

Children's orthopaedics

X-ref For other Roundups in this issue that cross-reference with *Children's orthopaedics* see: [Trauma Roundup 1, 6, 7](#); [Foot & Ankle Roundup 2](#); [Knee Roundup 3, 5](#).

Current practice in the management of slipped capital femoral epiphysis X-ref

■ Treatment of the slipped capital femoral epiphysis (SCFE) has been a controversial topic for many years and continues to stimulate much debate amongst paediatric orthopaedic surgeons. The authors of this survey-based study from [New York \(USA\)](#) report the results of their survey which was sent to all members of the Pediatric Orthopaedic Society of North America, inquiring about preferences in the treatment of SCFE patients.¹ The survey was designed to establish a consensus as to what could be considered current standards of care amongst a broad range of settings including private, public, specialist and generalist practice. As with the majority of survey-based studies, the response rate was respectable, with around 30% of the eligible 990 surgeons replying. The study highlighted the ongoing controversies among the membership, however, it was also able to highlight some areas of broad agreement. Aspects such as initial radiographic evaluation using the anteroposterior and frog-leg lateral views, and use of MRI or bone scanning in patients with significant clinical suspicion but with a normal radiograph, or for hips with questionable head viability, all met with sweeping approval. Members who responded to the survey also tended to agree that cannulated stainless steel screws are used more often than titanium screws and one screw is used more frequently for stable slips, as is the *in situ* fixation method without manipulation. The authors were able to shed some light on the disagreements as well, noting that the current treatment of SCFE

varies significantly depending on the surgeon's type of practice, years in practice, and volume of practice. With so much disagreement and so many recent publications on the topic, surely the management of SCFE is one of those topics where a prospective, multicentre study (randomised or comparative) would be invaluable in resolving some of these controversies and establishing evidence-based guidelines for the management of SCFE.

Calcaneal apophysitis: equally effective conservative options X-ref

■ Conservative management of self-limiting conditions is a bit of an art form, and given the general lack of funding for conservative management studies it is unusual to see well-conducted research in this area. We were delighted to read a report from Dutch authors in [Amsterdam \(The Netherlands\)](#) who designed a randomised controlled trial to evaluate the effectiveness of three different conservative treatment options in children with calcaneal apophysitis (Sever's disease).² The authors designed their three-arm randomised controlled trial to evaluate the effectiveness of observation, a heel raise and physiotherapy on pain at three months following enrolment in the study. The authors recruited 101 patients into the three groups, and each intervention was initiated for a ten-week period with a final follow-up at 12 weeks. Ultimately, each group showed statistically significant improvements in all measured outcomes when compared with baseline during follow-up. There were, however, no significant differences between the intervention groups at final follow-up. The

authors concluded that the results of this study demonstrate the effectiveness of each of these conservative options for children with calcaneal apophysitis, or they could, of course, just represent the natural history of the disease; after all, 'wait and see' is not really an intervention.

ACL reconstruction in the paediatric population? X-ref

■ We are not really fans here at 360 of the data mining exercise that many national datasets and registries have become. It seems to us to be the antithesis of good study design to have some data and *then* think of a question. However, this paper from [Charlottesville \(USA\)](#) is definitely worth bringing to readers' attention. Although a retrospective cohort study, the authors have taken care to answer their study question and used data from a national dataset to identify temporal patterns in ACL injury and treatment in the paediatric population.³ The ICD-9 codes from a national dataset covering treatment episodes between

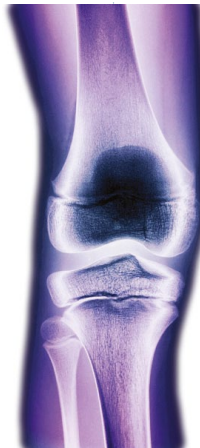
2007 and 2011 were used to identify both ACL tear and arthroscopic reconstruction in a variety of paediatric and adolescent age groups. For each age group, ACL reconstruction, partial meniscectomy, meniscus repair, microfracture, osteochondral autograft or allograft transfer, and shaving chondroplasty were also identified as secondary procedures. Across the dataset an ACL tear was identified in 44

