

III or IV, larger than 8 cm, and metastatic disease). In addition, those treated without surgical resection and those treated with limb salvage had the poorest prognosis with significant increases in mortality. This paper confirms the poor prognosis for this unpleasant disease and goes further to confirm that surgery with clear margins remains the only effective treatment at the present time.

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Children's orthopaedics

X-ref For other Roundups in this issue that cross-reference with *Children's orthopaedics* see: *Spine Roundup 3; Oncology Roundups 1 and 3.*

Shortened mid-shaft clavicular fractures in adolescents? X-ref

■ If you haven't fixed a clavicle fracture in an adolescent, please don't; if you are doing so, please stop. This is essentially the take home message from this much needed paper from **Rochester, Minnesota (USA)**.¹ One of the difficulties with randomised controlled trials is that because they are designed to test a single primary outcome measure, they can often be misquoted or misunderstood, or the subtleties of the trial design missed by the casual reader. The oft-quoted COTS study, for example, (which demonstrates improved functional outcomes in the shoulder) only applies to adult males with mid-shaft, shortened clavicle fractures. However, clinicians tend to extrapolate and expand indications when the evidence is strong and convincing in one group to apply this to another. A perfect example of this is the adolescent clavicle fracture which was a no-brainer for conservative management until relatively recently. In some centres it is now being considered for operative intervention. This paper reports

the outcomes of adolescents with displaced (> 1.5 cm of shortening) mid-shaft clavicle fractures to a minimum of nine months of follow-up. The authors were able to identify 16 patients (eight each in operative and non-operative groups) who met the inclusion criteria and were happy to undergo outcomes assessments. The children were, on average, 14 years old. They underwent a gamut of outcome measures, including radiological assessment, QuickDASH Score, Constant Shoulder Score, and questions regarding satisfaction with treatment. Quantitative isometric strength, range of motion, and abduction fatigue testing were performed on the involved and uninvolved sides for comparison. In short, there were no differences in outcomes in terms of appearance, satisfaction or functional scores. The differences observed all favoured the non-operative group, with clavicle fixation associated with poorer abductor function and a higher rate of symptomatic nonunion. This is another paper demonstrating equivalence in functional outcome and cosmesis between non-operatively managed and operatively managed isolated shortened clavicle fractures in adolescents; equivalence, that is, with the exception that in the operatively managed group there were two surgeries and significant

additional cost was incurred by our overburdened healthcare system!

Radiology reports in paediatric orthopaedic clinic?

■ Here at 360, we aren't sure of the value of radiology reporting in addition to reporting of the radiographs by paediatric orthopaedic surgeons themselves. There is little evidence one way or the other, however, reasoning that a 'radiology report' represents a significant input in terms of both time and resource, and is essentially duplicated work, these authors from **Pittsburgh, Pennsylvania (USA)** have set out to see if there is any value in this approach.² The authors undertook a retrospective review of patients presenting over a four-month period and compared the orthopaedic surgeon's note with the formal radiology report. In addition, the authors calculated the costs of the radiologist's reporting. There were 1570 consecutive patients included in the study who underwent 2509 radiographs. There were enough data available for inclusion in the study in 2264 cases. The radiologist's interpretation of the radiographs added useful information in just 23 cases (1.0% n = 23/2264), however, the radiologist failed to reach the diagnosis in 1.7% of cases (n = 38/2264). Overall, the cost for each 'positive read' was \$3798. Given that the radiologists 'missed' more diagnoses than the

paediatric orthopaedic surgeon, and the additional cost per positive diagnosis was nearly \$4000, one does have to ask if there is any value in this intervention in these times of austerity.

The management of residual acetabular dysplasia: updates and controversies

■ This article from **Beirut (Lebanon)** is a review article, rather than a study, but shares interesting concepts and discussion.³ The management of residual acetabular dysplasia is somewhat problematic, and there is much debate as to the indications for further surgery. These authors have succinctly reviewed the evidence, and their article is informative at all points in the treatment and decision-making pathway. The summary of what the current state of play is that essentially in a patient with persisting acetabular inclination of over 25° in children treated in infancy for developmental dysplasia of the hip should prompt all surgeons to think about further treatments or investigations. The authors consider the chondrolabral acetabular anlage a suitable intervention, and recommend MRI or arthrography as the appropriate investigation to aid decision making. If the results of these investigations are maintained normal morphology, then the

current literature and expert opinion appear to support watchful waiting. However, if the hip is undergoing significant morphological changes, then intervention in the form of an acetabular osteotomy is recommended. There is a simple and concise decision-making algorithm included in the paper. The failure of the normal development of the shape of the cartilaginous acetabulum and subsequent subluxation of the hip does happen overtime as these patients gain weight and age if the bony acetabulum does not sufficiently ossify to support it. Cartilaginous acetabulum of normal appearance at a point in time of development does not necessarily ensure ongoing normal development. One of the central thrusts of the recommendations in this article is that reassessment needs to take place regularly. In normal clinical practice, serial radiograph, rather than MRI, is the usual method of follow-up. However, MRI scanning and assessment of the cartilaginous acetabular shape is useful if it demonstrates a significant abnormality that supports operative intervention. However, if it is normal it does not necessarily reassure regarding ongoing normal development.

