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Time	Event	Who
07:30 – 08:00	Registration	
08:00	Welcome Message	Dr Doron Sher
	Sciatica	Dr Paul Annett
	When Sciatica is not Sciatica	Dr Mel Cusi
	Upper Hamstring Syndrome	Dr John Best
	Panel Discussion	
	Scaphoid Injuries	Dr Kwan Yeoh
	Peroneal Tendon Disorders	Dr Todd Gothelf
	Uses and abuses of MRI in the foot & ankle	Dr John Negrine
	Panel Discussion	
10:15 – 10:50	Morning Tea	
	Rotator Cuff Surgery	Dr Jerome Goldberg
	The Dysfunctional Scapula	Dr Ivan Popoff
	Panel Discussion	
	Computer Assisted Surgery or Navigation	Dr Andreas Loeffler
	High Tibial Osteotomy	Dr Doron Sher
	Panel Discussion	
12:30	Close	

Sciatica

Introduction:

Sciatica is a common and often disabling condition. It has an annual incidence of 1-5%, and a lifetime incidence of 15-40%. There is no sex difference, is rare under the age of 20 and peaks in the 5th decade. Sciatica can be a misleading term to both doctors and patients, often being used to describe any type of pain that occurs in the back, buttock or leg.

Etiology:

The sciatic nerve is formed by the confluence of the L4 to the S3 nerve roots. It courses through the back, pelvis, buttock and into the posterior aspect of the thigh. By definition sciatica is caused by any irritation of the sciatic nerve or its roots. This occurs most commonly in the lower back secondary to a lumbar disc prolapse, but may occur anywhere along its pathway. The L5/S1 disc is most commonly affected followed by the L4/L5 disc. The pain in sciatica may be attributed to either mechanical compression or chemical inflammation of the nerve root. Mechanical compression is more likely to cause loss of neurological function. Other potential sites of nerve compression are in the pelvis, gluteal musculature and upper hamstring.

It is important to consider other causes of buttock and leg pain that may mimic, but are not true sciatica. These may include hamstring origin tendinopathy, gluteal tendinopathy/bursitis, lumbar referred pain, hip joint pathology or sacroiliac joint dysfunction.

Diagnosis:

Historically sciatic pain radiates from the buttock, into the posterior thigh, calf, lateral shin and into the foot. There may be associated para or dysaesthesia. It may or may not be associated with a definite episode, injury or even back pain. It may occur after a lifting incident, although sometimes with a minor movement such as picking up an item off the floor. Pain may be aggravated by sitting, bending, coughing, sneezing or lifting. Symptoms of a cauda equina syndrome such as loss of bowel and bladder function need to be excluded as they constitute a surgical emergency.

Clinically the patient may demonstrate a protective list away from the side of the pain. A detailed assessment will include a full neurological examination, including power, sensation and reflexes. This includes plantar reflexes. Both myotomal and dermatomal abnormalities should be considered. Restriction of lumbar motion with reproduction of radicular pain may occur. The patient should be asked to stand on their toes, heels and squat. Signs of neural irritation, including the slump test and straight leg raise test should be performed. Straight leg raise will generally be limited to between 30 to 60 degrees. Positive cross-over signs (reproduction of pain on passive extension of the contra-lateral leg) are strongly suggestive of true sciatica and generally an indication of a large disc prolapse. Lumbar palpation may not reveal much abnormality. The finding of true neurological loss is a key clinical finding. A thorough examination should include the hip joint, gluteal and hamstring tendons and the SIJ.

Dr Paul Annett

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Sport & Exercise Medicine Physician

**Investigation:**

True sciatica will often be a clinical diagnosis. The natural history is normally favourable, so initial investigation is not always warranted. Imaging may be required if symptoms are not settling, there is worsening neurological function or interventional treatments are being considered. MRI scanning is the gold standard, but a CT scan is a viable alternative if there are issues obtaining an MRI.

Treatment:

As mentioned before, the natural history of sciatica is favourable, with 80-90% of patients settling within a 3 month period with conservative therapy alone. This may include anti-inflammatory medications, physiotherapy and avoiding aggravating activity. Physiotherapy should include a combination of manual or 'hands on' therapy, exercise prescription and lumbar traction. Important exercises should include McKenzie extensions and core strengthening. Patients should be counselled to avoid lifting and positions that aggravate their pain (usually prolonged sitting or bending forward).

Ongoing symptoms may require interventional treatments. A CT guided peri-radicular nerve root injection has a 50% chance of improving pain in sciatica. A partial discectomy may be considered if there is severe and unremitting pain or if there is deterioration of neurological function.

Key Points:

- Sciatica is a relatively common condition
- 'True' sciatica needs to be differentiated from other causes of buttock and leg pain
- The natural history is favorable for resolution within 2-3 months
- Conservative treatment includes rest, anti-inflammatory measures, physiotherapy and possible use of peri-radicular cortisone injections
- Surgery is indicated for intractable pain or worsening neurological function

NOTES:

When sciatica is not sciatica, what do you look for?

Pain in the lower back and buttock, with radiation to the lower limb is not uncommon, and can present diagnostic difficulties.

As the typical presentation of 'sciatica' (from an intervertebral disc hernia) is the subject of a different talk, we concentrate on the differential diagnosis of lower back, buttock and lower limb pain.

