2025

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Time	Event	Who
07:30 – 08:00	Arrival / Refreshments	
08:00	Welcome Message	Dr Doron Sher
	A refresh on Schaphoid Fracture management	Dr Kwan Yeoh
	Current concepts in the treatment of Osteochondral Lesions of the Talar Dome	Dr Todd Gothelf
	Uses and abuses of MRI in the foot and ankle	Dr John Negrine
09:10 – 09:25	Panel Discussion	
	Knee Malalignment and Instability	Dr Doron Sher
	Modern technologies in Spinal Surgery	Dr Andreas Loefler
	Greater Trochanteric Pain Syndrome (GTPS)	Dr Michael Goldberg
	Treatment of gleno-humeral OA in the young active patient	Dr Ivan Popoff
10:45 – 11:10	Panel Discussion	
11:10 – 11:40	**Morning Tea**	
	Clinical & health considerations with Arthroscopic Rotator Cuff Surgery (ARCS)	Dr John Best
	Low back pain in the adolescent athlete	Dr Leigh Golding
	Surgical Nutrition	Dr Paul Mason
	Sports Neurology	Dr Paul Annett
13:00 – 13:20	Panel Discussion & Close	

Dr Kwan Yeoh
M.B., B.S. (Hons) (Syd), F.R.A.C.S. (Ortho)
Hand, Wrist, Upper Limb & General Orthopaedics

A refresh on scaphoid fracture management

Scaphoid anatomy

- Vascular supply
- Surfaces & relations to surrounding bones

Acute scaphoid fractures

- History & examination
- Investigations
  - X-ray
  - CT
  - MRI
  - Other
- Treatment
  - Non-operative
  - Operative
- Assessment of healing

Chronic scaphoid fractures

- Investigations
  - X-ray
  - CT
  - MRI
  - Other

- Treatment
    - Non-operative
    - Operative
    - Other

Chronic scaphoid fractures with degenerative changes

- Long-term outlook
- Investigations
- Treatment
    - Patient discussion
    - Non-operative
    - Salvage operations

NOTES:

Dr Todd Gothelf
MD (USA), FRACS, FAAOS, Dip ABOS
Foot, Ankle, Shoulder Surgery

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Current Concepts in the Treatment of Osteochondral Lesions of the Talar Dome

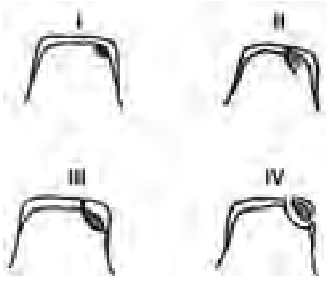
Introduction

Osteochondral Lesions of the Talus (OLT) involve injury to the articular cartilage and subchondral bone of the talar dome. Most talar dome lesions are considered to be traumatic in origin, mostly occurring after ankle sprains or fractures. However, talar dome lesion may be the main pathology in a patient with unexplained ankle pain. Traumatic lesions can be lateral or medial, but atraumatic lesions are more likely medial. Studies have shown that 98% of lateral talar dome lesions and 70% of medial talar dome lesions had a history of trauma, supporting that atraumatic lesions are more likely medial.

Classification

The traditional classification system was introduced by Berndt & Harty based upon radiographic findings. The stages include:

I- Subchondral compression
II- Partial detachment of osteochondral fragment
III- completely detached fragment without displacement
IV- Detached and displaced fragment.



MRI has become the gold standard for investigations for talar dome lesions, as x-rays may miss talar dome lesions. MRIs are highly sensitive and specific for talar dome lesions. In any patient with unexplained ankle pain, especially after a sprain or fracture, an MRI is warranted to investigate for talar dome lesions.

MRI classification system, Anderson, is similar to Berndt and Harty:

I- Bone marrow contusion, no chondral injury.
II- Partial detachment of OCL with subchondral cyst formation or fissure incompletely separating the lesion from the talar dome.
III- Undisplaced completely separated fragment
IV- Displaced fragment

Clinical Evaluation

Patients who present with unexplained ankle pain should have an osteochondral lesion of the talar dome in the differential diagnosis. Initial work up includes a standing x-ray to assess for alignment and arthritis, as well as radiographic evidence of lesions. Since lesions can be missed on x-ray, an MRI is warranted.

Treatment

Non-operative: Acute lesions that are less stable (Stage I-III) may initially be treated non-operatively. Success rates are around 40-60%. Persistent symptoms warrant surgical intervention.

