

## WHAT'S NEW IN . . .

### Orthopaedics

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#### ABSTRACT

**Orthopaedic surgery is a large and expanding speciality. There are approximately five million clinic attendances each year in this country and musculo-skeletal complaints are the commonest presentation in General Practice. This review examines three key areas within orthopaedics, fracture management, sports medicine and the new subspeciality of minimally invasive orthopaedics and highlights areas of recent advancement, significant research and ongoing debate.**

#### FRACTURE MANAGEMENT Hip Fractures

Around 60,000 patients are treated for hip fractures each year in the UK and the incidence is increasing (1). The majority are elderly, many have extensive co-morbidity and their treatment can often be surgically challenging and their post-operative recovery both lengthy and costly.

#### Prevention

The identification of risk factors is an important part of preventing these injuries. A case-control study from Belgium found that the greatest risk factor was the patient's self-perceived safety of their residence (2). If subjects thought that their residence was unsafe in which to perform the activities of daily living, this was associated with a six-fold increase in hip fracture risk. The risk was also increased after any two previous fractures, or any tendency to fall within the past year or the chronic use of psychotropic drugs. The ability to read a newspaper was protective. The predictive nature of previous fractures has been confirmed by a study from Edinburgh (3) which calculated the risk of refracture after a low-energy fracture (ie one that results from a fall from or below standing height), to be 3.89, hence the necessity for preventive measures. Hip fracture prevention strategies such as fall prevention programs, weight-bearing and resistance exercises, hip protectors and use of calcium and vitamin D can all reduce hip fracture risk (2,4).

#### Surgery

Traditionally, intracapsular hip fractures have been treated by hemiarthroplasty whilst extracapsular fractures undergo internal

fixation. The different strategies are based upon the relatively increased risk of avascular necrosis of the femoral head after intracapsular fracture, although this didactic division is now coming under renewed scrutiny. Rogmark *et al* conducted a prospective, randomised trial comparing internal fixation against hemiarthroplasty for the treatment of Garden 3 or 4 (See Box 1) subcapital fractures in 409 patients aged 70 or over (5). Two years after surgery, 43% of the internal fixation procedures had failed compared to only 6% of the hemiarthroplasties. The internal fixation group were also more likely to have impaired walking (36% v 25%) and severe pain (6% v 1.5%) compared to those who had hemiarthroplasty. There was no difference in mortality. The same authors conducted a further study including patients who were at least 80 years old, had evidence of dementia or were resident in a nursing home or other institution (6), most of whom were excluded from the previous trial. 103 patients with Garden 3 or 4 femoral neck fractures underwent hemiarthroplasty and were compared to a smaller control group undergoing internal fixation. There were no differences in complications, length of hospital stay, in-hospital mortality or ability to return home. The one-year mortality rates were also similar. Hemiarthroplasty however yielded a much lower failure rate (6% v 26%). The authors recommend that all patients over 70 with femoral neck fractures undergo primary hemiarthroplasty, to avoid the risks of revision surgery in this high-risk population when internal fixation fails. A meta-analysis of trials comparing hemiarthroplasty with internal fixation also showed arthroplasty to have lower revision rates, but greater infection rates, blood loss, length of operation and possibly early mortality rates (7), a finding confirmed by Su *et al* who reported an increased in-hospital death rate for patients treated with hemiarthroplasty (8).

#### Box 1. The Garden Classification.

The Garden Classification is a widely accepted method of describing intracapsular femoral neck fractures:

- Type 1: incomplete fracture
- Type 2: complete but undisplaced fracture
- Type 3: complete fracture with partial displacement
- Type 4: complete fracture with complete displacement

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Displaced femoral neck fractures in younger, fitter patients are usually treated with internal fixation rather than hemiarthroplasty, in an attempt to salvage the femoral head. The older patient with greater co-morbidity is less likely to tolerate a second operation if the femoral head is not salvaged, hence this group is usually treated with a hemiarthroplasty as the definitive operation. To minimise the risk of avascular necrosis in the younger group the operation has usually been done as soon as possible after injury. In contradiction of this traditional view Jain *et al* reported no difference in functional outcome in patients under sixty years of age treated either before or after 12 hours from injury (10). However, the late fixation group had a significant increase in the rate of radiographic evidence of avascular necrosis at up to two years follow up, suggesting that at present the current practice of treating this condition as an orthopaedic emergency should continue.