Outside the 'perennial' fracture, infection and inflammatory arthropathies, which need to be excluded, three areas are to be considered:

1. Lumbar spine
2. Hip
3. Posterior pelvic structures

Lumbar spine

- a) Facet joint: these can produce local pain, but also neural irritation, and hence mimic sciatica.
- b) Internal disc disruption (annular tears) without nerve root compression. Again, low back pain tends to be predominant
- c) Fractures: in the context of sport, stress fractures of the pars interarticularis (usually L5), and in the elderly or in patients with osteoporosis, insufficiency vertebral body fractures
- d) Spinal stenosis: these patients can present with low back pain which is very low, radiating to either or both lower limbs, and may improve with flexion (like leaning on the shopping trolley). There may be neurological claudication, but it not as evident as in arterial claudication

Hip pathology

Hip disruption can present as buttock pain, but the more typical pain is in the groin, aggravated by loading (stairs), and radiation to the anterior thigh. Flexion is limited (difficulty doing up shoelaces)

On examination loss of internal rotation is usually the earliest sign, even before X-rays show the typical osteoarthritic changes. On examination there is a solid endpoint, and a pain reaction. FADDIR and FABER tests are positive, and there is pain with overpressure.

Posterior pelvic structures

- a) Hamstring origin tears, sprains. These are also considered separately. In children it is important to bear in mind that the weakest link of the chain is bone, hence avulsion of the ischial tuberosity in skeletally immature people is the equivalent of a hamstring tear. These usually heal with rest
- b) Several muscle impingement syndromes have been described (piriformis syndrome, ischiofemoral impingement involving gemelli, quadratus femoris). Whilst they may be present, it is necessary to look for the cause that triggers the overactivity of the relevant muscles
- c) Sacro-iliac joint related pain.

A/Prof Mel Cusi

MBBS, FACSP, FFSEM (UK), PhD

Sport & Exercise Medicine Physician



History:

It generally presents as “hip” pain, where patients grab the pelvic girdle, from dimple of Venus to the groin, including the trochanteric area. Radiation can spread down the posterior thigh to the calf, but does not reach the ankle. It can also spread to the postero-lateral thigh to the lateral aspect of the knee, with very tight ilio-tibial band, with trochanteric bursitis and ITB friction syndrome.

The history normally follows trauma (falls on buttocks, dismounts, landings from jumps or hurdles, or MVA (stationary car hit in the rear, foot on the brake). Symptoms can take a long time to appear -months or even years. Alternatively, post-partum if symptoms last over three months.

The pain is worse with loading activities: sitting, standing, driving, in and out of car, turning in bed and sometimes dyspareunia and urge incontinence

Examination:

The four basic (evidence based) tests for SIJ are

- Stork test
- Active straight leg raise
- Posterior pelvic pain provocation (P4) test
- Tender Long dorsal sacro-iliac ligament (LDSIL) on palpation

In addition, Gaenslen and Faber tests can be useful. The standing forward flexion test may not be evidence based, but it can provide additional information: a positive test suggests that the femoral head does not ‘sink’ in the acetabulum like the normal side, usually because the hip external rotators are overactive, as a compensation strategy to stabilise the pelvis.

Imaging:

The imaging technique of choice is SPECT-CT, which also provides a window on the biomechanics of the pelvis, and confirms the Integrated Model of Function (Lee & Vleeming, 1998). Sub-clinical hamstring and adductor enthesopathy are present in more than 60% of cases, and signs of hip impingement (FAI) are present in three out of four patients. These are considered to be the result of compensation strategies, and point to initial steps in the rehabilitation of these patients.

SIJ incompetence is considered to be a consequence of force closure failure (default position), and hence the first step is to work on a very gradual core stability exercise programme. It needs to be very specific and well coordinated. Compensating muscles need to be down-trained, and postural cues can be very useful. Real time ultrasound training is a very effective teaching tool, but it is not “everything”.

The usual pitfalls are poor exercise technique, excessive activity and premature progression of the exercise programme.

Endurance is all important to ensure appropriate muscle coordination in functional activities (ADL’s and the relevant sport). The Wisbey-Roth scale of core stability is not evidence based, but it is arguably the best and has been used in elite athlete rehab programs overseas.

If a good exercise programme fails to produce the desired results (at least three months are needed), force closure is considered to be the cue. There is evidence of good results with injection of the LDSIL with prolotherapy. There is presently a trial to compare it with injections of PRP in the ligament under ultrasound guidance. Anecdotal evidence suggests that PRP may be a better alternative to prolotherapy in SIJ incompetence of ligamentous origin. In very few cases (<0.5%) SIJ fusion is the only available alternative.

NOTES:

Dr John P Best

*B Med, Dip Sports Med (London), FACSP, FFSEM
Sport & Exercise Medicine Physician*



Upper Hamstring Syndrome (Proximal Hamstring Tendinopathy – PHT)

Overview and terminology:

Buttock pain on or around the greater tuberosity is common in both athletic and less active populations. Dysfunction of the upper hamstring is a common cause and requires careful evaluation particularly when weakness is identified.

This handout and presentation will focus on both subacute and chronic presentations in adults. Most patients present with buttock pain affecting physical activity. The differential diagnosis includes ischial tuberosity bursitis, referred pain (neural / SIJ / ?hip) and piriformis dysfunction. As most subacute cases have existing or develop a degree of tendinopathy, the better diagnostic language is **Proximal Hamstring Tendinopathy (PHT)**.

