiency is in my opinion, far more common. In the later stages (Figure 3) the second toe no longer touches the ground and may cross over the great toe which frequently has a bunion deformity. In the final stage the second metatarso-phalangeal joint dislocates.

Investigations:

The condition is a clinical diagnosis in the majority of cases. Plain radiographs always taken weight-bearing will show the MTP subluxation and certainly the dislocation. The differential diagnosis includes the arthropathies such as rheumatoid and psoriatic. Bone scanning will merely show an inflamed joint. Ultrasound in very specialized hands will image the plantar plate as will MRI (See figure 4). Both these techniques require a radiologist well versed with the condition as the imaging and it’s interpretation can be very challenging.

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Non-operative treatment:

In the early stages without significant deformity patients get relief from taping the second toe or the use of a toe splint. Although a metatarsal dome in the shoe may help to deflect pressure from the joint many patients find them very uncomfortable to wear. Anti-inflammatory medication can help as well as a low volume judicious injection of intra-articular steroid. Obviously the avoidance of high heeled shoes in women and reduction of high impact sport such as running are important adjuncts.

Once deformity develops although symptoms may be alleviated by non-surgical measures they cannot be cured without surgery.

Plantar plate repair:

The plantar plate can now be repaired through a dorsal approach thereby obviating the need for an incision on the weight-bearing part of the foot.

In essence what has made the repair easier is new equipment and a trans-articular approach using a metatarsal head osteotomy (Weil Figure 8) which is replaced at the conclusion of the repair.

The operation is performed via a dorsal incision. The metartarsal head is osteotomised and slid proximally 8mm, fixation is provisionally performed with a k-wire which is used as a post for the joint distractor. The exposure is facilitated by distracting the MTP joint using an additional pin in the proximal phalanx and by sectioning the collateral ligaments. The plantar plate is then visualized, the tear repaired and the plate re-inserted into the freshened base of the proximal phalanx using two fine drill holes. The osteotomy is then replaced and fixed with a screw.

Post operatively patients are placed in a recovery shoe for 4 weeks. As with most foot and ankle operations patients experience swelling for 4 – 6 months.

I have so far performed 34 plantar plate repairs. 30 women and 4 men. Average age 61. 33 second MTP and 3rd MTP 1 patient.

Results are so far satisfactory in 75% but average follow up is less than 12 months.

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Forefoot Pain

Determining the cause of forefoot pain can be a difficult diagnostic challenge. The proximity of structures makes it difficult to localize the origin of pain by palpation alone. Investigations are useful, but can also lead to confusion when one reports a simultaneous neuroma and plantar plate instability. An understanding of the differential diagnoses, and a methodical approach can help lead to appropriate treatment and better outcomes.

The following table includes the differential diagnoses for forefoot pain, along with distinguishing history, physical examination, and investigation findings for each diagnosis:

Diagnoses	History	Physical Exam	Investigations
Bursitis	Short-lived	Localised pain	Seen on U/S or MRI
MTP instability	Usually 2nd MTP joint, walking on marble Worse without shoes	Pain over MTP joint dorsal and plantar; positive anterior drawer tests causes pain; often deformity	U/S and MRI are useful
Freiberg's infarction	Pain at MTP joint	Pain over MTP joint, no instability, no deformity	X-ray may show collapse; MRI excellent to denote chondral damage, necrosis, oedema
Keratosis/Metatarsalgia	Pain in ball of foot, worse without shoes	Callus present under area of pain, prominent metatarsal head	Lack of findings on MRI, U/S. WB x-rays may show long ray
Neuroma	Burning in the toes, pain worse with shoes.	Pain in web space, on bottom of foot, no dorsal pain, positive mulder sign	U/S or MRI can demonstrate an enlarged nerve. X-rays normal
Tight gastrocnemius/ soleus complex	Forefoot pain	Positive silfverskiold test	WB x-rays may show long ray, lack of findings on MRI and U/S

Physical Examination

The following tests should be done when evaluating forefoot pain:

General: Observe walking, as well as alignment of the feet, circulation, and arch height. Metatarsalgia is more common in patients with a hallux valgus deformity, as more pressure is placed on the lessor toes with walking. A cavovarus foot tends to put more pressure on the metatarsals.

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Silfverskiold Test: This test is used to determine if the gastrocnemius is tight independent of the soleus muscle. The gastrocnemius muscle crosses both the knee and ankle joints, while the soleus only crosses the ankle joint. The patient is asked to sit on the end of an examination table. Passive dorsiflexion of the ankle is tested with the knee extended. The patient's knee is then flexed while still trying to dorsiflex the ankle. An improvement in dorsiflexion is indicative of isolated gastrocnemius tightness. Less than 10 degrees of dorsiflexion with the knee extended which improves to past neutral with the knee flexed is considered to be a positive test.

Anterior drawer test: This is the "Lachman" test of the 2nd toe to test for 2nd MTP instability. The proximal phalanx is held by one hand and the other hand stabilizes the metatarsal. An anterior drawer is placed on the joint and any instability is noted and then compared to the opposite side.

Mulder Sign: The web space is pinched between the thumb and index finger while the other hand compresses the metatarsals. This manouevre will cause a neuroma to shift in and out between the metatarsals. A click that reproduces the pain is a positive result and highly indicative of neuroma.

Investigations

Ultrasound: An ultrasound can help to identify plantar plate ruptures, neuromas and bursitis. The radiologist can perform a cortisone injection if a neuroma is found. The findings of an ultrasound can also be confusing, as a neuroma may be seen that does not correlate with the patient's pain. Clinical findings should take priority in dictating treatment.

MRI: Forefoot MRI can help to differentiate all of the pathologies. It is the most sensitive test as it can identify stress fractures and chondral damage of the MTP joint, which an ultrasound or x-ray may miss.