A proportion of younger patients with internal fixation of a femoral neck fracture will subsequently require revision to a total hip arthroplasty because of failure of the fixation. One study compared outcomes after revision total hip surgery following failed internal fixation with primary total arthroplasty for femoral neck fractures (11). It found that the 'primary arthroplasty' group had a lower complication rate and lower subsequent revision rate than the 'revision arthroplasty'; there was also a better functional outcome if the hip was replaced at the first procedure. The authors concluded that the overall benefits of keeping the hip joint meant that open reduction and internal fixation (ORIF) will continue to be used as the primary treatment of displaced intracapsular fractures in most young patients, but that they should be advised of the greater risk of problems if subsequent revision is needed.

### **Wrist Fractures**

Fractures of the distal radius are common injuries, and the patient can expect to have significant pain and functional disability for the first two months following injury; by six months the majority will have minimal pain and disability but a small minority will still have symptoms a year later (12).

#### ***Immobilisation***

In adult patients with minimally displaced fractures, the use of lightweight removable splints instead of plaster casts has been examined in a prospective, randomised trial (13). The splint had better 'cast' satisfaction and functional assessment scores with fewer problems than

traditional cast immobilisation. After cast removal, patients with Colles fractures who attend physiotherapy achieve significantly greater increases in wrist extension and grip strength after six weeks compared to those who receive no active therapy (14).

Children with buckle or torus fractures almost always have an uncomplicated recovery and excellent outcome, so is orthopaedic follow up strictly necessary? In a prospective randomised trial Symons found that removal of the cast by parents at the three week point produced no differences in wrist deformity, tenderness or range of movement when compared to cast removal after review in fracture clinic (15).

In those patients in whom the fracture position is not acceptable, operative reduction must be considered. Initially this may be closed manipulation under anaesthetic followed by immobilisation in a cast - unfortunately distal radial fractures in osteoporotic patients often slip whilst in the cast. One group have tried finger-trap traction rather than manual manipulation and found no difference between the two groups in the eventual position of the fracture or the rate of failure, which was surprisingly high at approximately 70% at five weeks in both groups (16). An external fixator may be used to obtain greater stability if required (17).

#### ***Adjuncts to Healing***

As an adjunct to traditional methods of distal radial fracture management there is increasing use of the Norian Skeletal Repair System (SRS) (Figures 1a & b), an injectable calcium-phosphate bone cement that hardens in situ to form dahllite, a carbonated apatite equivalent to bone mineral. It can be injected percutaneously or through a limited open approach. It was developed to fill the metaphyseal defect often found on the dorsum of the radius in osteoporotic fractures (18, 19), but has also been evaluated in vivo in hip (20, 21), humeral (22) and tibial plateau (23) fractures. A prospective study found Norian SRS alone gave a better clinical and radiological result than conservative treatment (24), however a biomechanical analysis on cadaveric wrists concluded that calcium phosphate alone is insufficient to withstand physiologic flexion-extension motion of the wrist without supplemental wire fixation (25). A large, multicentre prospective randomised trial concurred, recommending supplemental fixation with Kirschner wires when using Norian SRS (26). The authors concluded that whilst there were no clinical differences at one year between groups, the use of Norian SRS may allow accelerated rehabilitation



Fig 1a. X-ray of fractured distal radius.

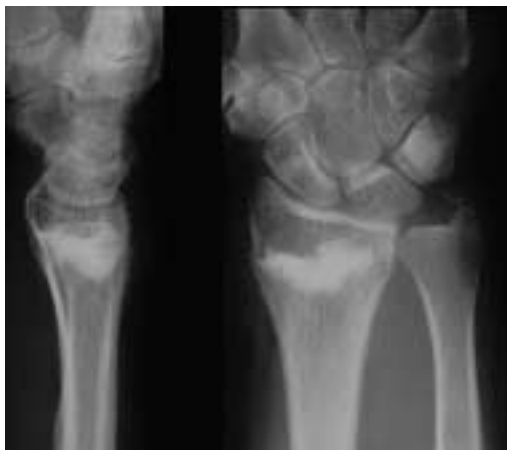


Fig 1b. X-ray of radius with Norian SRS in situ.