Presenting Symptoms and Pathology:

Buttock pain and altered physical performance are the main presenting symptoms. In the acute or subacute setting, patients describe sharp pain in the buttock on or slightly distal to the ischial tuberosity. There may have been an associated feeling of tearing or a 'click' noise. The positions and mechanisms usually involve some change in position or intensity (e.g a rugby player leaning in a ruck, a footballer accelerating, the patient slipping).

With the chronic varieties patients are often surprised by how their problem occurred. There may be a prodrome of ache or tightness, or previous injuries. A slow deterioration and inability to load the hamstring is noted – either with power loss or reduced endurance.

ADL symptoms are common. Pain sitting (direct compression) is a common and annoying feature. Painful prolonged sitting with associated compression should not be underestimated as a cause for slower recovery. Cook and Purdam (2009) describe this well in their review of the pathology of tendinopathy. Other ADL difficulties include removing shoes, sitting and leaning forwards, negotiating stairs and, depending on the severity and degree of power loss, walking briskly or uphill.

Prognostically it is helpful to determine the existence of predisposing factors and assess previous treatments and compliance to the same. Risk factors for hamstring muscle strain are well understood (Bourne et al 2015) as are risk factors for tendinopathy. Specific to PHT the key risk factors are – previous hamstring injury, (side-to-side) muscle imbalance and knee flexion strength.

History taking must include the current physical status, previous levels of activity and expectations with recovery. For example, a patient who has pain sitting and climbing stairs with a (level surface) walking tolerance of 30 mins may require 4-8 weeks before they can jog for 20 mins three times per week.

Physical Examination:

Assessing the proximal hamstring and grading the pathology requires experience and very good record-keeping. Recovery from PHT and functional returns are invariably slow, and progressively staged.

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Key physical examination features are summarised:

- standing - active lumbar and hip flexion hamstring stretch, careful dynamic 'flicking, kicking or catching' movements, ?wasting
- walking and squatting - ?antalgic, check Trendelberg
- sitting - ?pain, various stretch tests, knee flexion
- lying – various stretch tests, strength tests through range

Tenderness on the ischial tuberosity and upper hamstring tendon may be found more easily with the patient in the "coma position" painful side up. In addition to the assessment for PHT a brief assessment for lumbo-pelvic and hip pathologies is performed concurrently.

In their blinded assessment of 46 athletes with PHT, Cacchio et al (2012) found that the pain producing tests of Puranen-Orava, bent-knee stretch and modified bent-knee stretch had high reliability and validity. Careful strength testing through range and side-to-side comparison is also helpful to assess progress and compliance to rehabilitation. Giving the patient feedback, educating them constantly and reminding them of their progress will offer great encouragement and enhance compliance on what is often a long and invariable tedious rehabilitation regime. Recently Cacchio, Maffuli et al (2014) developed and published a VISA-H questionnaire for PHT. This is worth considering if your practice is biased towards this condition.

Grading, Imaging and Management:

There is no accepted grading for the PHT but it is helpful to give feedback to patients regarding the severity of their condition, as this impacts their expectation levels. It is important to always offer and consider non-operative treatments even if the patient presents with Grade 3/4 PHT. Many patients have been undiagnosed and mismanaged for months.

The following summarises pathological and clinical aspects:

Grade	Pathology	Clinical Features	Management/ Tests
1	Oedema, mild reactive tendinopathy	Post activity pain	Strength, ?stretch and load management
2	Reactive Tendinopathy	Pre-activity pain, warms up, can complete most of activity	As above. If symptoms >3/12 then MRI or high quality U/S if slim and grade 3 treatment. One-off cortisone injection if oedema noted.
3	Tendon disrepair, degenerative tendinopathy	Reduced power, reduced endurance, unable to run	As above. Tendinopathy management to include PRP options +/- SWT if calcification present
4	Degenerative tendinopathy	Pain with walking, increasing rest pain	As per 3. If symptoms present >6/12 then surgical options to be considered.

References:

Review - Is tendon pathology a continuum? A pathology model to explain the clinical presentation of load-induced tendinopathy. J L Cook, C R Purdam Br J Sports Med 2009; 43 : 409-416
Eccentric Knee Flexor Strength and Risk of Hamstring Injuries In Rugby Union : A Prospective Study. M N Bourne et al Am J Sports Med. 2015 Sep 2.pii:(Epub)
Reliability and validity of three pain provocation tests used for the diagnosis of chronic proximal hamstring tendinopathy. A Cacchio et al Br J Sports Med 2012; 46: 883-887

NOTES:

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Hand, Wrist, Upper Limb & General Orthopaedics



Scaphoid injuries

- **Importance of the scaphoid**

- **Types of scaphoid injury**

- Fracture

- Associated injuries

- ◆ Scapholunate ligament

- Acute vs chronic

Scaphoid fractures

- **Acute presentation**

- History

- Examination

- Investigations

- ◆ Fractured or bruised?