Surgical Treatment

Debridement/Microfracture: The standard treatment for osteochondral lesions involves arthroscopic debridement and microfracture. The technique involves arthroscopic debridement of loose cartilage and bone to stable vertical walls of cartilage, followed by perforation of subchondral bone to simulate fibrocartilage formation in the lesion. The success of this surgery is 80%

Retrograde Drilling: This involves drilling from the bone below the chondral surface in order to keep the overlying cartilage intact. This procedure is indicated when the chondral surface is intact.

Osteochondral Autograft Transfer (OATS): This procedure is indicated in larger lesions (>1.5 cm^2), contained lesions, or those that failed microfracture. The procedure involves harvesting osteochondral plugs, usually from the knee, and transferring them to the defect. This procedure has the advantage of transferring hyaline cartilage to the defect.

Cell Based Techniques (ACI/MACI): The procedure takes autograft cells, harvests them to multiply the cell population, and then the cells are re-implanted. The result is the production of hyaline-like cartilage. The procedure involves two surgeries but can be effective in lesions that fail microfracture.

The Surgical approach can usually be performed arthroscopically for most lesions. However, lesions that are hard to reach, usually medial, or when performing OATS procedures, may require a medial malleolar osteotomy.

Post-Operative Care

Arthroscopic treatment of talar dome lesions can be done as a day procedure, with weight bearing after three days. Physiotherapy can be started for range of motion exercises early to avoid stiffness. Return to sport is usually considered after three months with microfracture, and six months with procedures with grafts such as OATS.

Results: Generally, results of microfracture are 80% successful. Revision microfracture or other procedures are generally 80% successful as well.

Summary: Talar dome lesions are common causes of ankle pain, especially after trauma. Small lesions can be treated conservatively, but larger unstable lesions usually require surgery. Debridement and microfracture is usually 80% successful. Recurrences and larger lesions may require alternative procedures with bone or cartilage grafting.

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NOTES:

Dr John Negrine
M.B., B.S. (Syd), F.R.A.C.S. F.A. Ortho. A.
Adult Foot & Ankle Surgery

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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
- 2025 $5.8 Billion

Money spent on MRI (MBS):

- 2005 $120 million
- 2014 $323 Million
- 2025 $754 Million

Population 2005 20.39 Million
Population 2014 23.9 Million
Population 2025 27 Million

Background

Magnetic resonance imaging invented in 1971
1980 first clinically useful picture taken
MRI is exploding 349 scanners in Australia
Now > 500 scanners
The rise in the cost of diagnostic imaging is staggering. Doubled in 10 years
Government about to increase rebates for MRI scanning $162 million in recent budget

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

Diagnosis: The patient has a sprained ankle

- 500 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 commonest 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:

Dr Doron Sher
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Knee, Elbow, Shoulder Surgery

Knee Malalignment and Instability

High tibial osteotomy (HTO) was traditionally performed for unicompartmental (usually medial) arthritis to correct coronal plane (varus/valgus) malalignment in a stable knee. Off-loading the affected compartment reduces pain and improves function. While lateral closing-wedge techniques were more routine initially, medial opening-wedge osteotomies have become popular and are now more common. In certain cases, the osteotomy is done in the distal femur instead.

The use of osteotomies has expanded beyond simple arthritis to allow sagittal plane (the front to back slope of the tibia) deformity correction as well. This has an effect on the ACL or PCL, depending on which way the slope of the tibia is changed.

There are now osteotomies being performed to change the posterior tibial slope without coronal plane correction (Typically in patients with re-rupture of their ACL graft with a tibial slope of more than 12 degrees without coronal malalignment).

What causes the deformity?

The sum of the varus angulation comes from the bony alignment, the loss of meniscal tissue and cartilage in the medial compartment and from stretching or damage to the lateral and posterolateral structures of the knee. This can be combined with instability from and ACL or PCL injury as well.

- Primary varus refers solely to bony deformity.
- The term double varus refers to a combination of varus bony alignment along with demonstrable instability of the lateral ligament structures.
- The term triple varus includes the above with recurvatum or hyperextension with PLC insufficiency and abnormal external rotation. This is often treated staged, performing the osteotomy first. This is followed by a delayed ligament reconstruction if instability persists after the bony realignment. This approach allows better control of soft tissue tension, aids rehabilitation, and reduces risk of graft failure.