## Ankle Fractures

Fractures of the ankle are one of the commonest skeletal injuries. Stable fracture patterns such as an isolated lateral malleolar fracture can generally be managed non-surgically, whereas unstable fractures such as bimalleolar injury are usually managed by open reduction and internal fixation (27). Whilst this holds true in the young, in the elderly there is debate over the indications for open reduction. One prospective trial suggested that managing patients over 65 with displaced ankle fractures with closed reduction only, gave a better clinical outcome (28), a finding completely contradicted by a similar randomised study of patients over 55, who found the opposite was true (29).

Once ORIF has been decided upon the ankle is often too swollen to operate on. A novel pulsatile cold compression device has been tried against a standard moulded splint to reduce traumatic ankle swelling. The compression device significantly reduced the circumference of the ankle at 24, 48 and 72 hours and all of the patients in the treatment group tolerated the cold compression device well (30).

In injuries that have disrupted the syndesmotic ligament, a diastasis screw is required to fix the fibula to the tibia if there is remaining instability at the end of fixation; unfortunately this screw **must** be removed before full weight bearing is allowed, necessitating a second operation.

One option is now to use a bioabsorbable screw. Screws made of polylactide acid have been used in three different randomised clinical trials, all showing good results. There were no wound complications and no difference in range of motion. No patient suffered malunion, non-union or loss of reduction and there was no need for a second operation in any of the groups using the bioabsorbable screw (31-33).

## Post-operative Management

Postoperative treatment of an ankle fracture with cast immobilisation leads to a decrease in muscle performance, functional ability and fatigue resistance, all of which respond well to directed physiotherapy (34). Treatment with a brace that allows active and passive range-of-motion exercises instead of a rigid cast has been tried to improve the functional recovery of patients. One study found that patients using the brace had higher functional scores and a significantly reduced time from surgery until return to work without increased wound or fixation problems (35). However a larger, more recent trial with a longer follow up found no significant functional difference between the groups. There was also a significantly higher complication rate, mainly related to wound healing, in the group using the brace (36).

## Non-steroidal Anti-inflammatory Drugs After Fracture

Non-steroidal Anti-Inflammatory drugs (NSAIDs) are widely used in orthopaedics as effective analgesia and for the prevention of heterotopic ossification (37, 38), particularly after hip arthroplasty. Their use following fracture or fracture surgery is more controversial as there are some animal studies showing delayed fracture healing after use of traditional NSAIDs such as ibuprofen, diclofenac and indomethacin (39-43). Human studies are scarce, but patients receiving indomethacin to prevent heterotopic ossification following acetabular fracture had a significantly greater risk of non-union of concomitant long bone fractures than those not given the NSAID (44, 45). As it is the inhibition of prostaglandin synthesis promoted by NSAIDs that is implicated in the effect on bone healing - a prostaglandin dependent activity (41, 46) - the recent introduction of the selective cyclo-oxygenase inhibitors such as rofecoxib should impart similar deleterious effects on bone homeostasis as peripheral prostaglandin production is still inhibited. However, recent animal studies suggest that they may have less or even no effect (47-49) and that these effective analgesics could be prescribed after orthopaedic trauma without the worries

about fracture healing that their less selective forerunners imparted, although further clinical studies are needed.

### **Summary**

Fracture management forms a large part of the orthopaedic workload and much of the work in this area reaffirms what is already best practice. Advances have been made however, and hip fracture prevention schemes, Norian SRS, bioabsorbable screws and functional bracing rather than rigid cast immobilisation all show significant promise and may find their way into everyday practice.