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- **Chronic presentation**

- Other possible causes of pain

- **Long-term sequelae**

- **Management**

- Acute

- ◆ Non-operative

- ◆ Operative

- Chronic

- Salvage


Further reading:

1. Giugale JM, Leigey D, Berkow K, Bear DM, Baratz ME. The palpable scaphoid surface area in various wrist positions. *J Hand Surg Am* 2015, Oct;40(10):2039-44.
2. Symes TH, Stothard J. A systematic review of the treatment of acute fractures of the scaphoid. *J Hand Surg Eur Vol* 2011, Nov;36(9):802-10.
3. Yin ZG, Zhang JB, Gong KT. Cost-Effectiveness of diagnostic strategies for suspected scaphoid fractures. *J Orthop Trauma* 2015, Aug;29(8):e245-52.

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Peroneal Tendon Disorders

Peroneal tendon pathology can be an important contributor to lateral ankle pain. Conditions involving the peroneal tendons include the following diagnoses:

- Peroneal tenosynovitis
- Peroneal tendon tears
- Peroneal tendon subluxation or dislocation

Any of these conditions can occur after a lateral ankle sprain. One should be suspicious of peroneal tendon pathology in patients who have persistent pain after a lateral ankle sprain and fail to recover.

Peroneal Tenosynovitis

Inflammation of the peroneal tendons can occur after injury or can have an insidious onset. Traumatic conditions include an ankle sprain, calcaneus fracture, direct blow, or ankle fracture. Insidious onset may occur due to stenosis of the tendons in the peroneal sheath, due to enlarged peroneal tubercle or a cavovarus, or high arch, inverted foot.

History and Physical Examination: Patients will typically complain of pain along the course of the tendons, worse with activity, better at rest. Persistent pain along the tendons several weeks after an ankle sprain or fracture may indicate a tenosynovitis.

Physical Examination: Tenderness is present along the length of the peroneal tendons, just posterior to the fibula and toward the 5th metatarsal base. Thickening may be present. Pain is present with passive inversion of the ankle or active eversion against resistance.

Investigations:

- Ultrasound - Technician dependent, but very useful to demonstrate tenosynovitis, longitudinal tears, ruptures, or subluxation of the tendon around the fibula. The ultrasound allows for a dynamic examination as well, to better demonstrate dislocating peroneal tendons.
- MRI - Very useful to distinguish partial tears from ruptures or tenosynovitis. Also very useful to demonstrate rupture of the superior peroneal retinaculum in subluxing peroneal tendons. The drawback of an MRI is that it can OVERCALL longitudinal tears due to the *magic angle effect*- a phenomenon where the curving of the tendons causes a grayish appearance similar to that of a tear. MRI is not a dynamic study, so may not demonstrate subluxation or dislocation of tendons.

Treatment: Usually non-operative treatment is successful in treating peroneal tenosynovitis. Immobilisation in either an ankle brace or CAM-walker boot for 3-4 weeks, anti-inflammatories, activity modification, and physiotherapy are initiated. Corticosteroid injections into the peroneal sheath can be both diagnostic and therapeutic. The elimination of pain, even temporarily, can confirm the diagnosis. Recently, PRP injections have been used for tenosynovitis.

Surgical treatment is considered when all non-operative treatments have failed to help the patient after six months. The surgical procedure involves releasing the peroneal sheath at the inferior retinaculum and debridement of the peroneal tubercle. In addition a tenosynovectomy is performed to both tendons. Any low-lying muscle belly of the peroneus brevis is removed as well.

Dr Todd Gothelf

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Peroneal Tendon Tears

Tears of the peroneal tendons can be longitudinal or transverse. Complete, transverse ruptures do occur but are rare. In young, active patients, acute ruptures should be treated surgically. Longitudinal tears can occur after an acute injury or they can be attritional type tears, related to degeneration and tenosynovitis. Peroneus brevis tears are far more common than peroneus longus tears. The locations of tears also differs: Peroneus longus tears often are more distal and located in the region of the os peroneum, whereas peroneus brevis injuries are localized to the distal aspect of the fibula.

Treatment: Non-operative treatment is similar for peroneal tendon tears as with for tenosynovitis. When symptoms are mild, or when the diagnosis is uncertain, these measures should be attempted for longer.

It should be noted, however, that when a tear is strongly evident and symptoms are more severe, conservative treatment has a high failure rate (up to 80%) in many series in the literature.

Surgical treatment involves debridement of the longitudinal tear and circularization of the remaining tendon. The sheath is released to decompress the tendons as well.

Post op Care: My patients are placed immediately in a boot (VACOCast) to immobilize the ankle for six weeks. Weight bearing is allowed after 1-2 weeks, and range of motion of the ankle is allowed after two weeks. Progressive ROM and strengthening is begun at six weeks after surgery. The patient can wear an ankle brace (Air cast AIRSPORT) at six weeks.

Peroneal Tendon Subluxation or Dislocation

Awareness of peroneal tendon dislocation is essential, as it can often be misdiagnosed as a "lateral ankle sprain" This injury occurs with the ankle fixed in dorsiflexion and acute contracture of the peroneal muscles. It is a common injury in snowboarders, but can occur in many sports. Patients often feel a recurring "snapping" sensation at the lateral ankle, representing the dislocating tendons.

Dislocation of the peroneal tendons can be demonstrated during physical examination. The patient is asked to evert the ankle against resistance and the peroneal tendons are palpated. A finger is placed posterior to the tendons and they are forced anteriorly to see if they sublux around the fibula.

Investigations: The physical examination can be diagnostic when obvious. However, if uncertain, an ultrasound or MRI can help to demonstrate subluxed tendons or a disrupted superior peroneal retinaculum.