Presenting Symptoms

There are two main subgroups of patients to be considered:

1) Arthritic symptoms with chronic ligament deficiency and coronal or sagittal deformity.
    a. The main features are pain, swelling and reduced function
    b. They may also have some giving way but it is not the main feature

    - Mainly treated with isolated HTO

2) Ligament deficiency, together with a proximal tibial deformity. Some arthritis but it is not the main feature.
    a. These are often young, high-demand individuals

    – Usually combined ligament reconstruction and HTO

Frontal imbalance
The imbalance of the knee can be caused by isolated medial compartment narrowing, asymmetric lateral compartment opening or combined medial narrowing with lateral compartment opening. The reasons for this are multifactorial:

- ACL rupture causes increased medial rotation of the tibia and displacement of the centre of rotation of the knee toward the medial compartment.
    - This is worsened in the presence of a Medial meniscus injury.
- Posterolateral corner injuries and lateral ligament injuries allow lateral opening of the joint, excessive external rotation and usually a varus alignment. In 5% of cases this is combined with an ACL injury.
- Constitutional varus of the knee leads to increased medial joint forces. The deformity is usually in the proximal tibia but can be in the femur or both. Once the deformity reaches 6-8 degree it accelerates the development of OA in an ACL-deficient knee. It also allows stretching out of an ACL graft, leading to failure of the reconstruction when performed.

Sagittal imbalance

The Posterior Tibial Slope is most commonly measured on plain xrays as the angle between by a line parallel to the mid-diaphysis of the tibia and a line parallel to the posterior inclination of the tibial plateau (Osseous PTS). Medially this is between 9° to 11° and laterally 6° to 8° (with a large amount of variation). An angle beyond 13° is thought to contribute to failure of the ACL. When soft tissues are taken into account the posterior slope is relatively reduced because the posterior horn of the menisci are higher than the anterior horn. Clinical studies have shown patients with ACL deficient have significantly greater pivot-shift grades when they had a greater tibial slope.

Surgical treatment

Since Soft-tissue reconstruction alone in the setting of malalignment is likely to fail over time, correcting alignment is critical and often the first step in management. The main difference when dealing with instability rather than plain arthritis is that a biplanar osteotomy is used to allow correction of the tibial slope as well as varus / valgus realignment.

Correction of the posterior slope to neutral will reduce instability symptoms related to ACL deficiency. This might not be enough if instability was the primary symptom but often is enough if there is already some arthritis in the knee.

Where instability is the main symptom an ACL reconstruction combined with the HTO may be performed. This protects the ACL graft and slows the progression of any arthritis.

If there is posterolateral corner insufficiency this should be reconstructed as well as the ACL to reduce the degree of correction required from the osteotomy. This is sometimes done staged rather than as a single operation.

Rehabilitation

Post operative rehabilitation will vary widely depending on the procedure performed and what fixation methods are used. This will be covered in the lecture.

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NOTES:

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Joint Replacement & Spine Surgery

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Modern technologies in Spinal Surgery

Spine Surgery has increased exponentially over the past decade. Surgery for Fractures, Tumours, Deformity, Congenital and Degenerative Conditions have become common and are performed in virtually all age groups. There are different approaches to the spine and the implants used vary a great deal. There are inherent risks to the spinal cord, the nerve roots, and other nearby structures.

Several new technologies have been developed to enable surgeons to perform complex surgery in a safer way. These include navigation, neuromonitoring, robotics, as well as custom implants, motion preservation, and biologics. Some of these will be discussed in greater detail to provide some insight and understanding of the scope of modern Spine Surgery.

Pre-operative Planning

Patient selection is one of the most important steps in achieving good outcomes after spinal surgery. This includes not only modern scans, whether CT, MRI, functional x-rays, or bone scans, but also a multi-disciplinary assessment of the patients physical and mental health. Once a decision to operate has been made, we have some clever computer programs to allow virtual planning and execution of surgery. A CT based model of the spine can be used to plan and predict the size of pedicle screws and other implants needed for the case, thus reducing intraoperative surprises and lack of implants.

Specialised Operating Tables

Spina surgery is often prolonged and may take several hours. Positioning of the patient in terms of safety and pressure care is important. Surgeons need adequate access to the spinal column form the occiput to the sacrum as well as imaging equipment to guide and check positioning of implants. Radiolucent tables without a central base allow good access for intraoperative x-ray and CT scans. They also allow safe turning of patients when anterior surgery is followed by a posterior approach or vice versa.

3D Imagine and Navigation

Several systems, which can incorporate preoperative CT and MRI images, can be matched to markers attached to the spine. These markers usually have several reflectors, allowing an infra-red camera to detect their position and matching this to the patient's CT in three planes. This enables the surgeon to find the ideal trajectory for each pedicle and place screws in a safe way. Navigation has made surgery both safer and faster. An intraoperative CT scan is then used to check and verify positioning of the implants.

Computer Assisted Surgery (CAS)

Navigation in spine surgery, hip, knee or other surgery is also known as Computer Assisted Surgery. The principles of CAS are the same as for navigation, but companies may use certain terminology to advertise or profile themselves.