## **SPORTS MEDICINE**

### **Anterior Cruciate Ligament Reconstruction**

Traumatic rupture of the anterior cruciate ligament (ACL) is a common injury usually caused by a force, either direct or indirect, being applied to the knee whilst twisting. Most patients with ACL injuries do well with the activities of daily living even when followed up for up to 15 years. Reconstruction is, therefore, not always warranted, but it does appear to reduce the risk of subsequent meniscal injury, improve passive anteroposterior knee motion limits, and facilitate return to high-level sporting activities (50).

The debate about which graft to use continues. Synthetic grafts such as Gortex have long since fallen out of favour due to their unacceptably high failure rates and most surgeons now use either the bone-patellar-bone (BPB) or hamstring autograft. Several recent randomised controlled trials have compared the two grafts and there were no significant differences between them in terms of functional assessment scores and objective analysis of graft laxity (51-53). Two studies did find an increased incidence of pain on kneeling in the BPB group, but with no significant difference in functional outcome nor increase in anterior knee pain - the main criticism of BPB grafting (54, 55), whilst Aune *et al* found a significant weakness in isokinetic knee flexion strength among the hamstring tendon group - the main criticism of this technique (55). The most commonly used hamstring grafts are the four-strand gracilis and semitendinosus grafts and one way to decrease this loss of function is to only use the gracilis tendon (56, 57). There were no functional differences between single and double tendon techniques (56).

The Kennedy ligament augmentation device (LAD) is a polypropylene braid that is implanted in parallel with the biological graft to share the mechanical load, thereby protecting the biological graft when it is weakest in the early post-operative phase. Two randomised controlled trials have reported that at seven (58) and eight (59)

year follow up there were no statistical differences in stability testing, functional or activity scores compared to non-augmented grafts. However, the newer Ligament Advancement Reinforcement System has shown more promising results at a two year follow up (60) coupled with histological evidence of cellular and connective tissue growth into the artificial ligament (61).

Aside from operative advances, many post-operative additions to management have been studied to try and improve the results of ACL reconstruction. In short, creatinine supplementation does not augment recovery (62), whereas a brace set at slight hyperextension can ensure return to full knee extension (63). Post-operative pain relief can be helped with a 4-day 'take home' bupivacaine infusion, although only those with maximum pain levels received benefit compared to placebo (64) and there is no benefit to early ACL reconstruction within two weeks of injury compared to waiting 8 to 12 weeks (65).

### **Achilles Tendon Rupture**

The treatment of Achilles tendon rupture (ATR) remains controversial and lies between surgical repair or conservative management by immobilisation. A recent multicentre, randomised trial compared the two methods of treatment over a two year follow up period and recommended operative repair as the treatment of choice as the re-rupture rate in those operated on was 1.7% compared to 20.8% in the group managed conservatively (66). This recommendation was endorsed by two subsequent review articles, although they did point out that the complication rate was higher (67, 68). As in most branches of medicine, nothing is ever that simple and one cohort study (69) and two institutional case series (70, 71) have supported the continued use of non-operative management; in particular Wallace reports a series of 140 consecutive conservatively managed patients with a re-rupture rate of only 5%.

The higher complication rate of open repair, primarily infection, has led to some centres adopting a percutaneous or 'mini-open technique', which was first described in 1977 (72). Compared to the traditional open technique, the percutaneous method has a significantly lower rate of infective wound complications and has a similar re-rupture rate (73-76). It can even be performed under local anaesthesia as an outpatient procedure (77).

If re-rupture is avoided, both operative and non-operative treatments for ATR produce a good functional outcome, however, full restoration of muscle function will not occur for up to two years (78). To counteract this loss in muscle function, one option is to allow early movement of the

ankle between neutral and plantar flexion. Two randomised controlled trials compared this regimen to standard post-operative immobilisation in surgically treated ATR. One found isokinetic calf muscle strength to be better in the early motion group (79), but the other found no difference (80). Both of these trials only allowed weight bearing to begin after three weeks, but two smaller trials have shown some functional improvements from earlier mobilisation and weight bearing in a standard cast (81, 82).

**Summary**

There still appears to be no convincing evidence to identify which type of ACL graft is better nor is there enough evidence to decide between operative or conservative management for a ruptured Achilles tendon. However, mobilising both groups of patients earlier than is currently the standard may be of benefit.