Treatment: Treatment of this injury, either acute or chronic, is surgical. The injury to the superior peroneal retinaculum, similar to the Bankart lesion in the shoulder, fails to heal resulting in a chronic condition. Surgery involves repair of the superior peroneal retinaculum. In addition, the posterior groove in the fibula is deepened.

Post-op Care: Similar to peroneal tendon tears, my patients are placed immediately in a boot (VACO cast) immobilizing the ankle in a neutral position. Weight bearing is allowed at two weeks. ROM begins at six weeks, and strengthening and proprioception begins at 3 months. Success of this surgery is 90%.

NOTES:

Dr John Negrine

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Adult Foot & Ankle Surgery



Uses and abuses of MRI in the foot and ankle

Never start your talk with a graph or table!

Money spent on diagnostic imaging (MBS):

- 2005 \$1.6 Billion
- 2014 \$3 Billion

Money spent on MRI (MBS):

- 2005 \$120 million
- 2014 \$323 Million

Population 2005: 20.39 Million

Population 2014: 23.9 Million

Background

- Magnetic resonance imaging invented in 1971
- 1980 first clinically useful picture taken
- MRI is exploding 349 scanners in Australia
- The rise in the cost of diagnostic imaging is staggering and unsustainable

How does MRI work?

1. The patient is placed in a magnetic field
2. The protons (hydrogen ions) line up
3. A radiofrequency is buzzed across
4. The protons "rattle"
5. The protons give off an energy
6. That energy is put into a computer to create a picture

Water rich = MRI good

- Cartilage
- Brain/Nerve
- Ligament
- Muscle
- Fat
- Fluids

Water poor = MRI bad

Bone is much better imaged with CT scanning

So what is my point? **Don't order a test unless you know how to handle the result**

Clinical example:

- 25 year old man
- Inversion injury playing soccer
- Hears a snap
- Comes off the field
- Ankle swollen
- Tender anterolateral gutter
- Plain xrays normal
- Can't walk 24 hours later
- MRI complete rupture anterior talo-fibular ligament
- Bone bruise medially
- No chondral damage
- Patient is very worried

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Diagnosis: The patient has a sprained ankle

- 400 people sprain their ankles in Sydney every day
- Most have “normal” xrays
- Most don’t need surgery
- Most will get better regardless of whether or not they see you or me!
- Medicine is a study of probability
- MRI in this situation is not indicated

When do I order an MRI in a sprained ankle?

Failure to progress despite good treatment at 6 weeks

What is the most common reason patient is not progressing??

- Synovitis and irritation rather than locking from a detached osteochondral fracture
- Nerve pain
- Syndesmosis injuries controversial

Midfoot sprain:

- Lisfranc injury
- Suspect
- Standing films
- Treat
- If plain xrays are normal
- I prefer to examine under anaesthesia to determine stability
- MRI confirms injury but does not guide treatment

Interdigital neuroma: Clinical example

- 60 year old lady
- Works as a real estate agent
- 2 years of cramping burning pain in her feet
- Worse in tight/high heeled shoes
- Examination markedly tender at 3/4 interspaces with alteration of sensation at adjacent borders of 3/4 toes
- MRI
- Reported as no neuroma
- Patient gives up work as told “there is nothing that can be done for her”
- Can’t stand in heels for house inspections
- Patient sees foot and ankle surgeon
- From history and examination
- Bilateral 3/4 neuromas diagnosed
- Surgery successful
- Patient happy
- Moral of the story:
- Neuroma is a clinical diagnosis

I use MRI only when the clinical picture is not clear or typical

- Will pick stress fracture/tumour/arthropathy
- MRI excellent tumour examples:
 - Giant cell tumour of the tendon sheath (Pigmented villo nodular synovitis)
 - Schwannoma
 - Synovial sarcoma

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NOTES:

Principles of post operative management following Rotator Cuff Surgery

The success of Rotator Cuff surgery is dependent on many factors. The success of an anatomical repair is quoted as being between 60% and 70%. While surgical technique is very important, other issues can be as important as the surgery including:

- post operative immobilisation
- the correct course of physiotherapy
- activity restriction for 6 to 12 months
- an understanding that the repair doesn't give the patient a normal shoulder and there may need to be a permanent restriction in heavy lifting and sporting activities.

The principles of post operative physical therapy is very much dependent on the pathology present and type of repair, so each program must be individually tailored to the individual patient but the following serves as a general guideline:

- strict sling immobilisation for 6 weeks
- commence gentle ROM exercises at 6 weeks avoiding abduction.
- delay strengthening exercises but can commence them gradually at 6 weeks using Therabands
 - yellow at 6 weeks
 - red at 10 weeks
 - green at 18 weeks
 - blue at 25 weeks
- never use free weights

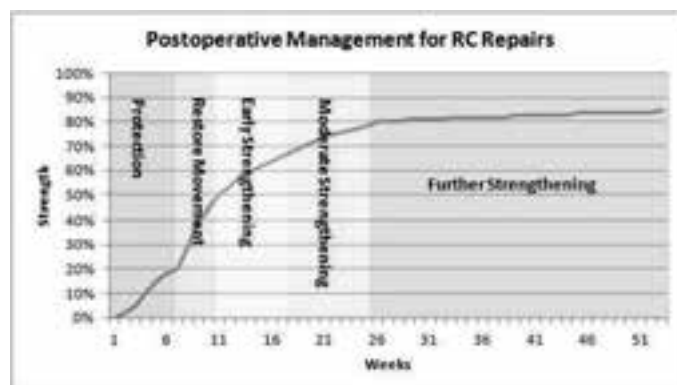
There are several warning signs that need to be noted during the post operative period including:

- infection in first 6 weeks - a high temperature and severe pain
- sudden loss of movement or power
- a sudden increase in severe pain
- a fall on the arm or shoulder

A post operative capsulitis is not uncommon and can be seen as an attempt, which is hormonally induced, to stimulate the repair process. Patients who develop a capsulitis generally get a better long term result than those who do not.