Treatment

Diagnosis	Non-operative	Operative
Bursitis	Metatarsal dome, NSAIDS	Usually not indicated
MTP instability	Toe strapping, met dome, injection	Weil decompression osteotomy and stabilization of MTP joint
Freiberg's Infarction	Metatarsal dome, NSAIDS	Debridement of joint
Keratosis/Metatarsalgia	Paring of callus, met dome, orthotic	Weil osteotomy, duvries arthroplasty
Neuroma	Met dome, wide shoes	Neurectomy
Tight Gastrocnemius	Stretching	Gastroc release

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Distal radius fractures: To fix or not to fix?

Distal radius fractures do not occur in isolation. They are associated with soft tissue injuries and other bony injuries, and occur in a patient – the whole patient needs to be taken into consideration when managing these fractures.

Amongst other things, these factors need to be considered:

- Fracture location:
  - Extraarticular
  - Intraarticular
- Fracture displacement
  - No or minimal displacement
  - Significant displacement
  - Direction of displacement
- Associated injuries
  - Open or closed fracture
  - Distal radioulnar joint (DRUJ) instability
  - Ulnar styloid fracture
  - Carpal bones and ligaments
  - Compartment syndrome
- Patient factors
  - Age
  - Function
  - Expectations

The American Academy of Orthopaedic Surgeons (AAOS) recommends operative fixation if the fracture has these characteristics:

- Shortening of > 3mm
- Dorsal tilt > 10°
- Intraarticular displacement or step > 2mm

…but correlating this with improved clinical outcome has not been proven. Making a fracture look better radiologically does not necessarily mean that the functional outcome is improved.

Possible types of treatment

Some of the types of treatment available for DRF are:

- Splint or cast alone
- Closed reduction
- Open reduction
- Fixation methods:
  - Moulded cast
  - External fixation
  - K-wires
  - Plates
    - Volar
    - Dorsal
    - Bridge
  - Screws
  - Intramedullary nail

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Complications of surgery

All surgery comes with potential risk. For DRF surgery, this includes:

- Wound infection or other problems
- Neurovascular injury
- Tendon irritation or rupture
- Stiffness
- Carpal tunnel syndrome
- Malunion
- Nonunion
- Anaesthetic complications
- Complex regional pain syndrome

Surgical risk tends to increase with age. Additionally, the benefits of surgery for DRF tend to decrease with age.

Therefore, at some age, the risk of surgery will outweigh the benefits. The cut-off age is being debated.

Associated injuries

Other factors that might sway a decision towards surgery:

- Open fracture
- DRUJ instability
- Large ulnar styloid fracture
- Carpal or ligament injuries
- Neurovascular damage
- Compartment syndrome
-

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Groin Pain 101

Introduction:

Groin pain is viewed as a difficult entity. There are multiple diagnostic terms, which can lead to confusion. Groin pain makes up 5% of all athletic injuries. It is common in direction change sports such as soccer and AFL, making up 25% of injuries in soccer. Groin pain should be considered in 2 main diagnostic groups, described as 'pubalgic' and 'non-pubalgic'. The pubalgic group includes the entities of adductor tendinopathy, osteitis pubis, posterior inguinal wall weakness (or 'sports hernia') and illiopsoas tendinopathy. In 30-40% of cases there may be more than one of these entities causing pain concurrently. Non-pubalgic pain is dominated by the hip joint where diagnoses such as osteoarthritis, stress fracture, avascular necrosis and femoroacetabular impingement need to be considered.

Aetiology:

The aetiology of 'pubalgic' groin pain is multifactorial. It may come as a consequence of acute injury, or more commonly as an overload of the soft tissue or bony structures around the pelvis. A combination of restricted hip motion and weakness or inflexibility of the adductor and lower abdominal muscles causes increased shear forces through the pelvis with direction change activity. Subsequent overload may lead to pain from the adductor, illiopsoas or conjoint tendons, or the pubic symphysis. Pain then causes further soft tissue dysfunction, causing a further deterioration of symptoms.

Diagnosis:

Historically the pubalgic causes of groin pain will tend to be worsened by running with direction change, and are more common in young men. As the problem in osteitis pubis is bony, the patient usually complains of a deep aching pain during and after activity. Lower abdominal problems may be aggravated by coughing or sneezing. Older patients are more likely to have degenerative hip disease.

In adductor tendinopathy the patient will have tenderness over the bone/tendon interface or pain on resisted hip adduction. Osteitis pubis may be diagnosed by a positive 'squeeze test', causing either pain or adduction weakness. Lower abdominal problems may be provoked by abdominal testing, such as resisted sit-ups. Hip joint problems may be reflected by loss of hip motion, especially in rotation, flexion and abduction. The 'hip quadrant' or FADIR test is sensitive for early osteoarthritis or an acetabular labral tear.

Investigation

A plain x-ray is essential to demonstrate hip arthritis or other pathology such as a stress fracture. It will also show erosions around the pubic symphysis in osteitis pubis. MRI is helpful to assess the spectrum of pathology, including adductor or illiopsoas tendinopathy and may demonstrate bone marrow oedema or degenerative changes in osteitis pubis, or hip joint pathology such as early osteoarthritis or acetabular labral tears. Sports hernias are diagnosed most accurately by ultrasound performed by an experienced radiologist.

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Treatment:

The treatment for all causes of pubalgic groin pain is similar and is initially non-surgical. Generally it is favorable, although may run a protracted time course. It involves unloading the groin from impact and direction change sports. Physiotherapy is essential to release the soft tissues of the adductors, hip flexors and gluteals and to improve hip joint mobility. A program of strengthening for core musculature, gluteals and adductors is also required. In one trial for adductor tendinopathy an 80% improvement occurred in patients treated with an exercise program compared to 15% of those treated with passive therapy alone (1). Injections of either corticosteroids or other agents may be an adjunct to the physical program in adductor tendinopathy. A return to training program is guided by improvement in clinical symptoms, but may take many months, especially in osteitis pubis. If symptoms are not settling then surgery in the form of an adductor tendon release or a hernia repair may be indicated.