**MINIMALLY INVASIVE ORTHOPAEDICS**

**Total Hip Arthroplasty**

Minimally invasive total hip arthroplasty (MITHA) is a controversial area of orthopaedics that has received a great deal of press interest recently, despite there being little objective published evidence to support the technique. Thomas Sculco, one of the technique's main supporters admits that the initial drive for shorter incisions was largely patient driven (83).

Total hip arthroplasty has been successfully performed by orthopaedic surgeons for over 40 years. Standard incisions are approximately 20 to 25cm long, with extensive tissue dissection and often significant blood loss. The idea behind MITHA is that by utilising an incision, usually posteriorly, that is only 6-10 cm long the surgery involves less deep-seated soft tissue disruption and blood loss and the operative time is shorter (Figure 2). These all then lead to a shorter hospital stay and faster rehabilitation (84, 85).

The surgery is technically demanding, requires specialised equipment (Figure 3) (86) and cannot be performed on the

morbidly obese (87) or those with severe hip dysplasia (84). Due to the technically demanding nature of the surgery, there is a steep learning curve, which is the main argument against its wider use. Surgeons may be performing the surgery without the necessary skill and experience to avoid its risks (88). An American unit has described its experiences with MITHA and reported longer operating times than standard hip arthroplasty with no reduction in blood loss. The authors admit that this was largely due to their inexperience with the technique (89).



Fig 3. Retractors designed for MITHA with incorporated light source.

No randomised trials have compared MITHA with standard hip arthroplasty, although several comparative studies have detailed benefits. Higuchi *et al* suggest that smaller incisions equate to shorter operations and less blood loss without an increase in complications (90). DiGioia showed a significant short-term (3 and 6 month) improvement in limp and ability to climb stairs following MITHA, but there were no differences at one year (91). Berger has described the first 100 MITHAs performed at his unit using a two-incision technique. After the first 12 patients, 85% went home on the day of surgery and the remainder on the following day. He reports no readmissions or complications after discharge (92).

**Shoulder Dislocation**



Fig 4. X-ray showing an anterior dislocation of the shoulder.

Shoulder dislocation and subluxation occurs frequently in athletes, the incidence peaking in the second and sixth decades: over 98% of traumatic dislocations occur anteriorly (Figure 4). The most frequent



Fig 2.

complication of shoulder dislocation is recurrence, which occurs most frequently in adolescents (93). Standard orthopaedic practice has been to immobilise the shoulder for several weeks after reduction of the dislocation, before starting graduated exercise regimes in order to strengthen the shoulder musculature to compensate for the soft tissue defect in the glenoid labrum (Bankart lesion) (Figure 5) that is largely responsible for recurrent dislocations. In an attempt to reduce this recurrence rate, some surgeons are now arthroscopically repairing the soft tissue defect after the first dislocation. Two recent clinical trials compared traditional conservative treatment to acute arthroscopic repair (94, 95) in young athletes. Although numbers were small, they demonstrated excellent results: a 4% redislocation rate at 1 year in those operated upon compared to 94.5% in the non-operative group. At least one orthopaedic unit in UK is now offering young patients with primary traumatic anterior dislocations arthroscopic lavage or repair within 10 days of injury (96).



Fig 5. Arthroscopic view of a Bankart Lesion.

The evidence for arthroscopic, as opposed to open, repair for recurrent traumatic anterior shoulder instability is less clearcut. Two trials have provided equivocal results. They both concluded that it was a difficult procedure and that careful patient selection was crucial (97, 98). If an arthroscopic repair of a chronic lesion is undertaken, then accelerated rehabilitation may be beneficial (99). Staged range of motion and strengthening exercises from the first postoperative day generated no increase in the dislocation rate when compared to the usual regimen of three weeks of immobilisation before rehabilitation, but the accelerated rehabilitation group regained a functional range of motion faster and returned to their functional level of activity earlier.

### Summary

Whilst MITHA clearly has enormous potential to revolutionise hip arthroplasty, long-term randomised trials are needed before its widespread adoption outside of

specialist centres is likely. Acute arthroscopic repair of the labrum following a dislocation rather than traditional immobilisation seems to have promise.

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