Long term patients who have had a Cuff repair should be encouraged to avoid:

- manual labour
- heavy and/or overhead lifting
- free weights, push ups and pull ups in the gym
- sports that load the should repetitively - tennis, squash and freestyle swimming.



Overdoing weights training in the shoulder of the older patient

During the past 10 years there has been an explosion of older people working out in gyms and under the care of trainers to maintain fitness. Unfortunately, this correlates with a significant increase of shoulder injuries, many of which require surgical intervention. It is important to recognise that structures in the shoulder are subject to ageing and are more easily damaged when excessive loads are applied.



Although the World Health Organization defines “elderly” as older than 55 years, many patients in their 60s and even 70s are commencing weights training for the first time. The use of weights equipment, as a form of resistance training, does have many benefits, if performed correctly. These include: reduced joint pain, reduced falls, reduced fatigue, improved fat metabolism with fat loss, and improved mental health, sleep quality and general wellbeing.

The rotator cuff, in particular, is subject to age-related wear and tear in persons older than 40. The tendinous portion of the rotator cuff is relatively avascular, and gets thinner with age.

Similarly, the labrum and biceps tendon exhibit the same age-related changes. These three structures are subject to damage when overdoing weights training, particularly in abduction and external rotation when weightbearing (e.g. push-ups, shoulder press, bench press and dips) in the person aged 40-plus.

The shoulder is a joint that is surrounded by 36 different muscles and relies on these muscles being “balanced” to function normally and avoid injury. When this balance is altered, for example when one overtrains the pectoral muscles to achieve a better looking body, the shoulder mechanics are altered and the shoulder is more commonly injured. It should be stated that in older patients maintaining strength and muscle tone is a better way to train rather than to ‘bulk up’. Table 1 outlines the differences in typical regimes.

The fitness industry is serviced with a range of personnel of varying levels of training, education and experience. This varies from online personal training certificates completed over a few weeks to undergraduate degrees in exercise physiology, exercise science or sports science.

The older patient would benefit from the expertise of a more experienced trainer. Trainers who are not well trained with older patients don’t always appreciate the challenges with older patients and older anatomy which may lead to significant damage to these ageing and degenerate structures.

The following are ‘danger exercises’ in the older population:

- Chin-ups
- Overhead presses behind neck
- Dips
- Bench press with extension of arms
- Push-ups
- Lateral raises with heavy weights.

Our advice for most people over 40 years:

- Have a program designed by a professional where the goals are clear and the technique is sound
- Avoid the 'danger exercises' if possible
- Keep elbows into the side as this takes the stress off the shoulder structures
- Avoid a wide grip and keep hands close together
- Never do weights where the bar is behind the head
- Use alternate exercises to bench press
- Use machines rather than free weights as these are more controlled
- Stop if discomfort is experienced — "listen to your body"
- See a doctor if you have persistent pain as early intervention gives better outcome
- Avoid doing weights on the same body area on consecutive days.

In summary:

- Care needs to be taken when doing upper body weights training, push-ups and pull-ups in the person over 40 years of age
- Prevention is better than the cure
- People need to have an appropriate program designed for them by a qualified and experienced trainer that strengthens ALL muscle groups and maintains muscle balance.
- Toning rather than bulking is better for the shoulder
- If your shoulder hurts when doing weights then stop that movement
- Early treatment and exercise modification can reduce the damage and avoid the need for surgery.

TABLE 1:

Strength Program Older patient	Purpose	Example
Toning (correct)	Commence weights Develop a base Strength maintenance	3 sets of 10-15 repetitions 3 times / week to start Maintain at twice / week
Hypertrophy (incorrect)	Bulking up Appearance	4 sets of 6-8 repetitions Alternate days 'split' program 3 times/week/muscle group



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The Dysfunctional Scapula

Scapula problems, usually in the form of postural abnormalities and scapula dyskinesia are quite common and may be primary or secondary, with the latter being by far the most common. Scapula dysfunction is common in overhead athletes and swimmers.

The scapula can be considered as the foundation of shoulder function and the loss of a stable foundation can have profound effects on shoulder function and symptomatology.

The only bone connecting the shoulder girdle and therefore the arm with the rest of the body is the clavicle; this effectively functions as a strut holding the shoulder out to length whilst allowing the scapula a wide range of movement via the scapula-thoracic articulation.

