

# ROUNDUP<sup>360</sup>

## Children's orthopaedics

### ACL reconstruction in paediatric knees

■ As children move more and more towards high-end sports at an early age, there has been increased focus on safety during sports. Despite this and the advances in 'pre-habilitation' and improved coaching, anterior cruciate ligament (ACL) rupture is still relatively common in the paediatric and adolescent population. There is still debate as to whether ACL reconstruction should be performed in young patients with open physes. There are proponents of the standard transphyseal techniques or by avoiding the physes (which is significantly more technically challenging). The worry with the transphyseal approach is that it could cause the physis to prematurely close and lead to leg discrepancy or malalignment. Researchers from **Santiago (Chile)** offer their report on one of the few long-term (ten-year) follow-up studies on paediatric ACL reconstruction.<sup>1</sup> Their prospectively followed up cohort study describes 27 patients, all of whom received ACL reconstruction at a mean age of 13 years. In all cases reconstruction was performed using a standard transphyseal tunnel technique with a hamstrings graft. Patient-reported clinics' outcomes were measured with a range of scores (Tegner, IKDC, Lysholm) and objectively growth arrest was quantified with measures of leg-length discrepancy. The clinical outcomes were almost universally reported as good. In terms of longer-term outcomes, two patients reported symptomatic

instability, and three suffered graft rupture at a minimum ten-year follow-up. There were no leg-length discrepancies or axis malalignment. The authors suggest this technique is safe, however, they did not establish what the remaining growth was following ACL reconstruction, and sadly it is not possible to infer from this paper what age ranges are safe to use a transphyseal approach on as the sample size is relatively small and the authors have not stratified results by age.

### Hips, slips and cams

■ The similarity of a slipped upper femoral epiphysis (SUFE) to a femoral cam lesion has led to a number of observational studies in recent years suggestive of a link between the two. For a condition that has only recently been recognised, hip impingement seems to dominate the pages of many an academic journal and often with small case series or anecdotal outcome reports. We were delighted to see two papers recently that really do shed some light on the potential pathophysiology and aetiology of cam deformities – and specifically the potential link to SUFE. Ganz's group in **Bern (Switzerland)** open the batting with their study aiming to explore hip morphology.<sup>2</sup> They set out to measure a range of MRI-derived measures including head-neck offset; epiphyseal angle and tilt angle. Reasoning that there is a subset of 'hip impingement' patients that look more like SUFE, they designed their retrospective study to include patients with a slip-like morphology

(29 hips), a group having undergone pinning for SUFE (just eight hips) and normal hips. They then went on to compare these with a much larger group (171 hips) of hip impingement patients and some normal controls (30 patients). While a range of morphological characteristics was measured and reported in this study, the headline result is that around 12% of patients appear to have a 'slip-like morphology' when presenting with hip impingement symptoms. These are characterised by a superiorly and posteroinferiorly-increased offset ratio, and an anterosuperior increase in epiphyseal angle. Tilt angle was increased in slip-like and post-slip hips, but decreased in idiopathic cam lesions and is perhaps the best way to differentiate the two. More precise 3D characterisation of the epiphysis and the head-neck junction was done, comparing patients with idiopathic cam, in-situ pinning for SCFE and post-slip (SCFE)-like morphology. This confirms earlier (French) work on 2D radiographs that suggest a substantial proportion of cam hips indeed have morphology resembling a low degree of slip of the capital epiphysis of the femur. In their study, researchers from **Toulouse (France)** evaluated the plain radiographs of 96 hips all treated surgically for FAI over a six-year period.<sup>3</sup> The research team were specifically looking for any SUFE-like deformities and measured the usual array of radiographic parameters. These were then compared with 108 normal hips from healthy volunteers. The research team con-

cluded that there are radiographic changes in hip impingement that resemble SUFE, and are particularly noticeable on the lateral hip films. Although this is not conclusive evidence from prospective studies, we now have the definitions and methods that can help differentiate idiopathic cam-and SUFE-like morphology in such studies. This will likely sharpen the discussions on the role of hip loading in the maturation years of the hip joint, particularly with sports in puberty.