Minimally Invasive Surgery (MIS)
Examples of MIS are Endoscopic Surgery and Percutaneous placement of Screws. The advantages claimed are less damage to soft tissue, less blood loss, and quicker recovery. Whilst there has been some progress in terms of efficacy and safety, there is still some concern about the adequate decompression or fusion techniques with limited access to the spinal column. Whilst MIS looks promising, further evaluation is required before we know its real place in spinal surgery.

Neuromonitoring
Intraoperative neuromonitoring is not new. Years ago, patients were woken up during the operation and asked to move their feet. We are now able to monitor somatosensory evoked potentials (SSEP) and motor evoked potentials (MEP) during surgery. This allows real time assessment of each surgical step, form placement of pedicle screws to de-rotation manoeuvres which may harm normal spinal cord function. There are also devices to monitor individual nerve roots if so required.

Robotics
The definition of robotics is a little grey. Whilst there is a lot of marketing for so called robotics in knee and hip surgery, we do not yet have autonomous machines, which can make decisions or perform surgery on their own. In Spine surgery we have had one machine to guide surgeons when drilling pedicles for screw placement. The Mazor used on the table images to navigate and presented tubes to guide drill bits down the pedicle. Unfortunately, the machine was not reliable, and its use has been abandoned. There is no doubt that industry will work on a new model, but the cost, safety and efficacy may limit its use for standard cases.

Laser Surgery
The use of Laser beams to shrink or remove tissue is not new and continues to be used in certain centres. Laser is used primarily for the treatment of herniated discs and spinal stenosis due to ligamentous hypertrophy. In the past, Laser discectomy had a relatively high rate of recurrence. Laser beams focus energy on tissue, thus creating heat. Laser beams risk injuring nearby structure, such as nerves. Laser also poses risks for the staff, as stray beams can injure the retina.

Custom Made Implants
When operating on spinal tumours, fractures or deformity, custom made implants may be very useful. Rather than shape the spine to the implant, one can use computer generated models to fit the spine and then 3D prints the implant. This is ideal for elective cases, as it often takes a few weeks for planning and manufacturing of the device. Such implants are becoming more common, although they are still very expensive.

Biologics
There is increasing interest in materials, which can help achieve fusion. Traditionally surgeons have relied on autograft, but there is donor site pain and sometimes the patient's own bone is of poor quality or of insufficient quantity for a fusion procedure.

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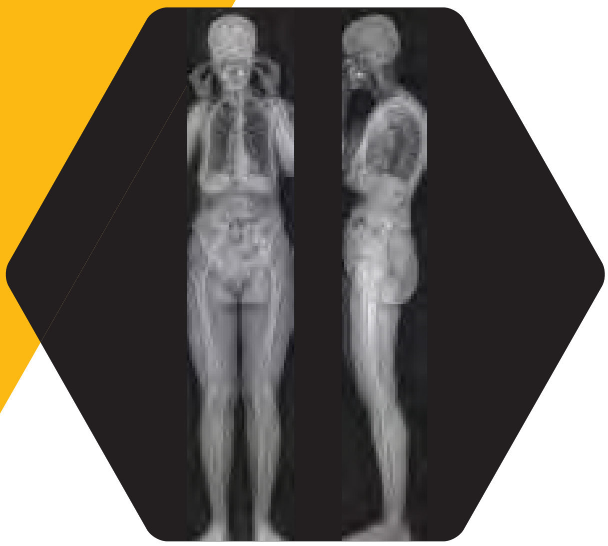

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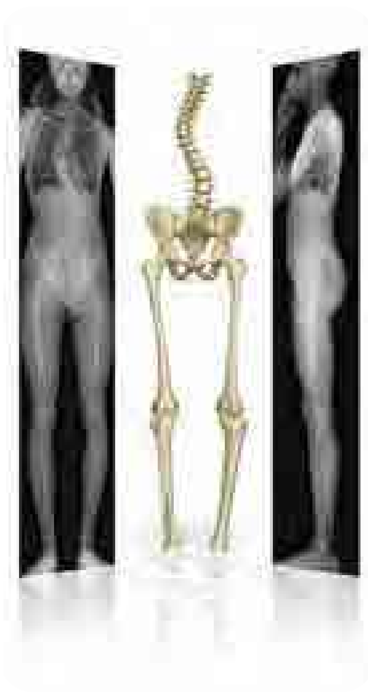
spineEOS

- Gain immediate understanding of 3D coronal and sagittal alignment and deformity
- Identify surgical target(s) with real-time automatic feedback
- Optimize surgical strategy by anticipating post-operative parameters
- Export patient specific report and associated rod templates in 2D or 3D format

hipEOS

- Evaluate patient's spino-pelvic mobility between standing and seated positions
- Determine size, orientation and position of implants in 3D
- Optimize THA surgical strategy with leg length restoration, femoral offset and femoral torsion angle simulation
- Simulate 3D range of motion to optimize the choice and orientation of implants and minimize the risk of impingement