Key Points

- Groin pain usually occurs in sports that require running and direction change, such as soccer and AFL
- A key differentiation is between 'pubalgic' and 'non-pubalgic' pain.
- Common causes of pubalgic pain are adductor tendinopathy, osteitis pubis or 'sports hernia'
- The most common source of non-pubalgic pain, and of groin pain in general, is the hip joint
- Pubalgic groin pain requires a comprehensive rehabilitation program. The time course may be lengthy, and surgery is occasionally required.

References

1. Hölmich P, Uhrskov P, Ulniths L, et al. Effectiveness of active physical training as a treatment for long-standing adductor-related groin pain in athletes: randomised trial. Lancet 1999; 353: 439-443.

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The Hip – Arthroscopy to Joint Replacement

Hip Anatomy

- The Hip Joint is a major weight bearing joint in the lower limb. It is basically a ball and socket joint. The ball is on the top of the femur and the socket is in the pelvic bone.
- Both of the articulating parts of the bone are lined by articular cartilage.
- Around the rim of the acetabulum is a fibrocartilaginous lip known as the labrum.
- The function of the labrum is to deepen the acetabulum. It deepens the acetabulum by approximately 20%.
- It creates a seal in the hip joint which maintains the hydrostatic pressure within the joint thus lubrication of the joint is enhanced.
- As it produces a seal it also maintains negative pressure within the joint and increases joint stability.
- It reinforces the acetabular rim and protects the edge of the articular cartilage.
- Tears to the labrum do occur and tears can be symptomatic.
- Tears can be caused by trauma either acute or repetitive. Repetitive trauma could be due to sport or deformity of the acetabulum such as CDH.

Femoro-acetabular impingement:

A large number of tears are due to a condition called femoro-acetabular impingement. Approximately 50% of labral tears are associated with FAI.

FAI is a condition in which the femoral neck impinges against the rim of the acetabulum and hence the labrum.

There are basically two types of femoro-acetabular impingement. One is the the pincer type and one is the cam type.

Pincer Type:
In the pincer type the acetabulum is excessively retroverted or too deep such as in protrousio acetabulae which results in the femoral neck impinging against the rim.

Cam Type:
In the cam type there is no dysplasia of the acetabulum but there is an anterior bump on the femoral neck which could occur as the result of a slipped epiphysis, an old fracture or sometimes just a lump that forms in the front of the neck of unknown cause.

This results in premature impingement of the anterior part of the femoral neck against the rim of the acetabulum resulting in a cam type movement of the hip joint.

Labral Tears:

Patients with labral tears that are symptomatic present with groin and buttock pain, sometimes associated with clicking and locking.

Stiffness is also a symptom but as most of these patients have had the symptoms for such a long period of time they think its normal.
If you ask the patients carefully then many will admit to stiffness following sport which they always put down to muscle stiffness and difficulty sitting on the floor with friends in the so called lotus or idiot position.

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The sign of a labral tear or impingement is restricted range of movement particularly internal rotation in flexion. Often there is the positive impingement test in which their pain is reproduced when forced flexion is combined with the internal rotation of the hip joint.

Investigations:

Any patient particularly in the young group who presents with groin pain and a slightly irritable hip and investigations show no evidence of arthritis or other pathology then one must look at the possibility of a labral tear.

Investigations of these types of patients include firstly an x-ray. The purpose of the x-ray is to look for other causes of the groin pain such as evidence of osteoarthritis, inflammatory arthritis, tumors or fractures.

Its also important to look for pathological anatomy that may predispose to impingement such as protrusio or retroversion of the acetabulum, or an anterolateral femoral head neck junction bump.

Bone scans are important to exclude arthritis and other pathology.

MRI is indicated again to exclude other pathology. Sometimes the bump is not visible on plain films and is more obvious on the MRI. It is good for accessing chondral damage and if a contrast enhanced MRI is performed then the labral tear is often visible.

It is important to remember that MRI for labral pathology has a sensitivity that varies between 30 to 90% and unknown specificity. It is known that something like 20% of asymptomatic patients will have a labral tear.

Treatment:

It is important to realize` that a patient can have a labral tear without pain and it is important that if treatment is to proceed that the symptoms and signs fit with the labral pathology.

As there are false negatives for MRI young patients who present with groin pain and an irritable hip and there is no evidence of other pathology then they can have a labral tear that is not showing up on the MRI and treatment would be justified.

Not all patients with labral tears require treatment. Certainly asymptomatic labral tears require no treatment. If the labral tear is symptomatic then non operative treatment should be tried first. This involves stretches, modification of activity particularly to avoid activity that involves force flexion combined with internal rotation and adduction of the hip. Analgesic and non-steroidal anti-inflammatory medications are worth trying.

There are many patients that have only a small amount of intermittent pain and tolerance of the pain is an option. In more symptomatic patients an injection of steroid into the joint can be both therapeutic and diagnostic.

If the pain is intolerable and the first line of treatment that is non operative treatment fails to work then surgery could be considered.

Surgery:

The surgery will involve repair or resection of the labrum and correction of the pathological anatomy.

Degenerate tears are in general not repairable and should be resected. Traumatic tears should be repaired.

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Correction of the pathological anatomy would involve either resection of the acetabular margin or removal of the anterolateral head neck junction bump.

Surgery can be performed open or arthroscopic but as almost all of the surgery can now be performed athroscopically, arthroscopic surgery is the preferred method.