815 paediatric or adolescent patients, and 19 053 underwent arthroscopic ACL reconstruction. Compared with the adult control group from the same coding database, there was an 18.9% increase in the diagnosis of ACL tear and a 27.6% increase in ACL reconstruction in the ten-

14-year-old age group. There was also a 17.7% and 15.7% increase, respectively, in the 15- to 19-year-old group. Rates in the youngest group were equivalent to those seen in adults. It seems likely that this trend is multifactorial; a combination of an increase in competitive athletic activity, increased single-sport concentration and year-round participation are implicated by the authors. In addition to this, there are some other potential explanations: increased awareness, more aggressive diagnosis and a lower threshold for evaluation with MRI may also be responsible. The estimated rate of injury is rising at a rate significantly higher in the paediatric population than in adults, and ACL reconstruction in this group was commonly associated with meniscal and cartilage injury requiring surgical procedures. This paper raises some interesting questions: if the rate of ACL injury really is rising, then why is that? If it is not, then is the increased rate of surgery due to over-investigation or higher expectations?

Severe open tibial fractures in the child

■ Limb salvage is the initial goal for the majority of children with Type IIIB and IIIC open tibial fractures. Soft-tissue reconstruction and management of bone loss are challenging in any case, and children add their own particular subtleties to this difficult problem. Surgeons from [Dallas \(USA\)](#) have reported their own (small) experience with this injury.⁴ Their retrospective 20-year series includes just eight patients with this injury, indicating its rarity. All of the cases reported were type IIIB and IIIC open tibial fractures, all managed with circular external fixation and soft-tissue coverage between 1990 and 2010. These injuries were at the more severe end of the spectrum, with free or rotational soft-tissue flaps required to achieve soft-tissue closure and with a mean



bone segment loss of 5.4 cm (0 to 12 cm). The authors used circular external fixation for initial static stabilisation to allow for soft-tissue coverage and fracture healing, acute shortening with subsequent limb lengthening, and stabilisation of the extremity for soft-tissue coverage and bone transport. Complications are dealt with candidly in their manuscript. These included infection, partial or total flap necrosis, delayed union, infected nonunion leading to amputation, ipsilateral growth disturbance due to physeal injury, angular deformity, leg-length discrepancy, ipsilateral fracture proximal to the frame, neurogenic pain, equinus contracture, premature consolidation of distraction regenerate, inability to proceed with treatment plan due to psychosocial concerns, progressive contralateral deformity due to incomplete epiphysiodesis, and foot drop due to initial injury. All were present in at least one of the just eight patients reported with this injury. Seven of eight limbs were salvaged and all patients were followed to skeletal maturity, at which point all were walking without assistance. Four patients suffered from foot drop due to anterior compartment soft-tissue loss, three had a clinically significant leg-length discrepancy (> 2 cm) and four required secondary or contralateral procedures. The fact that this study considers a 20-year experience from a US paediatric level I trauma hospital indicates the rarity of these injuries. The authors describe a general algorithm to inform management and demonstrate that limb salvage with good function is possible for these severe injuries. Despite the clearly specialist nature of the care provided to these children, the outcomes were average at best.

Tibial spine fractures: what to do best? X-ref

■ Tibial spine avulsions are a common occurrence in the paediatric population, and setting aside for a moment the controversies that exist surrounding the indications for

fixation, there are also two differing schools of thought regarding the approach (open or closed) for fixation and appropriate peri-operative care. Paediatric orthopaedic surgeons in **Rochester, Minnesota (USA)** have reported their study designed to establish which of the modifiable risk factors affect outcomes in tibial spine fixation.⁵ Although ambitious in its aims, this paper makes its conclusions based on 31 patients (13 open and 18 arthroscopic) on whom the authors evaluated the effects of surgical approach and modifiable peri-operative factors on arthrofibrosis incidence. The series included patients treated over a 26-year period, and follow-up continued until both radiographic union and clinical recovery. Arthrofibrosis was seen in eight patients (one open and seven arthroscopic). Actually having an arthroscopy was not found to be the independent risk factor that it appears, however, it is confounded by operative length - which was an independent risk factor for arthrofibrosis. Specifically, a surgical delay of over a week and prolonged operative times (> 120 min) were significant risk factors for arthrofibrosis. Despite possibly overinterpreting what is a limited series of patients, the authors do make very sensible conclusions. They conclude that prioritising those patients needing surgery and then using whichever approach the surgeon is most familiar with seems a very sensible option.