The Birmingham Interlocking Pelvic Osteotomy in the long term X-ref

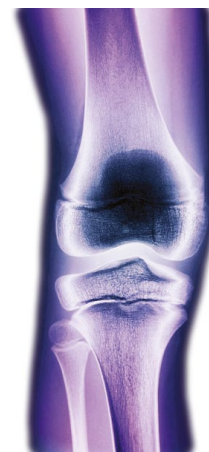
■ We were delighted to see this 13- to 21-year outcomes study of the interlocking osteotomy from **Birmingham (UK)**, the originating centre.⁴ The Birmingham osteotomy is a triple osteotomy in which three linked bone cuts are made in the ilium. It relies on CT scanning to accurately delineate the cuts, and essentially the angle between the cuts defines the rotational correction achieved. One of the key advantages of the Birmingham osteotomy is that it is intrinsically stable and, as such, there is no need for the patient to partially weight bear, and nonunion rates are low. There is a general dearth of long-term follow-up studies of a reasonable size following

pelvic osteotomies in children, which is curious given that it is the longer-term results in which one should really be most interested. This prospective study includes 116 hips in 100 patients, all of whom underwent a Birmingham Interlocking Pelvic Osteotomy to correct their acetabular dysplasia. This is a prospective originating-centre study, and represents the first 100 cases of this procedure undertaken in Birmingham. The authors report their outcomes in terms of survival of the hip without conversion to arthroplasty. This was a mixed group of patients with an age range of seven to 57 years at the time of initial surgery, and a mean age of 31. The paediatric population did incredibly well, with the 20 hips under the age of 20 years at the time of operation achieving 90% survival at 17 years following surgery. This is as impressive a result as any published elsewhere, and should boost the confidence of those undertaking this procedure in the younger age group. Survival wasn't quite so good across the whole group, with just 76% survival overall at ten years, and 57% at 17 years. As perhaps would be expected, given the nature of the surgery and the fact that this represents the surgical learning curve, there were a number of complications with a 10.4% post-operative complication rate. The authors identified that increasing patient age and established hip arthritis were the determinants of poor outcome. Nonetheless, overall it appears that if the correct patients are selected initially, the survival of this procedure is good and it is a reasonable option even for the young adult hip.

How much bone to remove in cam deformities? X-ref

■ There are still some big unanswered questions surrounding hip preservation surgery. The proponents argue that the preservation of a joint is better than replacement, and here at *360* we wholeheartedly agree. However, there is also the potential to do harm, and even the best series of hip-preserving surgery

have a significant complication and failure rate. We still do not know very much about the best way in which to perform the procedure, and one of our concerns is that the patients may not have technically the best operation even if they do need one. Surgeons in **Salt Lake City, Utah (USA)** have argued that patients with residual pain following surgery for cam-type impingement often benefit from revision surgery, and that the problem is usually insufficient initial debridement.⁵ They set out to establish exactly how much should be removed in typical cam-type lesions in order to restore the geometry, and specifically whether subchondral bone should be removed. The authors constructed 3D segmental reconstructions of 45 control subjects and 28 patients with a diagnosis of femoroacetabular impingement (FAI). The authors then used a clever geometric statistical shape modelling system to produce a model of the average impingement and normal femoral head. This allowed them to identify a consistent area in the femur represents the 'cam' lesion and should be treated as part of the surgery. They then undertook simulated resections to establish how much ought to be removed and from where to solve the problem. The authors established that the median distance between the mean native cam and control femurs was 1.8 mm (1.0 mm to 2.7 mm). If resected directly to cortical subchondral bone, this average difference was reduced to just 0.3 mm. It is clear from this study that, in general, debridement of a cam lesion should involve removal of some subcortical cancellous bone, and that without this there remains a residual cam lesion, and we would agree with the hypothesis of the authors that this may be the reason for residual pain. At the very least, it seems that if an operation is to be undertaken one should remove enough bone to restore the normal geometry.



Inlet radiographs in DDH reduction

■ Surgical treatment of developmental dysplasia of the hip (DDH) remains commonplace despite the success of non-operative interventions such as the Pavlik harness. Although, for the most part, the debate surrounds who should have what intervention and when, this paper from **São Paulo (Brazil)** caught our eye as it crossed the editorial desks here at *360*.⁶ The authors are attempting to answer a much simpler question than who benefits from operation; rather, they were interested in how best to judge the reduction having decided to undertake the surgery. These authors set out to identify the benefit of inlet radiographs in judging the operative reduction. The study results are based on two years of surgical workload and include all children undergoing operative reduction of their DDH between January 2013 and January 2015. All of the participants in the study underwent both CT scanning and inlet radiographs. There were a total of 26 radiographs and CT scans obtained from 23 children over the two years of the study. Two independent observers reviewed the imaging, and interobserver reliability and intra-observer reproducibility were quantified. Using the CT scanning results as gold standard, there was a high level of agreement between the inlet radiographs and CT scan results ($K = 0.834$, 5% CI), with excellent

sensitivity and a specificity of 95.5%. These results demonstrate impressive accuracy of reduction as judged by the inlet view which, in this series, is as accurate as CT scanning. This is a much more important finding than first appears as, given the current trends towards on-table CT scanning in complex operative interventions, it raises questions about radiation exposure in paediatric patients who are incredibly sensitive to radiation.