The surgery does involve a general anaesthetic. It is done on a traction table and involves distraction of the hip and x-ray image intensification.

Post operatively treatment will depend on what surgery was performed. If there has been no bony surgery and a degenerate labrum has been resected there is really nothing to protect and the patient can weight bear as tolerated and return to activity as their pain subsides.

If a labral repair has been performed then for the first six weeks the repair needs to be protected and the patient needs to be partially weight bearing on crutches.

For three to six months following the repair they should undergo a strengthening and fitness program and return to sports after a period of six months.

If bony resection particularly of the femoral neck has been performed this needs to be protected. Unrestricted activity may result in a pathological fracture through the osteotomy and the femoral neck.

Summary:

Femoro-acetabular impingement results not only in labral tears but chondral damage.
This chondral damage will result in premature osteoarthritis.

It is important to realize that femoro-acetabular impingement is the most common cause of early onset idiopathic osteoarthritis.

One must realize that arthroscopic surgery will not deal with chondral pathology. Once there is significant arthritis or chondral damage in the joint then arthroscopy is not indicated.

Therefore even if there is a labral tear in the presence of significant osteoarthritis then dealing with the labral pathology will not be beneficial.

In well selected patients 80% of labral repairs and bony resection will obtain a good to excellent result and 80% able to return to their sport. There is little evidence to suggest at this stage that correction of the pathology either prevent or slow the progression of arthritis. We do know however that there are poor results of arthroscopic surgery of the hip if osteoarthritis is present.

In a patient in which there is significant osteoarthritis then arthroscopy is not indicated.
The treatment of the arthritis will initially be active in modification weight loss analgesic medications and non steroidal anti inflammatory drugs.

If the pain becomes intolerable then surgery would be indicated.

These days with modern hip replacements the surgical option of choice would be total hip replacement.

It is important to remember and to explain to the patient that the difficulty of THA surgery does not increase with severity of the disease. The results of the surgery independent of the timing of the surgery and that the complications rates do not significantly increase with age. It means that the only indication for total hip replacement is pain that justifies going through major surgery. This decision is left to the patient.

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In younger active patients who are undergoing hip replacement uncemented protheses are generally recommended. It is important to pick a good bearing surface either ceramic on ceramic or one of the new highly Xlinked polyethylenes.

If young patients are to undergo total hip replacements then regular surveillance is important. This would involve an x-ray every two to three years looking for pre mature wear or bony pathology in particular particle induced granuloma.

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Spine Surgery: Where is the evidence?

Herniated Lumbar Disc

Classic Paper by Henrik Weber, 1982 Volvo Award in Clinical Science:
280 patients with sciatica and disc herniations, of which 67 were treated with surgery, 87 non-operatively and 126 patients randomized. Of the randomized patients, the surgically treated showed statistically significant better results at one year. At four years the difference was no longer significant.

Spine Patient Outcome Research Trial (SPORT), 2009

Prospective randomized 501 patients in 13 US clinics as well as an observational cohort of 743 patients in surgical and non-operative treatment.
Outcomes were assessed using Oswestry Disability Index and SF 36. At 4 years the patients who had surgery did better on all primary and secondary scores, except work status.

Degenerative Spondylolisthesis

Cochrane Review, 2005
Meta analysis concluded that there was limited evidence to support some aspects of surgery for degenerative lumbar spodylolisthesis.

SPORT 2009
Randomized 304 patients into non-operative and surgical group.
Surgery consisted of laminectomy with or without fusion. The surgically treated patients had a substantially more pain relief.
A further analysis looked at the types of fusion: posterolateral, pedicle screws, screws and Interbody cages. At 4 years there was no significant difference.

Chronic Low Back Pain

Classic Paper by Peter Fritzell, 2001 Volvo Award in clinical Studies:
Randomized controlled study of 294 patients with chronic pain (mean duration 8 years) and had radiographic changes at L4/5 and or L5/S1.
19 spine centres, 1992 till 1998. 222 treated surgically and 72 non-operatively.
In the surgical group back pain reduced by 33% and in the non-operative group by 7% only. In the surgical group 63% rated themselves at “much better” or “better” compared to 29% in the non-operative group. 36% of the surgical group went back to work versus 13% in the non-operative patients.
The authors concluded that in a well-informed and selected group of patients with severe CLBP lumbar fusion can diminish pain and decrease disability more efficiently than non-operative treatments.

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Degenerative Lumbar Spondylosis

Cochrane Review by Gordon Waddell, 2008, a Meta-analysis of the literature.
31 RCT were included and studied in great detail.
The authors observed that instrumentation improves the fusion rates, but increases costs and complications. Instrumentation makes it more difficult to assess the fusion and the clinical outcomes improved only marginally. The studies did not show an advantage of anterior, posterior or circumferential fusion.
The authors conclude that there is limited evidence to support some aspects of surgical practice for degenerative lumbar spondylosis.

NOTES |

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Conservative management of sub acromial pathology

Patients with sub-acromial pathology (impingement) usually present with a history of

- Shoulder pain (deltoid region)
- Stiffness (a stiff shoulder is a painful shoulder)
- Loss of function (Range of Motion)

A thorough clinical examination is essential in the diagnosis of subacromial impingement. This requires the usual sequence LOOK, FEEL, MOVE, and include:

- Active Range of motion (Elevation, Abduction, Internal and External Rotation)
- Passive Range of Motion
- Power (Resisted IR, ER and abduction (empty can manouvre)
- Impingement (Hawkins and Neer signs)
- Biceps signs (Speed's test)

SUB-ACROMIAL IMPINGEMENT IS A CLINICAL DIAGNOSIS, not an Ultrasound report

The **conservative management** of sub-acromial pathologies includes

- Subacromial impingement (tendonitis, bursitis, tendinosis)
- Partial thickness of the rotator cuff
- Full thickness of the rotator cuff provided that there is good function

The **goals of treatment** are mainly three

1. To improve efficient humeral depression (without Deltoid activation)
2. To decompress the subacromial space (reduce inflammation)
3. To prevent impingement

Rehabilitation stages

1. Restore the range of motion
2. Strengthening programme, including scapular stability and postural work
3. Functional activities for ADL, Sport

The *initial stage* includes a period of relative rest (two weeks), where aggravating activities are avoided. The shoulder should not be immobilised as there is a risk of developing shoulder capsulitis. Antiinflammatory medications and subacromial injections of cortisone are important features when not contra-indicated for other reasons (such as a history of side effects).