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NOTES:

Dr Michael Goldberg
M.B., B.S. (Hons), F.R.A.C.S. (Ortho.)
Knee, Hip Surgery

Greater Trochanteric Pain Syndrome (GTPS)

Background

- Greater Trochanteric Pain Syndrome (GTPS) refers to lateral hip pain. It is a term for what was formerly referred to as "trochanteric bursitis".
- GTPS = Trochanteric bursitis + Gluteal tendinopathy/tears + external coxa saltans.
- Pathophysiology: repetitive microtrauma → gluteal tendinopathy/tears which cause secondary bursal inflammation.
- Epidemiology: 10-25% of population will be affected. Females > males.

Anatomy

- Superficially: fibromuscular sheath comprised of Glut max + ITB + TFL
- Glut med, glut min tendons attach to lateral facet of GT.
- 3 main bursae: Subgluteus maximus ie trochanteric bursa (between glut max muscle and glut med/min tendons) is most commonly implicated. Smaller subgluteus medius and subgluteus minimus bursae.

History/Examination

- Lateral hip/trochanteric pain. Often exacerbated sleeping on affected side, side bending, prolonged sitting.
- Positive GT palpation test + Positive resisted hip abduction test → 96% GTPS.

Treatment options

- Physiotherapy (exercise prescription + education) ***should be first line therapy***.
- Adjunct therapies include:
  - Cortisone injections
  - PRP injections
  - Shockwave therapy
- Surgery is rarely required.
  - Indications: pain refractory to non-operative treatment, gluteal tendon tears with associated weakness.
  - Open/endoscopic bursectomy
  - ITB release/lengthening.
  - Gluteal tendon repair/reconstruction.

An evidence-based physiotherapy program (LEAP study)

Education plus exercise versus corticosteroid injection use versus a wait and see approach on global outcome and pain from gluteal tendinopathy: prospective, single blinded, randomised clinical trial

Mellor et al 2018 – BJM. Access at https://www.bmj.com/content/361/bmj.k1662

- Key findings:
    - Physio-guided education + 8 week exercise program → 78% at least "moderately better" at 1 year (77% at 8 weeks).
    - Cortisone → 57% moderately better. Wait and see → 52%.
    - Education is likely a key component (handouts, explanations and DVD about tendon care, appropriate amount of tendon load and gradual progression of activity).
    - Exercise program specifically targeted gluteus medius/minimus muscles. (4-6 daily exercises. 14 supervised sessions over 8 weeks).

- Details of education/exercise program. Access at https://bjsm.bmj.com/content/bjsports/52/22/1464/DC1/embed/inline-supplementary-material-1.pdf?download=true

Week	Stage	Exercises
1	Familiarisation	**Daily** Low level activations: static abduction (lying and standing) Pelvic control during functional loading: double-leg bridging, double-leg squats Abductor loading: side-stepping
2	Early loading and movement optimisation	**Daily** Add: offset bridging, offset squat.
3-8	Graduated loading	**Daily** Add: band sideslides, **Twice weekly supervised in clinic** Add: Sliding platform with spring resistance (bilateral abduction upright, minisquat, scooter).

NOTES:

Dr John P Best
B Med, Dip Sports Med (London), FACSP, FFSEM
Sport & Exercise Medicine Physician

Clinical and Health considerations with Arthroscopic Rotator Cuff Surgery (ARCS)

Shoulder arthroscopy is the most common arthroscopic orthopaedic surgery after the knee joint. Tears of the rotator cuff in active individuals under the age of 70 years are most commonly repaired arthroscopically (>80% world-wide). The measurement of success will include a return to an improved quality of life but also the prevention of the complications of untreated large or massive tears such as the development of osteoarthritis (cuff tear arthropathy). Small tears carry a 90% success rate whilst large to massive tears may have a success rate of less than 10%.

The presentation is not intended to focus on a detailed rehabilitation plan. Post-operative rehabilitation programs vary from surgeon to surgeon including what expectations the patient may be given. Somewhere between 6 -12 months post-operatively patients will reach their maximum rotator cuff strength which, if successful, tests at 90% of normal strength.

Once a decision is made for surgical repair further planning should occur to improve clinical outcomes and maintain good health. For each stage a dietary bias toward higher protein, lower sugars and saturated fats, careful calorie intake and cautious alcohol consumption is advised. The stages of this process may be considered as 6 separate time periods with some overlap:

1. Pre-operative

Whether there has been an acute episode or a background of chronic impingement the earlier the time from diagnosis to surgery offers better outcomes. Pre-operative planning should include organisation of meals, transport, personal hygiene and attention to other medical issues (e.g. fitness for anaesthesia, dental care, nail care and other medical concerns). Most patients have experienced sleep disturbance for weeks or months and will also require arrangements for the set-up of their bedding and pillows.