Open tibial fractures in children

■ The changes that have happened in the UK trauma system have centralised the management of badly injured patients, adults and children alike. While this has resulted in great progress in the management and care of these patients, the scientific publications are only just starting to follow. In the adult trauma world, the management of open tibial fractures is a much studied area, in part due to the severity of the injury and in part due to the problems we face

when it all goes wrong. Although there has been a great deal of work done on the treatment of adult patients and optimising their outcomes, there has been little progress (or little apparent progress in the literature) in children's open tibial fractures, largely due to the rarity of the injury. Surgeons in the Major Trauma Centre in **Birmingham (UK)** have shared their experience with open tibial fractures in children, and it's a paper that really is worth reading.⁷ Their study concerns the management of 61 children treated between 2007 and 2015 with a mean age of nine years. In contrast to what we might expect, just eight involved the physis, the majority arrived 'out of hours', and two thirds were due to motor vehicle collisions. The cohort had a range of different immediate stabilisation options, including casting (15%), elastic nailing (31%), K-wiring (21%), and a single case of intramedullary nailing. From the soft-tissue perspective, wound closure

was primary in 39%, delayed primary closure in 18%, split skin graft in 13%, local flap in 28% with a single free flap. The overwhelming majority (70%) were high-energy injuries and this resulted in three deep infections. No patient in this study who underwent primary wound closure developed an infection which would clearly be at somewhat odds to the results seen in the adult population where primary closure in high energy fractures is associated with significant infection rates. There are some valuable lessons to be seen here, and we applaud the authors for publishing a large series highlighting the difference between the management of adult and paediatric open tibial fractures.

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Research

X-ref For other Roundups in this issue that cross-reference with Research see: *Hip Roundup 3; Knee Roundup 1; Foot & Ankle Roundup 5, Spine Roundups 1 and 7; Trauma Roundups 1 and 8; Oncology Roundup 2.*

Genetic factors contribute more to hip than knee osteoarthritis X-ref

■ As the age of the genome is progressing, we are starting to see the publication of large cohorts which rely on genome sequencing. These cohorts usually utilise genome-wide association studies (GWAS) where the entire genome is sequenced in a number of individuals and genetic associations are made that may or may not be associated with a specific phenotype. However, before the age of the nucleotide and rapid and cheap gene sequencing, it was possible to undertake similar studies

using twins – after all, the only way you can really unpick the nature versus nurture issue is to undertake twin and sibling studies. It transpires that there is still a lot you can figure out from these kinds of studies, and researchers in **Oslo (Norway)** undertook an interesting association study using a combination of twin data and the Norwegian Arthroplasty Registry.¹ This study involved linking data from the Norwegian Arthroplasty Registry and the Norwegian Twin Registry, resulting in a population cohort study of all same-sex twins born between 1915 and 1960. There were 9058 pairs of twins (18 116 individuals) reported in this study, of which 3803 were identical (monozygotic) twins and 5226 were non-identical (dizygotic) twins. The study spanned the life of the outcome registry (27 years

for hips, 20 years for knees). Using this methodology, the research team were able to explain rather elegantly the contribution of genetic and environmental factors to the incidence of hip and knee arthroplasty. It appears from their results that these are somewhat different. In total, 73% (95% CI 66% to 78%) and 45% (95% CI 30% to 58%) of the observed variation in hip and knee arthroplasty rates could be explained by heritable factors. The authors also recorded other factors such as sex, body mass index (BMI) and education level. When the authors adjusted for potential confounders, there was a huge difference in observed association between genetic factors and incidence of primary arthroplasty. With regard to the hip, the hazard ratio was 2.98, but it was

much lower in the knee, at 1.15. This difference was chiefly explained by a more significant effect of BMI on knee arthroplasty rates. This is a fascinating article and underlines the profound effect that BMI has on a range of conditions; here, it appears more important than genetics.

Metal hypersensitivity the cause of unexplained post arthroplasty pain? X-ref

■ There is an ongoing debate, which is increasingly difficult to follow, surrounding metal allergy and its implications for arthroplasty. As the common cause of metal sensitivity is immunoglobulin E (IgE)-mediated histamine release and specifically is a contact dermatitis, there has historically been some scepticism surrounding the reports of metal allergy affecting outcomes following joint arthroplasty.²