Physiotherapy initially includes anti-inflammatory measures, passive ROM exercises (pendulum) and gentle stretching of the rotator cuff and glenohumeral joint capsule, but not anteriorly.

The *second stage* includes a strengthening programme for the rotator cuff, as well as postural training. The latter is important in educating the patient to prevent recurrences. It includes sitting and standing posture training as well as advice and/or assessment of ergonomic arrangements at work and in the home

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The **strengthening programme** comprises three aspects:

1. Eccentric Rotator Cuff strengthening (supra- and infraspinatus, Teres minor)
2. Concentric/eccentric Scapular stabilisers strengthening (Middle and Lower Trapezius, Rhomboids, Serratus Anterior)
3. Posterior shoulder stretching

Our simple management paradigm

1. Unless there is an indication for initial surgery (such as sudden loss of power following trauma such as a fall or heavy lifting) patients are treated initially with
2. Conservative management
    a. Monthly injections of cortisone (usually 3)
    b. NSAIDS
    c. Physiotherapy as described above
3. Should this approach fail (continuing symptoms or insufficient improvement), surgical alternatives are then considered. These vary from arthroscopic acromioplasty to rotator cuff repair and biceps tenotomy or tenodesis

Cortisone or PRP (Platelet Rich Plasma)

The purpose of injecting subacromial cortisone or PRP is different. Cortisone is an anti-inflammatory, whereas the purpose of PRP is tissue regeneration/healing. The mechanism of action is thought to be to increase the concentration of growth factors.
There is anecdotal evidence of good results, but there are no large studies that demonstrate the effectiveness beyond doubt.
On the other hand, there is evidence of increased presence of growth factors in the subacromial space following arthroscopic acromioplasty

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ROTATOR CUFF TEARS - WHO NEEDS SURGERY?

What do we know:
- Many older people have RC tears
- Many people with RC tears have no pain and full or near full function
- Non operative management gives good outcome in many
- Risk of developing arthritis small
- Surgery fails to repair the RC in up to 40% of cases yet many of those have no pain and good function
- Larger tears will get bigger with time

Incidence of RC Tears:
- 10% to 40% of 60 year olds have R.C. tears
- 50% to 75% of 70 year olds have RC tears
- MOST ARE ASYMPTOMATIC.

Results of Non Op Treatment:
- ITOI (clin orthop 275;165, 1992) - **83% good or excellent**
- BROWN (JBJS 31B; 423,1949) - **87% good**
- TAKAGISHI (J. jpn orth assn 52; 1978) - **44% good**
- HAWKINS (clin orthop 321;178,1995) - **58% satisfactory**

Results of Operative Treatment:
- SONNABEND (jses 3;201, 2002) 710 open cases only, 88% patients satisfied
- BOILEAU (arth 23;4 , 2007) 597 arthroscopic cases only, 94% excellent results, but only 75% of cuffs repaired on arthrogram

Operative treatment fails because of failure of RC healing capacity – POOR BIOLOGY

Several studies have been unable to determine who will benefit from nonop treatment based on:
- Rotator Cuff strength
- Symptom duration
- Functional impairment

Biomechanical Rationale for treatment of Rotator Cuff Tears:
- S. Burkhart Arthroscopy 10 (1) 4, 1994

"Functional" Rotator Cuff Tear:
- Anatomically deficient
- Biomechanically intact

Patient has a RC tear but has no pain and good function

Tear is not the cause of pain!!!!!!
<u>Pain is caused by:</u>
- Impingement
- Edge of tear instability
- Synovitis
- Capsulitis
- Biceps / s.l.a.p.

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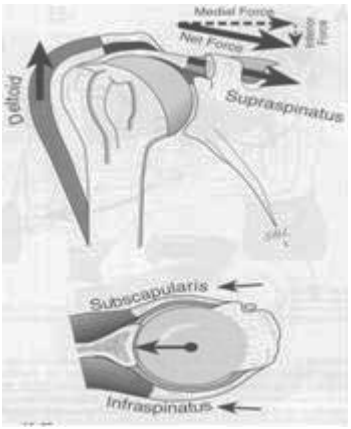
Loss of function caused by:
- Tear location and to a lesser extent tear size
- Loss of force couples where humeral head cannot be kept centred in glenoid

Force Couples keep humeral head centred in glenoid:



Coronal Plane
- Deltoid (D)
- Inferior part of Rotator Cuff (C)
  - subscap and infraspinatus

Transverse Plane (most important)
- Subscapularis (S)
- Infraspinatus & T. Minor(I)

Rotator Cuff Cable:
- Cable area 3 x as thick as rotator cuff
- Thickening acts as suspension bridge and reduces risk of tear extending

A Stable Fulcrum Kinematic Pattern must exist:
- Location of tear is more important than size
- Tears involving supraspinatus plus a portion of infraspinatus fit this pattern providing the tear is within the RC cable
- Rest of infraspinatus balances subscapularis and pulls the humeral head inferiorly and into the glenoid

Clinical Implications:
Normal function will occur with unrepaired R.C. tears when
- Force couples intact (humeral head can be kept adjacent to glenoid)
- Rotator cable intact AND pain relief can be achieved

Examination Essentials:
History:
- Dislocation (in older patient)
- Symptom severity
- Loss of function

Examination:
- Bruising
- Profound loss of r.o.m.
- E.R. power
- Lift off test

Investigations:
- xrays
- ultrasound
- arthrogram
- M.R.I. with INTRAARTICULAR gadolinium.