Flexible nailing in the paediatric tibia X-ref

■ The tibia is not the femur. This is a lesson that adult trauma surgeons seem to relearn on a regular basis. The soft-tissue envelope is different, the cortical bone is much thicker and the biomechanics are also different. The use of titanium elastic nails has revolutionised the treatment of many fractures. Nonetheless, they are not as stable as interlocking nails, with only frictional rotational stability and no length stability unless endcaps are used, and even when endcaps

are used there is a risk of failure due to excessive loading. Surgeons at the Children's Hospital of Philadelphia, **Philadelphia (USA)** undertook a research project to evaluate the benefits or otherwise of flexible tibial nailing in children of different sizes.⁶ This retrospective review reports the outcomes of a cohort of 95 patients, all of whom underwent stabilisation of a tibial shaft fracture with titanium elastic nails. Patients were stratified according to arbitrary weight (+/- 50 kg) and age (+/- 14 yr) thresholds. Analysis was undertaken for adverse outcomes (delayed and malunion at fracture union and/or nail removal) at a mean time of 243.6 days. There were similar malunion rates between the two weight groups, with the lighter patients faring better (13.3% vs 10%), and similarly the malunion rate in > 14-year group was not significantly higher than in the younger patients (17.6% vs 8.2%), although clearly there is the potential for a significant difference with larger group sizes. Conventional wisdom recommends a cut off of 50 kg for the management of lower limb, long bone fractures with flexible intramedullary nails. This study contradicts this and certainly raises the prospect of extending these indications. We clearly have some concerns about a malunion rate of nearly 18% and would want to see a larger study before changing our routine practice here at 360.

Paediatric tibial osteomyelitis X-ref

■ Paediatric tibial osteomyelitis often requires sophisticated investigation and prolonged management, typically in a multidisciplinary manner. Treatment with antibiotics and surgical debridement as appropriate can lead to a good clinical outcome, but complications are common. The paediatric team in **Auckland (New Zealand)** set out to establish the outcomes of their own series of patients with follow-up to just shy of eight years.⁷ This retrospective study reports on an impressive 191 patients. On average, patients presented with

symptoms for around five and a half days and the majority (60%) were atraumatic. Inflammatory markers were the most sensitive, with 78% presenting with an elevated ESR, 78% an elevated CRP, and 40% presenting with pyrexia. In common with many other types of osteomyelitis, only 75% were tissue-culture positive, with *Staphylococcus* being the most identified organism. Almost half of patients required a surgical debridement, and antibiotic treatment was required for an average of 20 days (intravenous) and 23 days (oral). Six post-surgical complications were identified and 25 patients required re-admission for one or more relapses. This paper restates what is already known about the serious nature of tibial osteomyelitis, even in the paediatric population. However, it presents contemporaneous information on a condition that has a changing epidemiology. The paper highlights the variable clinical and radiological features seen and the improved diagnostic accuracy of MRI and nuclear imaging.

On supracondylar fractures

■ This is a peer-reviewed, level V (expert opinion) paper from **Nottingham** and **Bristol (UK)** that examines the controversies associated with this common fracture.⁸ The authors' view is that preservation of neurological function, the prevention of further neurological injury and the avoidance of ischaemic muscular damage are of fundamental importance in management. They argue that the majority of perfused but pulseless hands can be managed expectantly, provided there is no evidence of evolving muscular ischaemia. The majority of peripheral nerve injuries, which are caused at the time of injury and present at the time of first assessment, can also be managed expectantly, provided there is no evidence of neuropathic pain, or deterioration over a period of eight to 12 hours. The current dogma of reduction and transcutaneous pinning of all displaced supracondylar humeral fractures in children should

be approached in a more analytical fashion, and there are alternative management strategies for under-resourced healthcare systems. Good function is to be expected in the majority of cases and the current paradigm of prevention of cosmetic deformity at all costs is not only illogical, but also potentially harmful. This is an interesting read by two 'senior' opinions, but like all opinions, should be taken as such!

