

# Update in Anaesthesia for Orthopaedic Surgery

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## Introduction

Orthopaedic surgery makes up a significant amount of the daily throughput of most operating suites. Exposure is both elective and acute, with an escalating demand for care, exacerbated by an ageing population. Most tertiary centres now provide at least one extra dedicated orthopaedic theatre just to manage the fractured neck of femur population. Combined with upper and lower limb fractures, these orthopaedic injuries account for 3 of the top 5 presentations for unplanned surgery in Australia.

Elective orthopaedics is dominated by shoulder and knee arthroscopic surgery, and major joint arthroplasty. Many of these procedures are being performed in the private sector, supported by third party insurers.

This update on anaesthesia for orthopaedic surgery will focus on clinical innovations I feel are most likely to influence the future direction of anaesthesia services for orthopaedics, with special emphasis on interventions that produce meaningful outcomes.

## Arthroscopic Surgery

### Knees

The majority of lower limb arthroscopic surgery involves correction of chondral or meniscal lesions of the knee. These are low-acuity cases, mostly with fit patients and carried out on a day-stay basis. Procedures are quick and complications rare. There is little evidence to support moving away from balanced general anaesthesia for these cases. Morphine injected into the intra-articular space provides no additional analgesia when compared to placebo. Routinely performing peripheral nerve blocks (PNB) is also not supported. Neuraxial blockade should be reserved for more complex patients for whom GA is less desirable. Low-dose intrathecal bupivacaine (heavy 5-8 mg) mixed with fentanyl or clonidine (20-25mcg), inserted in the lateral position with a 15 minute "set time", will produce reliable surgical anaesthesia without adversely influencing turnover or delaying same-day discharge.

### Shoulders

Shoulder arthroscopy is different. Acromioplasty, cuff repair and shoulder stabilisation are commonly associated with high levels of patient discomfort postoperatively. It can be difficult to manage these cases in the ambulatory setting unless a reliable analgesia plan is in place. In the absence of plexus blockade there can be considerable variation in opioid requirements between patients, and predicting who will (or wont) do well is difficult.

There is no doubt that interscalene nerve block (ISB), either with or without GA, will improve pain scores, decrease rescue opioid requirements and improve patient satisfaction when compared to systemic analgesia. This improvement will become less detectable beyond 18-24 hrs. It is important to both anticipate and manage the block wear-off period. Effective regional analgesia can be extended by using a continuous nerve block technique. Maintenance dose requirement with Ropivacaine 0.2% is low (~5ml/hr). A lower background rate (2ml/hr) with an intermittent 5ml bolus capability is associated with low pain scores and avoidance of motor blockade. Disposable, patient-controlled devices have been successfully used with low-risk in the outpatient setting for this purpose. Attention to asepsis and line fixation is mandatory if complications are to be avoided. The first dose down the catheter should always be administered in a monitored setting, and practitioners are advised to review ANZCA PS3 (regional anaesthesia) prior to instituting a block program.

Use of ultrasound to guide placement of nerve blocks is well-supported and should be considered a standard of care when performing Peripheral Nerve Blocks (PNB). Ultrasound guidance is superior to other nerve localisation techniques with respect to block success, performance time, onset time, needle passes and complications. Access to a well-stocked regional anaesthesia trolley with appropriate echogenic needles, will improve the integration of PNB into routine practice. Traditional dose-related side effects of interscalene brachial plexus block (Horner's syndrome, hoarseness, dyspnoea and motor weakness) are largely avoided when using modern ultrasound techniques with low volumes. Contemporary audit databases confirm a low rate of complications with little difference in outcomes between ISB placed awake, sedated or under GA. Patients prefer to be asleep.

Other analgesic techniques commonly associated with shoulder surgery include local infiltration, subacromial injection/infusion and suprascapular nerve block. All provide some benefit with respect to early postoperative pain scores but are inferior to ISB. Concerns about LA-mediated chondrotoxicity have led to a decline in the utilisation of subacromial and intra-articular infusion techniques, and they are no longer recommended by the American Academy of Orthopaedic Surgeons.

### **Fractured neck of femur (#NOF)**

The biggest change in the management of the patient with a fractured NOF, in my career, is the introduction of the fast-track pathway. The whole approach to these patients is now more holistic and multi-disciplinary, with a focus on the best mechanism to achieve return to home or care facility. Effectively patients are now managed under geriatric medicine, with a brief orthopaedic episode of care within the admission. All patients should be approached systematically, commencing in ED on arrival. Pathways should include routine blood workup, iron studies, ECG, early non-opioid analgesia, bladder management, dietary assessment, medication rationalisation and correction of coagulation abnormalities. Early intervention for correctable abnormalities should be initiated. Optimally a Consultant-lead operating service, a dedicated theatre and a radiography team should also be part of the process.