In normal elevation of the arm the first 30 degrees of motion occurs solely at the gleno-humeral joint with further movement occurring at both the gleno-humeral joint and the scapula-thoracic articulation at a ratio varying from 3:1 to 5:1. Any persistent variation from this is known as a scapula dyskinesia. Failure of the scapula to rotate will lead to the greater tuberosity impacting on the acromion, resulting in loss of elevation and impingement. This can be differentiated from other causes of loss of active range by the scapula relocation test, where the scapula posterior is corrected by the examiner and the range of motion returns to normal.

The scapula has an ideal resting position, this is where its supporting musculature (trapezius, rhomboids, serratus anterior, levator scapulae etc.) are at their resting length. It is at this resting length that the muscles have their maximum number of actin and myosin filaments engaged, so as to be able to generate their maximum tension (as per the length tension curve).

As the scapula posture moves away from its ideal position some muscles will lengthen, decreasing the number of actin and myosin cross-linkages, and some will shorten, causing congestion of the contractile units. Both actions diminish the muscles ability to generate tension.

Because the mass of the arm doesn't change the muscle has to perform the same work at a mechanical disadvantage. Initially the muscle may hypertrophy but eventually the work required exceeds the muscles' capacity and it develops tetany i.e. spasm.

Over time, the muscles fatigue and the support of the scapula is lost and the scapula assumes a infra protracted posture, effectively hanging by the superior muscles' tendons (the far right of the muscle length tension curve), which develop a traction tendinopathy. The muscles most affected in this process are the superior trapezius, levator scapulae and rhomboids, leading to neck, superior shoulder and medial border of scapula pain.

The abnormal posture of the scapula also affects other structures. The acromio-clavicular joint is placed in an extreme position resulting in pain. This is also true, although to a lesser extent of the sterno clavicular joint. Also, as the scapula protracts, it peels the pectoralis minor away from the anterior chest wall, resulting in supero-lateral chest pain, tightness as well as a traction tendinopathy at the medial border of the coracoid where it attaches.

The infra positioning of the scapula causes the clavicle to drop, potentially compressing the brachial plexus against the first rib, potentially resulting in a thoracic outlet syndrome.

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The “hanging” of the scapula off the cervical spine can lead to facet joint irritation, unilateral cervical pain and stiffness, particularly in the presence of a preexisting spondylosis.

By far the most common cause of primary scapula dysfunction is overuse injuries, such as seen in the overhead athlete, heavy manual workers and office workers with prolonged poor posture and computer use. The only treatment is non operative with appropriate postural retraining, strengthening and stretching exercises. Recovery is quite prolonged as once the abnormal posture becomes encoded at the spinal level it becomes the default position for the scapula.

By far the most common cause of secondary scapula dysfunction is rotator cuff pathology with the development of a hitching scapula to either avoid impingement or to compensate for a deficient cuff.

Another less common but often missed secondary cause is subtle instability of the gleno-humeral joint in which the scapula “chases” the humerus to maintain the fulcrum of rotation in the centre of the glenoid, eventually resulting in muscle fatigue and loss of support. Obviously, in these cases the primary pathology has to be addressed as well as the scapula pathology.

NOTES:

Computer Assisted Surgery or Navigation

The idea of using computer technology to guide surgeons is not new. However, the technology has improved considerably and there is now good data to show that outcomes can be improved, when using computer navigation, especially in Total Knee Replacement.

Ideally, a Total Knee Replacement is placed square to the mechanical axis of the leg. This runs from the centre of the femoral head to the centre of the ankle. In addition, the ligaments and soft tissue envelope needs to be balanced to ensure a good and stable range of motion.

Traditionally the anatomical axis of the femur is used by inserting an intramedullary rod. The distal femur is then cut with 5-7 degrees of valgus and neutral flexion off the anatomical axis, thus estimating the mechanical axis.

The intramedullary (IM) canal is itself roomy and the IM rod can accidentally be placed in slight varus or valgus. In addition, there are patients, who have had a Total Hip Replacement and the femoral stem will interfere with the IM rod. There are also patients, who had fractures of the femur with mal-union, in whom the anatomical axis will be distorted.

Apart from the inaccuracies of measurement, insertion of an IM rod may pose an insult to the patients cardio-respiratory system. The medullary canal is filled with fat and marrow. Some of this will be dislodged when the rod is inserted and may end up in the venous system, potentially causing an embolus in the lungs. Whilst most patients will be able to cope, there may be some, especially those having bilateral knee replacement, whose heart and lungs will be stressed.

Whilst minor deviations in angle may not lead to accelerated wear in elderly patients, the National Joint Replacement Registry now shows that computer navigated TKR done in younger patients will last longer.

There are a number of competing navigation systems in use in Australia. Whilst the jigs may vary, the principles are the same. By referencing anatomical landmarks on the distal femur and by rotating the femur around the hip, the mechanical axis can be established to within 1 degree. Similarly, the mechanical axis of the tibia can be established using the proximal landmarks as well as the medial and lateral malleoli.

The more sophisticated navigation systems now allow an assessment of ligamentous balance as well as the flexion and extension gap, which will determine range of motion and stability.

Some of the earlier navigation jigs were inserted mid femur and mid tibia. The resulting pin holes left potential stress risers or weak points, and a number of fractures were reported. The newer jigs can be placed in the metaphysis in the operative field, thus avoiding additional scars and a risk of fracture.

Some of the earlier navigation systems were slow and added considerable time to the operation, but the current software is much faster, adding only little time, whilst saving some of the steps required with standard instrumentation.