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Absolute Surgical Indications:
- Young patient (less than 50 years) - tear is likely to get bigger
- Patient involved with heavy or overhead occupation – tear likely to get larger
- Following dislocation in older patient (usually large tears)
- Acute & very large tears – NO ER POWER

Relative Surgical Indications:
- Older patient (50 yrs plus) based on loss of e.r. power & function, plus MRI – **force couples disrupted**
- Chronic and large tear in older patient with disability and good quality RC on MRI and failure of conservative treatment
- Failed non operative management

Nonop Indications:
- Patients over 50 years with small tears and low demand on shoulder and with **force couples intact**
- Patients older than 65 years with RC tear and good function even if **force couples not intact**
- Large tears with poor quality RC

Non Operative Treatment:
80% to 90% successful over 3 months
- Monthly subacromial cortisone injections
- NSAIDs
- Physiotherapy
  - capsular stretches
  - strengthening

(do not forget scapula stabilisers)
- Avoid heavy lifting & overhead activity

My Operative Technique of Choice:
<u>Arthroscopic Repair:</u>
- Tear under 4 cm
- Good quality RC

<u>Open RC Repair:</u>
- Tear over 4 cm
- Subscap tears
- Significant RC degeneration & laminations

My Operative Technique of Choice:
Lattisimus Dorsi/ Pec Major Transfer
- Young patient with massive tear

Reverse shoulder replacement
- Cuff tear arthropathy
- Old patient with massive irrepairable tear, poor function plus severe pain (limited goals)

The Future:
Biological stimulation of tendon to bone healing – PRP, Growth Factors, DBM, LIPUS & stem cells.

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Rehabilitation Post Rotator Cuff Repair

Same for open, arthroscopic, partial thickness

0 – 6/52

- Sling no shoulder exercises

6/52 -12/52

- Active assisted ROM exercises.

12/52 – 24/52

- Theraband strengthening – Rotator cuff and scapula stabilizers

  Light (yellow) 4/52
  Medium (red) 4/52
  Heavy (green) 4/52

24/52

- Free weights, swimming (initially breast stroke),
- graduated return to normal activities.

Note:

- Avoid strengthening at or above shoulder height for 6/12
- If painful drop band strength or decrease reps
- No free weights for 6/12
- No ROM including pendular ex for is 6/52 – no dif for ROM, increased failure rate (Bradford et al J. Shoulder Elbow Surg 2010 19, 1034 – 1039)
- Repair maximal strength at 6/12 function improves for 18/12 (Kyoung Houn Koh et al J. Shoulder Elbow Surg 2012 21, 859-866

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Reasons for Slow Recovery:

- Large normal variability
- Compliance
- Failure
- Adhesive Capsulitis
- Pain syndromes
- Suprascapula Nerve palsy
- Severe rotator cuff atrophy

NOTES |

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Meniscal Repair

The meniscus works like a shock absorber in the knee, assists with lubrication of the joint and helps to stabilise the knee. Most meniscal injuries are from a twisting type movement of the knee. Unfortunately the meniscus has a poor blood supply and it therefore has a limited potential to heal.

Injury to the meniscus and even partial loss of meniscal function significantly alters force transmission across the knee. This allows arthritis to develop in the knee over a very long time period (the severity and timing of the resulting arthritis depends on your age, activity levels, body weight and degree of meniscal damage). Damaging your lateral meniscus has a much poorer long term prognosis than damage to the medial meniscus.

Most patients with a repairable meniscus are under 45 years of age and up to 80 percent of these are associated with a tear of the anterior cruciate ligament. Isolated tears in young patients can result from a specific high energy twisting incident but older patients may develop symptoms just standing from a chair.

The **clinical features** of a meniscal tear can be variable with all or none of these features being present:

1. History of sports related injury
2. Pain not allowing further movement or game play
3. Pain localized to the anteromedial joint line (medial meniscal tear - the pain that occurs with a lateral tear is far more diffuse)
4. Locking or catching of the knee
5. Swelling can appear hours after the injury but the knee does not always swell with an isolated meniscal tear
6. Initial symptoms are relieved by rest
7. Symptoms reappear after trivial twists or strains of the knee

Signs:

- The knee may be held slightly flexed
- An effusion may be present
- Localized tenderness over the medial joint is typical of a medial meniscus tear; tenderness on the lateral side is less well-localized;
- Extension is often limited; flexion is generally not reduced
- McMurray's test may be positive
- Quadriceps muscle will be wasted in long-standing cases

Investigations

A plain Xray of the knee is always performed. This includes a weight bearing AP, Lateral, Notch view and Skyline patella. This will exclude fractures, OCD, arthritis or tumours.

If the diagnosis is not clear a MRI scan may be helpful but is not always useful in deciding on treatment (and may delay things unnecessarily). *MRI scan findings should be closely correlated with the patient's symptoms and signs as up to one third of meniscal tears present on MRI are asymptomatic.*

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An MRI scan helps determine the extent of the tear but the final decision whether to repair or not can not be made until the time of surgery as it depends on the size, site and the quality of the remaining meniscus.

