Skeletal Survey: Five Top Experts Cut to the Bone to Answer Your Questions on the Hot Issues in Orthopedic Surgery

What are the pros and cons of hip resurfacing (or Birmingham hip) vs. total hip replacement?
The one indisputable advantage of resurfacing arthroplasty is that less bone is removed from the femur compared to conventional total hip arthroplasty. This may make for easier revision operations. Resurfacings allow for the largest diameter femoral head implant currently available, which provides a greater range of motion and less risk of dislocation. The biomechanics of the femoral implant may be better for the health of the bone at the top end of the femur.

The above advantages mean that patients are being allowed to return to more vigorous and risky activities (however, there is no proof that this is safe to do.)

The major disadvantage of resurfacing is the lack of published results. We do not know the short-term results, other than those from a very few centers. Femoral neck fracture has been the most common complication. There is also concern over the long-term exposure to metal ions (chrome and cobalt, in particular) and what effect(s) this exposure might cause to various organs and tissues. Resurfacing requires a long incision and generous exposure; some total hip replacements are now being done through much smaller incisions. Since resurfacing is a new procedure, surgeon experience with it is limited.

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What is the role of surgery in Legg-Perthes' Disease?
In light of current knowledge about this enigmatic condition, the inescapable answer to this question is: limited and unproven. Nevertheless, surgery remains a mainstay in the management of Perthes'. The generally accepted current principles of treatment among orthopedic surgeons treating children are maintenance of the range of motion (ROM) of the affected hip(s) and containment of the avascular but regenerating capital femoral epiphysis. It is the intuitive belief of a substantial majority of surgeons that if ROM can be maintained and the femoral head contained within the acetabulum, then the outcome will be more favourable than if these goals are not met. However, some skeptics favour "benign neglect"—a position that generates neither confidence nor acceptance from parents of affected children.

What do we know about Perthes' that may inform discussion about the role of surgery? The outcome roughly correlates with the age of onset (older age is worse), the extent of epiphyseal involvement (>50% is not good), the damage to the physeal plate (a short femoral neck leads to a permanent limp), and the shape of the femoral head at completion of regeneration (an incongruent joint leads to early osteoarthritis). Even these risk factors are not absolute—exceptions occur. Children younger than six years of age, those with <50% of the epiphysis involved and those who maintain a reasonable ROM (>30° ab-

duction, >20° internal rotation and 100° flexion) require no management other than observation and, fortunately, constitute 40%-50% of those affected. For those whose pain, limp and hip stiffness are not relieved by anti-inflammatory medication, physiotherapy and weight relief with the use of crutches, the surgical options are:

1. Adductor +\- iliopsoas tendon lengthening and application of Petrie casts (cylinder casts with a bar fixing the hips in abduction and internal rotation yet permitting flexion-extension and weight-bearing);
2. Rotational pelvic osteotomy (Salter and variants);
3. Proximal femoral osteotomy (varus or valgus depending on the stage of the disease process);
4. Combined pelvic and femoral osteotomies (so-called "hyper-containment"), typically for older children (>8.5 years); and
5. Hip joint distraction employing an external fixator attached by pins to the pelvis and femur with a hip hinge, thereby permitting motion while defunctioning the hip.

Each of these procedures (solo or combined) have advocates who consistently publish reports of retrospective series with 70%-80% good to excellent results, where typically the selection criteria is not described, there are no control groups and the patients are not consecutive. A noble attempt at a multicentre trial, commenced more than two decades ago,[1,2] failed to demonstrate a statistically sig-

nificant advantage of one surgical method over another. This was presumably because each participant chose his/her favourite method of treatment as there was no randomization and case stratification was imperfect.

The regrettable conclusion to be drawn is that we know little more than we did three decades ago about the etiology, pathogenesis (evidence from post-mortem studies suggest there must be more than one avascular episode for the clinical picture to occur), risk factors (passive smoking[3] and thrombophilia[4] have been implicated), and predictability of the shape of the epiphysis after healing based on the radiographic classification at presentation and outcome (with or without intervention). I have not provided a bibliography citing the hundreds of published reports advocating one type of surgery over another, but instead have listed recent textbooks with excellent accounts and key references.[5,6,7] Since the preferred management for Perthes' is in a constant state of flux, for any child presenting with the disease, I strongly recommend early referral to an orthopedic surgeon who is an expert in children's hip conditions.

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What is the value of acromioplasty in rotator cuff pathology?