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For these reasons computer navigation has now become my standard practice for Total Knee Replacement, irrespective of age. Navigation avoids pulmonary debris whilst achieving more accurate angles. In addition, dynamic navigation allows me to better predict and plan the sizing and precise positioning of both femoral and tibial components, without the risk of mid shaft fractures. More and more younger patients are having TKRs, the benefits of navigation will become evident in the years to come. Navigation is, in my view, here to stay.

NOTES:

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High Tibial Osteotomy

Medial compartment arthritis of the knee causes pain and interferes with the activities of many physiologically young and active patients. Treatment options for these patient are limited if they wish to stay physically active. Total knee replacement (TKR) is reliable at providing pain relief for these patients but it restricts their work and sporting capabilities considerably.

The main goal of a high tibial osteotomy (HTO) is to re-align the leg to decrease the pain associated with arthritis. In younger patients who wish to remain active this improves function and slows the progression of the arthritis. Older or less active patients may be satisfied with a TKR but it is an imperfect long-term solution for active patients. Unicompartmental knee replacement (UKR) creates poorer outcomes for young patients in the longer term when they are later converted to a total knee replacement.

(It is well known that a revision TKR does not work as well as a primary TKR. What is less well known is that the results of revising a UKR to a TKR are about the same as revising a primary TKR to a revision TKR. In contrast to this, the results of performing a TKR after an opening wedge HTO are similar to those of a primary TKR).

Osteotomy of the proximal tibia has been used for more than a century to correct angular deformity in the setting of rickets, poliomyelitis, and posttraumatic conditions. It became popular for the treatment of arthritis in the 1960's and it has always been recognized that the procedure had many limitations. As the results and success of total knee replacement improved, osteotomy became a less popular solution.

Perhaps the most important part of achieving success with proximal tibial osteotomy is selection of the appropriate patient. Important aspects of a patient's general history include age, occupation, activity level, and medical and surgical history. Extremely important are the expectations that the patient has for activity postoperatively.

High Tibial Osteotomy has two principle drawbacks:

1. It is not an ideal treatment option for patients with significant bicompartamental or tricompartmental disease and
2. The results of the procedure progressively deteriorate.

However, unlike a total knee replacement:

1. HTO imposes no permanent activity restrictions
2. Superior results are more likely with contemporary fixation not requiring several weeks of postoperative cast immobilization
3. The results of a total knee replacement after an HTO are nearly the same as a TKR as the first line of treatment. The difference is that the knee replacement is often performed 10 years later when the patient does not need to be as active any more

Contraindications include tricompartmental arthritis, severe patellofemoral disease, severely restricted range of motion (extension loss of more than 15 to 20 degrees or flexion less than 90 degrees) and inflammatory arthritis. Age over 65 years is probably a contraindication.

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Radiographic assessment:

The standard assessment includes bilateral antero-posterior weight bearing radiographs, taken at full extension and 45 degrees flexion and lateral and skyline films of the affected leg (the standard OA knee series). Single leg standing films from the hip to the ankle are taken to assess knee alignment and calculate the amount of correction required. MRI scans are helpful and are usually performed but are not actually needed for surgical decision making.

In a knee with varus or valgus malalignment, osteotomy is performed based on the measurement of the **mechanical axis** (defined by a line drawn from the centre of the femoral head through the centre of the knee), the **anatomical axis** (defined by a line from the piriformis fossa through the centre of the knee and a line through the long axis of the tibia) and the orientation of the joint line. The angle subtended by these two axes represents the normal 6° of knee valgus.

The **weight-bearing axis** of the lower extremity is defined by the line drawn from the centre of the femoral head through the centre of the ankle joint. In the tibia, the anatomical and mechanical axes (defined by a line drawn from the centre of the knee through the centre of the ankle joint) are the same in the absence of any post-traumatic or congenital deformity. The intersection of the mechanical axis of the femur and tibia is between 1° and 3° of varus in normal individuals. The tibiofemoral joint line is evaluated by a line across both femoral condyles; the intersection of that line with the line of the femoral mechanical axis defines the joint orientation line of the distal femur.

Normally, the distal femoral joint line is 87° of valgus from the femoral mechanical axis. Similarly, the proximal tibial joint line is measured by the intersection of lines across the proximal tibial joint surface and the mechanical axis of the tibia; the normal proximal tibial joint line is 87° of varus.

Surgery:

An arthroscopy is typically performed at the time of the operation. A small incision is made over the pes anserinus bursa on the proximal medial tibia and an opening wedge osteotomy performed under image intensifier control. These days it is rare to bone graft the defect as healing rates are excellent (except in smokers). The patient stays in hospital overnight and is discharged the next day on crutches and in a hinged brace.

Post Operative care:

For the first six weeks the knee is kept in a range of motion brace. During this time the patient remains touch or partial weight bearing using crutches. From week 6 to 12 the brace is discontinued and their weight bearing is increased gradually to full at the end of the six week period. From 3 to 6 months postoperatively the patient is encouraged to progress their activities as tolerated. Unlike after a TKR the patient may return to running and jumping sports and labouring work if they choose to.

Conclusion:

It is expected that the results of high tibial osteotomy will deteriorate with time and the majority of these patients will end up with a TKR as the rest of their knee becomes arthritic. For a lot of patients they will have had an extra 10 years of high level activity which a TKR would not have provided for them.

NOTES:



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