Understanding how to negotiate a sling and what clothing is most suitable may take some rehearsing. Buttoned shirts and zippered jackets/tops are easier to use initially. Ideally more than one sling is required and possibly up to three (one for day-to-day use (walking), one for sleeping and one when showering).

The surgical planning should include a discussion with the surgeon on the benefits of Tetrous anchors (the use of demineralised bone plugs to reduce the risk of enthesis failure and retearing of the repair) and other surgical nuances (e.g. long head biceps, acromio-clavicular joint).

2. Immediate post-operative (0-2 weeks)

A good surgical team will include excellent anaesthesia and post operative medication guidelines. Pain management will vary but most patients require a consistent regime of analgesia during this period. Some patients may experience ‘sling claustrophobia’ and neck pain. The DonJoy UltraSling (Pro Arm Sling and Shoulder Immobiliser) has been personally used by the author and found to be effective and comfortable. Rehearsing how to apply this sling is important.

Active bleeding and swelling at the surgical site is common, so maintaining a low heart rate and blood pressure is preferred. This stage is not the time to increase one’s fitness. Even increasing one’s walking may create pain due to some subtle shoulder movement which occurs in the sling. One may perform simple isometric lower limb exercises, calf raises, grip strengthening, basic core activities and lower limb stretching. Commence isometric scapular retraction exercises immediately. Follow your surgeon’s advice.

3. Immobilised post operative (2-6 weeks)

Generally by 6 weeks sleep quality improves and medication requirements are less. Increasing one's walking and adding low impact cardio-respiratory training may be considered. This would include a stationary bicycle and the elliptical cross-trainer (from 4 weeks if balance is secure) with the arms fixed. Check with the surgeon.

A focus on lower body exercises may include shallow squats and lunges (only if one's balance is satisfactory). Training the thighs and calves in a seated position is safe (e.g. leg press) but ensure the patient does not create a new injury from being over-zealous!
Training the non-injured arm is encouraged to enjoy the benefits of contralateral training.

4. Early post immobilisation (6-12 weeks)

At this stage most patients will enjoy better sleep quality and will feel that their shoulder is more 'secure'. There will be a temptation to 'test it out'. The repair needs to be protected at this stage. It is a dangerous time period when one may start to forget about their surgery and possibly take some risks. It is not unreasonable to ask patients to wear their sling in a crowded environment during this time period. Continuing on their general fitness as per point 3. Increasing cardio-respiratory fitness into zone 2 training is possible.

5. Mid post immobilisation (12-26 weeks)

This is a more interesting rehabilitation stage. Post activity pain or ache is not unusual. Patients who develop a post-operative adhesive capsulitis (5-23%) should be reassured that their pain and stiffness is unlikely to be a long-term complication and may indeed assist recovery. From an exercise perspective jogging is generally comfortable at this stage as well as high intensity interval training (HIIT) using a bicycle, elliptical cross-trainer and possibly a rowing machine. Once again care to avoid sudden movements and falling.

6. Later longer-term rehabilitation (6-12 months)

Return to sports and more advanced functional movements occur at this stage. In general for upper body sports (swimming, tennis, golf) delaying a return until 9-12 months is recommended. Side-to-side variation with sports are to be considered here.

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Low back pain in the adolescent athlete

Athletic load & risk context: Growth spurts + repetitive extension/rotation (cricket fast bowling, gymnastics, diving, throwing) ↑ lumbar load; in junior fast bowlers, younger age, taller height, and greater bowling frequency are independent risk factors for lumbar BSI.[5]

What causes LBP in adolescent athletes?

- **Pars BSI / spondylolysis:** leading structural cause in extension athletes; ~14–30% of adolescent athletes with sport-related LBP, with sport-specific male cohorts ~47–54%.[3]
- **Lumbar disc herniation (LDH):** uncommon in paediatrics; population incidence ~0.1–0.2%; typically single-digit share among paediatric LBP/athlete presentations.[10]
- **Facet-related pain (synovitis/arthropathy):** recognised clinically/MRI but robust paediatric prevalence data lacking.[1,2]
- **Other specific causes (smaller combined share):** posterior apophyseal ring injury, Scheuermann disease, sacroiliac joint pain, juvenile spondyloarthritis, infection/tumour (rare).[1,2,3]
- Many adolescents have no single mechanical lesion on imaging-use a functional approach[1,2]

Red flags & when to image: Night/constant pain, systemic symptoms, neurological deficits, infection risk, trauma, or >4 weeks of symptoms despite care → image/refer; paediatric pathways favour judicious imaging over routine scans.[1,2]