Rotator cuff tendinopathy is recognized as a significant cause of chronic disability. In 1972, Neer popularized the term "impingement syndrome" by evidence of mechanical impingement of the rotator cuff and humeral head on the undersurface of the acromion and the cora-coacromial ligament becoming a proliferative spur as a coracoacromial arch. Although it is the most frequent shoulder pain in adults, we must rule out other pathology: intra-articular (synovitis, labral tear), acromioclavicular, capsulitis, tumor, or referred pain. A good physical exam and proper imaging is of prime importance. Steroid injections are useful to differentiate subacromial pain.

Conservative measures of rotator cuff tendinopathy is effective in both younger and elderly populations and is the treatment of choice. Failure of conservative measures and long-term disability from bursitis, partial tear or complete tear of the rotator cuff is an indication for surgery.

The accepted surgical treatment for impingement syndrome is acromioplasty consisting of removing the anterior part of the acromion protruding in front of the clavicle and by thinning its undersurface (5 mm resection) to make it flat from a hook shape. According to the clinical picture, it is often associated with other acts, such as cuff repair, debridenment or reconstruction, acromioclavicular resection arthroplasty, long head of the biceps tenodesis, labral repair or debridement. Rehabilitation is necessary for up to 12 weeks in all cases of acromioplasty with intact cuff.

Results of acromioplasty have been reported as very good[1,2] but, to date, there is no randomized study. There is little doubt that operative treatment of rotator cuff disease improves general health status in selected cases[3] but appropriate selection of patients is considered the key to success.[4]

There is little difference between the results of arthroscopic subacromial decompression and open technique,[5] but there is a definite learning curve to arthroscopy; cuff repair remains a less reliable technique in most hands than open reconstruction.

Today, arthroscopic acromioplasty is an effective and well-accepted method of decompression of the cora-coacromial arch and improves patient- and surgeon-based outcome criteria for impingement tendinopathy. Beware of instability tendinopathy in the younger population where acromioplasty has little to no role. Other intra-articular, calcific and acromioclavicular pathologies must be addressed specifically.

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What surgical treatment is available for patients with ankylosing spondylitis and spinal deformity? What are the risks of surgery and long-term effects?
Spinal deformity in patients with ankylosing spondylitis may develop; a deformity in the sagittal plane is known as kyphosis (Figure 1).
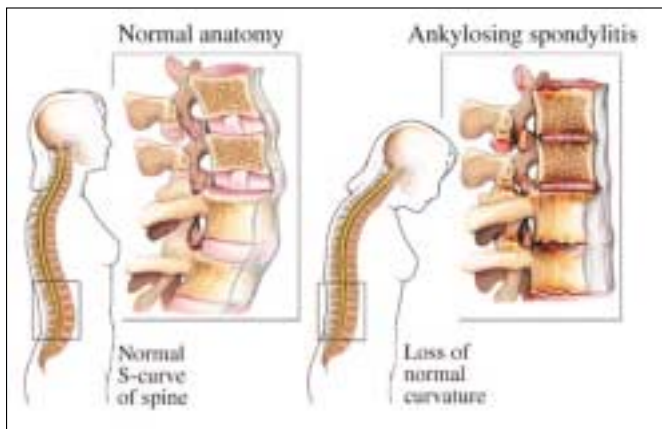

Figure 1. Normal spinal alignment compared to kyphotic deformity in anky-losing spondylitis that can occur in the cervical, thoracic or lumbar spine.

Kyphosis can occur in the cervical, thoracic or lumbar spine and, in some cases, the inability to straighten the pelvis can be secondary to hip flexion contracture. Patients may compensate for kyphosis by increasing the lordosis in mobile parts of their spine, flexing their hips and knees. The degree of kyphosis and the anatomic location may cause the patient to walk in a stooped forward posture with the inability to maintain horizontal gaze because of the inability to compensate for the spinal deformity.

To determine the anatomic site of the deformity, the patient is placed with hips and knees extended, so the
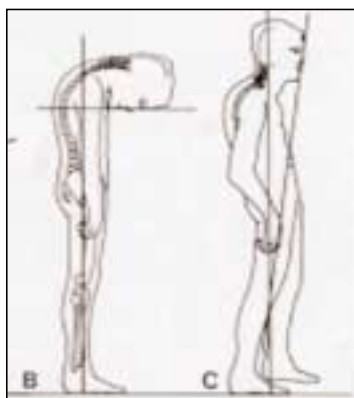