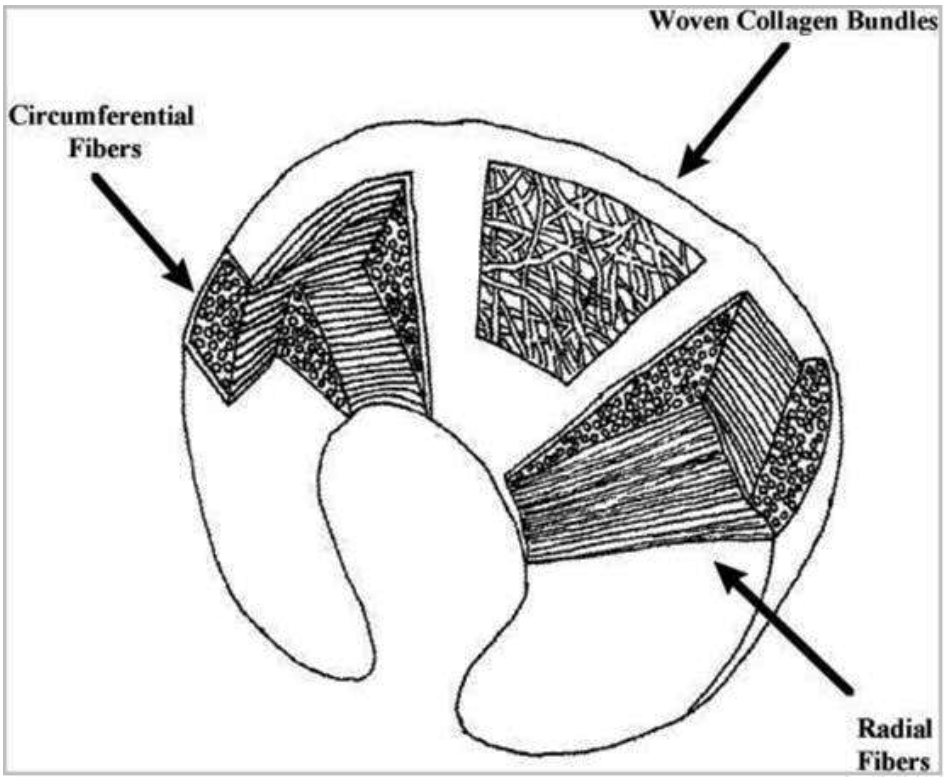
Meniscal Anatomy

The menisci are 70% water and 30% organic matter (which is 75% collagen). Most of the structural scaffolding is Type I collagen (hyaline cartilage is mainly type II collagen) but there are fibrochondrocytes in the extracellular matrix. Three collagen fiber layers are specifically arranged to convert compressive loads into circumferential or “hoop” stresses.

(1) In the superficial layer, the fibers travel radially, serving as “ties” that resist shearing or splitting. (2) In the middle layer, the fibers run parallel or circumferentially to resist hoop stress during weight bearing. (3) Lastly, there is a deep layer of collagen bundles that are aligned parallel to the periphery.

The glycosaminoglycans (GAGs) make up only 1% of the wet weight of the meniscus but contribute most to its material properties, such as tissue hydration, compressive stiffness, and elasticity.

Meniscal shock absorption is time dependent due to the exudation of water out of the extracellular matrix. The exudation of water from the GAG substances provides not only compressive stiffness but also joint lubrication as water is forced into the joint space. Meniscal tissue also displays the time-dependent viscoelastic property of “creep,” deforming over time when loading occurs with greater frequency or duration. lastin, which constitutes less than 0.06% of meniscal tissue, is believed to aid in the recovery of shape after load deformation.



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Types of Tears

While there are other possibilities the two common forms of meniscal tears are:

- **Bucket handle** –This is often a larger tear that is amenable to repair.
- **Degenerative** – The tear starts at the inner edge and works its way back. This causes a horizontal tear which is not repairable.
- Symptomatic degenerative tears are best treated with a partial menisectomy but in younger patients every effort should be made to repair the meniscus where possible.

Repair or Resect?

- When assessing a meniscal tear to decide if it is repairable we look at the location of the tear, the type of tear and its related blood supply. Three zones determine the healing prognosis for meniscal lesions: red-red, red-white, and white-white.
- The red-red zone is fully vascular and therefore has an excellent healing prognosis. The red-white zone is at the border of vascular supply and has a generally good healing prognosis. The white-white zone is relatively avascular and has a poor prognosis for healing.
- Meniscal repair procedures are divided into 2 major types: open and arthroscopically assisted. The location of the tear will determine which technique is used.

Rehabilitation after a meniscal tear can take up to 6 months to complete but is well worth the effort as it protects the knee from arthritis in the long term. The success rate of the surgery is about 85%.

Generally speaking younger patients should be referred early for surgery as the results of repair are better if performed soon after the injury.

The Future

Since areas with poor blood supply do not heal well, attempts are being made to enhance healing. These methods include: fibrin clot injection, vascular access channel creation and synovial abrasion.

Fibrin Clot

A fibrin clot can be injected into the meniscal lesion to promote healing through hematoma chemotactic factors.

Vascular Access Channels

Vascular access channels (trephination) are tunnels created from vascular portions of the peripheral meniscus (red zone) to the more central avascular area (white zone).

Synovial Abrasion

Abrasion of the synovium with a surgical rasping device activates chemotactic factors that stimulate meniscal healing. Synovial cell migration to the meniscal defect may enhance healing

Lasers

Lasers can be used for ablation or destruction of damaged meniscal material. They are thought to work via photothermal, photochemical, and photomechanical mechanisms but the exact reason for their effectiveness is not actually known.

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Meniscal Reconstruction
A meniscal allograft is donated from a cadaver and transplanted into an injured knee. This is usually only done if the patient has ongoing symptoms with their day to day activities several months after their initial surgery. There are 4 types of meniscal allografts: fresh, deep frozen, cryopreserved and freeze dried. In Australia all grafts are irradiated by law which changes their mechanical properties. Results of this type of surgery have been disappointing but if new methods of sterilization (super critical) are approved in Australia this will become a viable option.