Typical clinical presentations

- **Pars BSI/spondylolysis:** insidious, often unilateral low-lumbar pain; worse with extension/rotation; focal pars/pedicle tenderness; seasonal spikes with load/growth.[3]
- **LDH:** flexion-provoked pain ± radicular features; straight-leg raise may be positive; progressive neurological deficit = urgent.[10]
- **Facet-mediated pain:** localised extension-rotation pain, sometimes relieved by flexion; MRI may show effusion/synovitis; diagnosis is clinical + response to care.[1,2]
- **Inflammatory back pain:** morning stiffness, improvement with activity, alternating buttock pain/enthesitis/family history; consider MRI SIJ if suspected.[1,2]
- **Posterior apophyseal ring injury:** acute extension-loading event; possible radicular pain; CT/MRI shows bony ring fragment.[1]

Examination: Hip/SIJ screen, full neurological exam; **quadrant test** = symptom provocation for posterior elements.[9] **Stork (one-leg hyperextension) test** has limited standalone value for spondylolysis—interpret within a cluster (history/sport + imaging when indicated).[8]

Imaging: Avoid routine imaging in uncomplicated non-specific LBP; follow paediatric criteria/trajectory.[1,2] **Have a low threshold for considering pars pathology in adolescent athletes; when imaging is required order MRI with STIR (fat-sat T2) + 3D T1-VIBE** to detect marrow oedema (activity) and delineate a fracture line.[6,1]

STIR: pedicle/pars marrow oedema = active injury, often precedes cortical break.[4] **3D T1-VIBE:** delineates fracture line; excellent agreement vs CT.[6] **Load-prescription tip:** the relative STIR oedema burden in pars/pedicle vs midline vertebral body marrow helps stage loading—greater pars/pedicle oedema → longer rest/slower build; falling oedema supports progression.[7]

Risks if BSI is missed: complete fracture with non-union, contralateral pedicle/pars stress fracture, progression to isthmic spondylolisthesis; risk rises with ongoing load.

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Management—pars BSI: Identify early (history/exam + MRI); immediate off-load from extension/rotation; consider short-term bracing in selected cases; build trunk endurance and hip–pelvic control; address workload mechanics/recovery; **most cases resolve if caught early**; healing likelihood is lower with higher lumbar levels, contralateral involvement, multiple levels, or advanced lesions; pars stabilisation surgery only for recurrent pars stress fractures despite good load management or **persistent symptomatic non-union** limiting function. [11]

Prescribing load using MRI: Use symptoms **plus** imaging: greater STIR oedema burden → longer rest/slower build; **serial MRI at key decision points** shows oedema reduction; VIBE fracture-line signal normalises with union.[7] [6]

Workload & prevention—Cricket Australia Junior Fast-Bowling Guidelines (2023/24)

Age group	Per spell (overs)	Per match day (overs)	Weekly caps	Pre-season build (weeks)	Weekly ball targets
U15	5	12	≥1 day off; max 3 bowling days/week	4	90–100
U17	6	16	≥1 day off; max 3 bowling days/week	6	100–120
U19	6	18	No more than 2 consecutive days; max 4 bowling days/week	8	120–140

In-season recovery cycles: 1 easy week every 4 wks; **1 full week off bowling** every 10–12 wks. **Principles:** many adolescents are overloaded—especially with **early sport specialisation**; govern **daily and weekly volume**; avoid **back-to-back high-load days** *(e.g., serving practice in tennis)*; **progress gradually** in pre-season; **program regular low-load weeks** and **complete off-load weeks** across the season.[12]

Follow-up: Review ~6 wks initially; repeat MRI selectively (e.g.,8–12 wks) if slow to settle or if results will change management/RTP; expect STIR to fall; VIBE fracture-line signal diminishes with healing.[7] [6]

Practical pathway: Triage red flags/neuro deficit → consider pars early in adolescent athletes → **when imaging is required order MRI (STIR + 3D T1-VIBE)** → stage injury + off-load with criteria-based graded rehab → govern workload (age-appropriate fast-bowling limits if applicable) → **criteria-based RTP:** pain-free ADLs→sport-specific loading→full training→competition.[1] [2] [11] [12]

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12. Cricket Australia / Cricket NSW. **Junior Fast-Bowling Guidelines** (Season 2023–24): overs per spell/day, rest, weekly caps, pre-season build, recovery cycles, ball targets.

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Sports Neurology

Understanding neurology is an essential component of the practice of musculoskeletal medicine. Neurological presentations do make up a small but important component of patients seeking treatment for either pain or functional issues. Not uncommonly the presentations can be complex and difficult to diagnose.