Figure 2. Chin brow to vertical angle in a patient with cervical kyphosis (left) and post-operative cervicothoracic osteotomy (right).
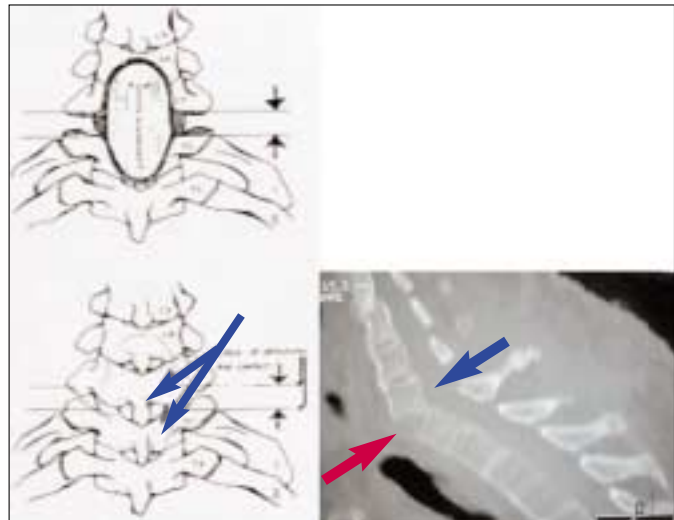

Figure 3. Cervicothoracic osteotomy between C7 and T1 with distraction through the C7/T1 disc space (red arrow); the posterior elements of C7 and T1 are removed prior to correction of the deformity (blue arrows).

lumbar, thoracic and cervical spine can be observed. The chin brow to vertical angle is observed (Figure 2). This is an angle formed between a vertical line intersecting with a line drawn from the chin to brow, measured with a goniometer.

Correction of a spinal deformity (after a flexion contracture of the hips has been ruled out) can be accomplished by a posterior osteotomy at the cervicothoracic junction C7-T1 (Figure 3) or mid-lumbar spine at L3 (Figure 4), and occasionally in the thoracic spine. An

Figure 4. Pedicle subtraction osteotomy through L3 to restore lumbar lordosis (red arrows).

osteotomy serves to shorten the posterior aspect of the spine and increase the lordosis, thereby correcting the kyphotic deformity and improving the alignment of the patient. The risks to the patient are those inherent to a general anaesthetic and specific to the procedure, including: wound infection, implant or bone failure and recurrence of the deformity, transient or permanent neurologic deficit, bleeding and medical complications such as deep venous thrombosis, pulmonary embolism and myocardial infarction.

Patients find the correction of the deformity to be extremely gratifying as they can ambulate more easily and safely with their horizontal gaze restored. Deformity correction is usually permanent without recurrence and may require surgery at more than one spinal region to completely correct the alignment.

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When is surgery indicated for patients with atlantoaxial instability?

Atlantoaxial instability is the most common spine problem in rheumatoid patients.[1]

In adults, instability is defined by an atlas to odontoid space of more than 3 mm. Surgical referral is indicated for patients with gaps of more than 5 mm, neurologic (bulbar or high cervical cord) symptoms, progressive instability on serial X-ray or the presence of subaxial instability on imaging.

My absolute indications for surgery are C1-C2 gaps of more then 9 mm or the presence of neurologic signs or symptoms. Relative but strong indications are gaps of 7 mm or more, severe pain, or progression of the instability on serial X-rays. Some clinicians have also proposed prophylactic surgery in milder cases to reduce the risk of developing subaxial instability.[2]

The surgical discussion will be limited to isolated C1-C2 instability with or without inflammatory pannus on the odontoid.

The first step is to determine the reducibility of the complex and rule out any neurologic compression in the reduce position. If, in the reduce position, there is persistent neurologic compression by the inflammatory mass or bone, a trans-oral resection of the odontoid process is required followed by the definitive surgery. This can be done in one or two operations. In the latter situation, the patient will require halo immobilisation between surgeries.

Although technically more demanding, C1-C2 transarticular screws with interlaminar bone graft and sublaminar cables have been shown to be far superior, both biomechanically[3] and clinically, to isolated wires, cables or clamps.[3,4,5] This procedure provides immediate fixation, limiting movements in all axes of the C1-C2 complex. Performing this procedure with navigational assistance (*e.g.*, Stealth Station, Medtronic, Memphis USA) is safe and very effective, with a fusion rate above 90%.[6]

The most feared complication is vertebral artery injury. This complication is greatly reduced by increased experience with the procedure and the addition of a navigational system. Other complications, such as infections, non-union, screw malposition and hardware failure are, fortunately, rare.[7]

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