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Research

X-ref For other Roundups in this issue that cross-reference with **Research see: Hip Roundup 1, 3, 5, 6; Knee Roundup 1, 3, 5, 6; Trauma Roundup 5; Foot & Ankle Roundup 5.**

Body fat should be the focus X-ref

■ Much has been made of the potential issues associated with obesity and outcomes. However, the current body of research could at best be described as 'conflicting' and, perhaps more accurately, as 'murky'. The majority of studies are consecutive case series, where, at worst, patients are arbitrarily divided into their WHO groups, and incidence of complications and such is reported in a comparative manner, usually with some rudimentary statistical analysis. Researchers in **Durham, North Carolina (USA)** have taken a slightly more scientific approach, and started by asking, how should obesity be defined? There are plenty of potential measures, and body composition is becoming 'in vogue' in many academic disciplines. The research team reports a small study of 215 patients undergoing lower limb arthroplasty, and examines the value of body fat percentage as a marker of complications and outcomes.¹ The study team collected patient demographic data, BMI and body fat percentage as pre-operative variables, and the UCLA activity and

appropriate clinical outcome scores. Perhaps not surprisingly, the body fat percentage was a better predictor of medical or surgical complication (odds ratio 1.58) than BMI. The measure also predicted UCLA activity and pain scores more accurately than BMI, which was not predictive in this small study. Patients may be denied surgery secondary to a high body mass index, however, this study demonstrates that manual measurement of body fat percentage is a better metric for evaluating clinical outcomes and complications. Future use of this index may be beneficial for patient risk stratification, if properly measured, and certainly should form the basis for further study rather than the much more crude (but easier to obtain) BMI data.

How best to learn orthopaedic surgery?

■ There is a potential problem raising its head in the future - that of a lack of a skilled workforce. Healthcare systems throughout the world are struggling with raised expectations, difficulties of surgeon-reported outcome measures (which can be a bar to training) and imposition of time-restrictive and service-driven contracts. All of this may potentially lead to a significant skills shortage. Proponents of modern training argue that simulation (now a compulsory part of the UK core teaching curriculum)

may be able to compensate for this and that surgeons ought not to be worried. However, with more and more specialties and centres the world over also moving towards an 'on call'-based system of care provision, there is the worry that the traditional model of 'surgical apprentice' may not suffice to allow appropriate training in procedural skills such as arthroplasty. The financial and human cost of a poor arthroplasty is high, and researchers from **London (UK)** have undertaken a nice assessment of the learning curves and assessment tools, making the point that the move to a competency-based training framework really does require the use of appropriate and validated assessment tools.² In a 2013 report in the same journal, researchers in **Christchurch (New Zealand)** evaluated the outcomes of 35 415 patients and concluded that, in their system at least, there were no differences in outcomes between those who underwent consultant-led surgery, and those who underwent trainee-led surgery.³ We may do well to re-evaluate this question as surgical training moves forward into the future.

All prep is good prep X-ref

■ The prevention of infection is a laudable goal, and sometimes it is the more simple steps - theatre hygiene, skin preparation and

attention to detail in maintaining a surgical site clean of contaminants - that are perhaps of greater importance than the more expensive approaches to infection control, such as laminar flow and antimicrobial-resistant implants. We were delighted to see this simple study from **Philadelphia, Pennsylvania (USA)** evaluating the use of particular skin prep methods.⁴ Six hundred patients were enrolled in a prospective randomised controlled trial, comparing standard of care (alcohol and povidone-iodine prep before draping) with a double prep group where a second application of iodine povacrylex and isopropyl alcohol was undertaken before application of the final adhesive drape. The final analysis included the outcomes of 577 patients. The incidence of superficial surgical site infection was significantly higher in the control group (6.5% vs 1.8%), although there were no differences in deep infection risk between the two groups. It certainly seems that the results of this study support the double prep approach as a simple low-cost intervention to reduce the risk of superficial infections.

The 'weekend effect' does not exist!

■ Much has been made in the world's press about the potential difficulties associated with the new