### The adolescent clavicle

■ The levels of evidence that exist to support the operative management of clavicular fractures in adult patients are not mirrored in children, and it is unclear how, if at all, they might relate to fractures in the child or adolescent. Middle third clavicular fractures in children represent over 90% of these injuries and some recent studies have suggested improved outcomes in adolescent patients with operative management. However, these are contradicted by other studies that show acceptable functional outcomes with non-operative management in fractures with over 2 cm of displacement. The authors of this highly topical study from **Virginia (USA)** use the publicly available PearlDiver Patient Records Database (PearlDiver Technologies Inc., Pennsylvania) to study trends in the management of clavicular fractures in the US.<sup>4</sup> They have subdivided the patients into two groups: ten- to 14-year-olds and 15- to 19-year-olds. A total of 14 683

clavicular fractures were identified over a four-year period between 2007 and 2011. There was no change in annual incidence, with around 3000 fractures recorded per year, however, there was a significant decrease in non-operative management over the course of the study (309 managed operatively in 2007, rising to 530 in 2011). This trend was seen in both age groups, although it was greater in the 15 to 17 age group. The total costs for a non-operatively managed clavicular fracture increased over the study period from \$477 to \$585 per patient, which is dwarfed by the cost and rise in costs of operative management from \$2904 to \$4158 per patient. Recent multicentre randomised controlled trials in adults have brought into question the rationale for operative management of clavicular fractures. It is disappointing that the accepted wisdom of decades of non-operative treatment by our predecessors can be ignored by many physicians based on small single-surgeon series and opinion. Unfortunately, it takes time for the EBM machine to redress the biases and in the meantime, particularly in a fee-for-service model healthcare system, patients must bear the brunt of the increased morbidity associated with enthusiastic but injudicious treatment. While there remains no evidence for operative treatment in children and adolescents, the trends of practice seem to be following limited evidence from adult studies.

### 3D fluoroscopy in DDH?

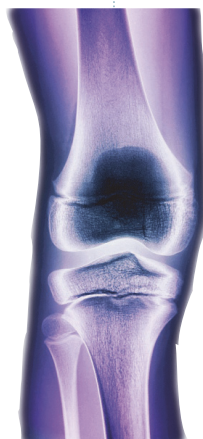
■ We won't just yet be rushing out just yet to purchase our 3D fluoroscopy machines here at 360 based on the results of this study. Sometimes one wonders whether a study is published because of its origin and authorship rather than its content. This retrospective review of a select group of 16 infants treated in **Toronto (Canada)** who had intra-operative hip reduction assessed on 3D fluoroscopy suggests that this method is superior to intra-operative 2D fluoroscopy,

and, without any supporting data or statistical analysis, recommends that post-operative cross-sectional imaging may not be necessary with the use of this technique.<sup>5</sup> The practice of our Editorial Board here at 360 HQ remains the use of hip arthrography, avoiding the purchase of such an expensive machine and reducing the 60-second screening time reported with 2D fluoroscopic imaging. Sadly, although this study has value as the first description of a new technique, the authors have not addressed the question of whether further cross-sectional imaging is required post-operatively to ensure an adequate reduction, although this is standard practice. The authors state that they have abandoned cross-sectional imaging post-operatively, however, this study simply shows that 3D fluoroscopy can be used to assess intra-operative hip reduction. Here at 360, we would caution against abandoning post-operative cross-sectional imaging after hip reduction in infants until appropriately designed, statistically valid studies demonstrate that it is of no benefit.

### The psychiatric aspects of hip pain in adolescents

■ Adolescence is a difficult time, as any parent will attest from personal experience! Most physicians who treat patients in this age group recognise that there is often much more to the physical presentation than simply the injury, mechanical symptoms or inflammatory problem. It has been previously reported that adolescents make up 25% of patients with chronic pain. As the advent of advanced imaging and arthroscopic assessment of the hip has allowed for surgical treatment of these injuries, we wonder what happened to these adolescent patients with life-modifying hip pain in years past? The group at **Texas**

**Scottish Rite (USA)** conducted a prospective study on 58 patients presenting with adolescent hip pain.<sup>6</sup> Their study was designed to evaluate the psychological effects of this condition. They established that 17.2% were receiving psychological treatment and 30% had a family history of mental illness. The cohort was fairly representative of adolescent hip practice with diagnosis including femoroacetabular impingement (n = 25), acetabular dysplasia (n = 16), Perthes' disease (n = 11), and slipped capital femoral epiphysis (n = 6). A range of psychological assessments including the



Behavioural Assessment System for Children, Beck Youth Inventory, and Resiliency Scales were administered to all patients pre-operatively. The authors identified that clinically significant anxiety and depression symptoms were seen in 10% and 31% of patients, respectively. Worryingly, up to 36% of patients appeared to display symptoms of maladaptive

behaviour. An interesting question to answer here would be, "Does intervention to address anxiety, depression and maladaptive behaviour in adolescents with hip pain improve their functional and hip pain scores?" Could our psychiatric and psychology colleagues help some of our patients to avoid orthopaedic intervention all together? Is the current trend towards hip arthroscopy always appropriate? Given the findings in the older age group (Hip & Pelvis, abstract 6) of asymptomatic cam and pincer lesions, are hip debridement and labral repair always appropriate? We at 360 agree with the authors not only that 'optimising the emotional state of the patient pre-operatively will have a positive effect on outcome', but given the findings of this study, it may avert the need for surgery in some patients altogether.