Neurological conditions may present with pain or loss of nerve function, or a combination of both. Depending on whether it is a motor or sensory nerve the functional issue may be weakness, loss of sensation or again a combination of both. Neural symptoms need to be evaluated against other potential sources of pain, including soft tissue, bone, joint and tendon structures. A comprehensive knowledge of myotomal and dermatomal levels is essential to determine neurological issues, as is reflex innervation. This can also help differentiate a spinal nerve root from a peripheral nerve involvement. In all causes of neurological issues potential medical conditions should also be considered, including inflammatory myopathy, diabetes and vitamin deficiency or excess.

This presentation will address certain neurological syndromes that may occur in clinical practice.

Lumbar and cervical radiculopathy must always be considered in the context of referred arm or leg pain, particularly with nerve related symptoms such as paraesthesia or numbness. The presentation may not always be as typical as in the ‘text-book’ case. Not all sciatica will be pain in the entire leg, but could present with buttock pain only or isolated paraesthesia in the lower leg. Motor loss must be examined for, with a knowledge of myotomal innervation.

In a similar vein cervical radiculopathy may present with pain in the trapezius or parascapular region, not necessarily involving the entire arm. Weakness may be subtle and needs to be examined for, especially in the hand in a C7/8 radiculopathy. A good knowledge of myotomal and dermatomal supply is again essential in clinical evaluation.

Brachial neuritis is an inflammatory condition affecting brachial plexus. The onset is generally one of severe and acute pain in the entire upper limb. Motor loss may occur rapidly after this and may take a prolonged time course for improvement. The severe pain typically lasts for 2-3 weeks before settling. The upper trunk is typically more affected and patients may present with signs of a suprascapular or long thoracic nerve palsy. Exclusion of a cervical radiculopathy on the basis of an acute disc prolapse is important. An MRI of the cervical spine and brachial plexus may be helpful in diagnosis, as will nerve conduction studies. Treatment in the acute phase may include oral corticosteroids, pregabalin (Lyrica) and simple analgesics. Long term management will include strength based rehabilitation.

The lateral femoral cutaneous nerve of the thigh is another common nerve compression. This condition is also referred to as ‘meralgia paraesthetica’. It is a purely sensory nerve and the patient will present with pain, numbness and paraesthesia in the anterolateral thigh. There is no motor or reflex loss. This issue is typically initiated by blunt trauma or compression. The most common site of compression is 1-2cm medial to the ASIS as the nerve exits under the inguinal ligament. It will typically settle with relative rest and relieving any compression. If there is painful paraesthesia then Lyrica may be helpful. A trial of a US guided peri-neural cortisone injection may also be useful both from a diagnostic and therapeutic perspective. Refractory cases could require surgery.

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The posterior interosseous nerve is another relatively common peripheral nerve compression to acknowledge. It is in the differential diagnosis of lateral elbow pain, especially if not clinically consistent with common extensor tendinopathy. The nerve is typically affected as it passes through the supinator muscle or into the arcade of Frohse. It may be aggravated with repetitive use of the forearm and wrist, particularly with pronation and supination. The discomfort is noted in the forearm and may refer to the wrist. Clinically there may be tenderness directly over the nerve at this site with pain on resisted supination. Treatment will include relative rest, manual release and strengthening exercises. A trial of cortisone injection delivered to the radial tunnel given under ultrasound guidance may be helpful. Definitive treatment may involve a surgical release of the nerve.

Ulna neuropathy is generally a more straight forward diagnosis. Patients will present with numbness in the 4th and 5 fingers and may have weakness of the intrinsic muscles of the hand. It can often be positional, worsened by positions of elbow flexion and especially at night. The cause may be a primary ulna neuritis, ulna nerve subluxation or a compressive lesion. The neve is most commonly affected at the elbow, but can also be compressed at the wrist at Guyon's tunnel (commonly in cyclists). Treatment involves splinting of the elbow to avoid elbow flexion (greater than 30 degrees), anti-inflammatory measures including peri-neural cortisone injections and surgery if symptoms are ongoing.

Cervical 'burner' syndrome occurs in contact athletes. It typically occurs when making a front on tackle where there is separation of the head and shoulder causing a traction type injury to the brachial plexus. The player may describe a burning sensation in the arm and a loss of strength. Symptoms will usually settle within seconds to minutes, but can last days to weeks, and in more severe injury many months. The differential diagnosis includes cervical disc prolapse or canal stenosis, and similar symptoms can occur with shoulder instability. The key to management and return to sport is complete resolution of any strength deficit and a graduated return to contact training. If strength loss persists then evaluation of the neck and brachial plexus may be required with an MRI, as well as consideration of a shoulder MRI scan if instability is demonstrated clinically.

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