Many patients with #NOF are high-risk, there are few non-operative options for management and best practice advocates early fixation (< 48 hrs). While every effort should be made to optimise patients prior to surgery, delays for additional tests or specialist consultation should be avoided unless the outcome is critical to the management.

Perioperative morbidity is high. Hypoxia (17%), post-operative delirium (25%), transfusion (28%), congestive cardiac failure (14%), acute renal impairment (12%) and myocardial infarction (4%). Mortality at 30 days is 12-15%.

Integrated ortho-geriatric care systems for fractured NOF have been associated with reduced 1-year mortality, earlier hospital discharge, increased return to same place of residence, and higher functional levels (ADLs) than standard-care models. If your hospital does not have a NOF pathway then it is overdue.

How does anaesthesia contribute to #NOF management?

Provision of effective regional analgesia as soon after admission as possible is recommended. Both fascia iliaca (FIB) and femoral nerve blocks (FNB) have been shown to be advantageous in this setting. Catheter-based techniques are probably the gold standard for pre-operative analgesia, as they provide ongoing pain relief with minimal systemic effects. The approach used at SCGH is to insert a CFNB in ED, commence an overnight infusion and top-up the block prior to removal of the catheter at the time of surgery.

There is good evidence supporting the use of supplementary PNBs for #NOF analgesia, prior to surgery and combined with spinal or GA.

Choice of Anaesthesia for #NOF

In many centres, there is a tendency to favour neuraxial anaesthesia for fractured NOF. Single-centre randomised and cohort studies support this choice, but are limited somewhat by size or study design. Recent reviews and meta-analyses, combining multiple publications, have been unable to demonstrate a difference in 30- day mortality between neuraxial block and general anaesthesia. There is only a subtle trend towards improved 1-yr outcomes favouring the neuraxial group. My feeling is that the difficulty in producing solid evidence in favour of one technique versus another is multi-factorial. Combining studies increases the heterogeneity in a population that is already difficult to enrol in randomised studies. They are acute admissions, often with cognitive impairment and they have multiple other problems that may skew outcomes. Of significance is the fact that not all fractured NOFs undergo the same operative treatment. This is probably the most important factor limiting the ability to detect differences in outcome when comparing interventions.

It makes sense to consider percutaneous fixation (pin and plate / proximal nail) as a totally different procedure to hemi-arthroplasty. Proximal fixation is minimally invasive with little or no femoral reaming. General anaesthesia supplemented by FNB is safe and effective for these procedures. Conversely hemi-arthroplasty is a major insult, with similar physiological stressors to hip replacement, including the risk of bone cement implant syndrome.

Registry database analysis favours regional anaesthesia over general anaesthesia for hip replacement (odds ratio 1.31). Incidence of adverse cardiac and respiratory events is lower with RA, transfusion risk is lower and RA patients go home quicker.

So for hemi-arthroplasty, my preference is to utilise neuraxial blockade as the default technique. Frequently this will be in association with invasive monitoring and pressor infusions in higher risk patients.

### **Adductor canal block (ACB)**

This block is what's trending in orthopaedic anaesthesia. Most knee arthroplasty centres are utilising a locally-modified ERAS program to promote early mobility and discharge after knee replacement. Regimes vary between centres, but most involve surgeon-administered local anaesthesia infusion (LIA) and multi-modal analgesia. Addition of standard femoral or sciatic nerve blocks will improve the quality of analgesia after knee replacement, but have the potential to delay early mobilisation. Recent experience with continuous adductor canal blockade looks promising. Studies show that analgesia is improved compared to LIA alone and ambulation is better. Our experience is that there is improved capacity to rescue patients who are limited by breakthrough pain. This block is effectively a sub-sartorial femoral block, below the level of the motor innervation of the quadriceps. Analgesia of the anterior knee without weakness is the aim. It is easy to perform with ultrasound assistance and has no significant complications.

### **Summary**

This update in anaesthesia for orthopaedics has selectively targeted arthroscopy, fractured NOF and knee arthroplasty; all procedures common to the specialty but without a clear consensus as to which anaesthesia techniques will produce the best outcomes. Balanced general anaesthesia should be viewed as the default option for the majority of orthopaedic procedures. Addition of single-shot or continuous ISB has clear benefits for shoulder surgery and incorporation into daily practice is encouraged.

Anaesthesia for percutaneous fixation of fractured NOF should be considered a different challenge to arthroplasty for the same condition. Both GA and RA have equivalent outcomes for standard fixation. Neuraxial block is the better option for hip replacement or hemi-arthroplasty.

Adductor canal blockade as a supplementary technique for analgesia after total knee replacement is recommended.

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