Meniscal Regeneration
Collagen scaffolds may eventually provide the properties necessary for fibrochondrocyte ingrowth to facilitate meniscal regeneration in humans. Histologic studies have shown variable results and further clinical trials are needed to decide if this is a good or bad idea.

Rehabilitation
Return to full activities after a menisectomy usually takes about 6 weeks. Patients typically walk out of hospital and do not require crutches or splints.

After a meniscal repair patients are typically placed in a splint and given crutches for balance but are asked to fully weight bear through the operated leg. At four weeks the splint is removed and range of motion exercises are started. Straight line running is achieved at 3 months and return to side stepping sports, squatting and twisting achieved at 6 months.
Patients who undergo combined ACL reconstruction and meniscal repair can safely follow the same accelerated protocol as patients who only undergo ACL reconstruction.

SUMMARY

Historically, the lack of understanding of the function of the meniscus resulted in its total removal when it was injured. Unfortunately this led to a generation of patients with medial compartment OA. Increased preservation of meniscal tissue has led to less long term arthritis. We now remove as little tissue as possible and repair the meniscus to preserve its function when we can.

We are working on meniscal replacement tissue but so far none of the materials tried are as good as being able to repair the patients own meniscus.

Rehabilitation after a meniscal tear can take up to 6 months to complete but is well worth the effort as it protects the knee from arthritis in the long term. Generally speaking younger patients should be referred early for surgery as the results of repair are better if performed soon after the injury.

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Return To Sport After Knee Injury

The nature and severity of knee injuries in sport are as varied as our patients who participate. Re-injury rates following return to sport after knee injuries are high – 30% within 3 weeks, 15% within 12 weeks.

Once an accurate diagnosis and management plan is established, our aim is to allow our patients to return to their pre-injury levels of sport / physical activity, whilst minimising their risk of re-injury.

The presentation will offer an approach whilst considering **three clinical scenarios**:

Case 1 - Little Johnny is now 15years of age, weighs 85kg and has started his second year of rugby. He suffered a traumatic patella subluxation during game 2 of an 8 game season. He loves playing in the front row. His father played in the front row; his mother loves music and languages.

Case 2 – Bridget is a healthy 46 year-old mum who is recovering from a partial medial meniscectomy after a skiing injury. She was noted to have grade three medial and patello-femoral chondral changes at arthroscopy. She is desperate to get back to tennis with her kids and girlfriends. There is a family history of OA.

Case 3 - Mark Quay, 23, plays in the NRL. He is a star halfback who suffered a moderate grade MCL sprain 2 weeks before the semi-finals. At 2 weeks he can run in a straight line comfortably. His team need him for a knock-semi-final. The coach calls you twice daily to check his progress.

1. Understanding the Issues – create your own approach

- The Injury and the player / patient
    - Diagnosis – Pathology**;** Grading / Severity**;** Past History
- The Sport
    - The demands**;** Experience**;** External Factors
- The Assessment
    - Physical – functional testing: office and field test
    - Non-physical**:** Psychological**;** Economic**;** Nutritional
- The Advice

2. A Simple Approach: Guidelines for Safe Return to Sports (AOSSM)

- Pain free; no swelling; full range of motion (compare the injured part with the uninjured opposite side)
- You have full or close to full (90 percent) strength (compare with the uninjured side)
- Full weight bearing on injured knees without limping
- Take extra care with the injured part for several months due to balance or strength deficits.

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3. An Approach – BWH, Harvard Medical School, Boston, Mass, USA (Summary - abbreviated)

Phase 1: Functional Balance and Core Strengthening:

- Enhance single leg weight bearing strength at varying angles of knee flexion.
- Improve side-to-side symmetry in lower extremity running mechanics.
- Lunges; Single leg squatting; Treadmill training with a mirror; Balance activities (level surface, uneven surfaces, soft surfaces).
- Criteria to progress to Phase II:
- Able to single leg squat to 60 degrees knee flexion and hold for at least 5 seconds.
- Symmetry in running mechanics on a treadmill (10-15kph).
- Acceptable single leg balance performance involved extremity compared to uninvolved.

Phase II: Functional Strength

- Improve lower extremity strength.
- High intensity balance training activities and begin perturbation training.
- Criteria to progress to Phase III:
- Side to side symmetry in peak torque knee flexion and extension.
- Single-limb peak-landing-force symmetry on a 50 cm hop (less than 3 times body mass and within 10% in side-to-side measures).

Phase III: Power Phase

- Improve lower extremity muscular endurance and biomechanics during plyometric activities.
- Mid-level intensity double-limb plyometric jumps.
- Low-level intensity single-limb repeated hops.
- Criteria to progress to Phase IV:
- Single-leg hop for distance (within 15% on uninvolved side).
- Single-limb crossover triple hop for distance (within 15% on uninvolved side).
- Single-limb timed hop over 6 meters (within 15% on uninvolved side).
- Single-limb vertical power hop (within 15% on uninvolved side).

Phase IV: Sport-Specific Symmetry

- Equalizing ground reaction force attenuation strategies between limbs.
- Improving confidence and stability with high intensity change of direction activities.
- Improving and equalizing power endurance between limbs.
- Power, cutting and change-of-direction tasks that are modified to the athlete's individual sport.
- Provide verbal and visual feedback to assist the athlete develop safe biomechanics during plyometric moves.
- Criteria for integration back to sports (field testing within 10-15% other side):
- Drop vertical jump landing force bilateral symmetry (within 15%).
- Modified agility T-Test (MAT) test time (within 10%).
- Single-limb average peak power test for 10 seconds

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