### Adolescent bunions: dealer's choice?

■ It appears that, like many things in surgery and even more in paediatric orthopaedics, surgical correction of the juvenile bunion (as with the adult bunion) remains a case of 'dealer's choice'. Surgeons in **San Diego (USA)** designed their own retrospective radiographic review of early correction (mean duration of follow-up 10.5 months) of juvenile hallux valgus to establish what the likely outcome is.<sup>7</sup> Their study included 81 patients (106 feet) treated with either single proximal, single distal or double osteotomy. There were no significant differences in any of the standard radiographic pre-operative measures (intermetatarsal angle (IMA), hallux valgus angle (HVA) and distal metatarsal articular angle (DMAA)). Although the majority of the group underwent double osteotomy (n = 70), there were reasonable comparator groups of single proximal (n = 14) and single distal (n = 22) osteotomies. The post-operative IMA and HVA were not significantly different between the three groups, although the DMAA was smaller in the double osteotomy group. None of the three osteotomies overcorrected the IMA and HVA, and overcorrection was not associated with a particular osteotomy type. Double osteotomy was, however, associated with a higher rate of DMAA overcorrection (22% of cases). Proximal osteotomy was found to have a significantly higher revision rate of 21% as opposed to 8% for the single distal and 3% for the double and, as would be expected, early recurrence rates were similar (3% to 14%). Although limited by the usual selection biases, this series does not suggest there is any particular advantage of one approach over another. Surgeons should continue to select the operation they believe will be most successful for their patients.

### Medial epicondylar fractures revisited

■ Controversy remains regarding the displaced medial epicondylar

fracture and the need for operative fixation. To those of you who remain dogmatic in their management, stop reading now! It is generally accepted that minimally displaced fractures should be treated non-operatively and indications for operative management are regularly quoted to include incarceration of the medial epicondyle (particularly if failed closed reduction has taken place), symptoms and signs of ulnar nerve entrapment, open fracture and a displaced fracture in a throwing athlete. Fixation with symptomatic nonunion, one could argue, is the worst possible outcome! Researchers in **Singapore (Singapore)** report their own experiences

of medial epicondylar fractures in a retrospective review.<sup>8</sup> They were able to report the results of 34 of 156 patients after exclusion criteria was applied (presenting between 2005 and 2010). All of these patients were managed non-operatively, and in 26 patients (76.5%) spontaneous improvement in the position of the epicondylar fragment was observed over time. In patients in whom an increase in the displacement was seen (23.5%), no adverse clinical outcomes were observed. Perhaps this is an injury that is widely overtreated?

#### REFERENCES

1. Calvo R, Figueroa D, Gili F, et al. Transphyseal

anterior cruciate ligament reconstruction in patients with open physes: 10-year follow-up study. *Am J Sports Med* 2015;43:289-294.

2. Albers CE, Steppacher SD, Haefeli PC, et al. Twelve percent of hips with a primary cam deformity exhibit a slip-like morphology resembling sequelae of slipped capital femoral epiphysis. *Clin Orthop Relat Res* 2015;473:1212-1223.

3. Murgier J, Reina N, Cavaignac E, et al. The frequency of sequelae of slipped upper femoral epiphysis in cam-type femoroacetabular impingement. *Bone Joint J* 2014;96-B:724-729.

4. Yang S, Werner BC, Gwathmey FW Jr. Treatment trends in adolescent clavicle fractures. *J Pediatr Orthop* 2015;35:229-233.

5. Sachleben B, Perry DC, Wedge J, Kelley SP. Intraoperative assessment of closed reduction for developmental dislocation of the hip using

3-dimensional fluoroscopy. *J Pediatr Orthop* 2015;35:246-252.

6. Podeszwa DA, Richard HM, Nguyen DC, De La Rocha A, Shapiro EL. Preoperative psychological findings in adolescents undergoing hip preservation surgery. *J Pediatr Orthop* 2015;35:253-257.

7. Edmonds EW, Ek D, Bomar JD, Joffe A, Mubarak SJ. Preliminary radiographic outcomes of surgical correction in juvenile hallux valgus: single proximal, single distal versus double osteotomies. *J Pediatr Orthop* 2015;35:307-313.

8. Lim KB, Woo CY, Chong XL, Ul-Alam S, Allen JC Jr. The isolated medial humeral epicondyle fracture treated nonoperatively: does fracture displacement change over time? *J Pediatr Orthop B* 2015;24:184-190.