

ROUNDUP³⁶⁰

Children's orthopaedics

3D-CT gives a better idea of coverage than plain radiographs

■ Assessment of femoral head coverage after pelvic osteotomy is frequently undertaken using plain radiographs. Good though they may be, radiographs do carry some limitations. Consequently, a study from **Liaoning (China)**, grasped 360's attention. The investigation was undertaken to establish whether three-dimensional (3D) CT measurements were consistent with plain radiological findings. The authors reported 24 patients (24 hips) with a mean age of 11.5 years who had undergone a Chiari osteotomy for acetabular dysplasia. These were compared with 15 control subjects (30 hips) with a mean age of 12 years. The pre- and post-operative coverage of the femoral head was measured by using conventional plain radiography and 3D-CT on the anterior 1/4, middle 1/2, and posterior 1/4 of the coronal plane. The anterolateral, mediolateral and posterolateral coverage was measured by 3D-CT and compared with the coverage measured by plain radiography. These measurements were also compared with the normal controls. The post-operative anterolateral and mediolateral coverage measured by 3D-CT was significantly smaller than that measured by radiography. No significant difference was found between the 3D-CT measurements on the posterolateral coverage and the radiological results. The anterolateral femoral head coverage in the patients after Chiari pelvic

osteotomy was also smaller than that found in the controls. In contrast, the post-operative posterolateral coverage in the patients was greater than that seen in the controls.¹ We found this interesting at 360 because conventional radiographs may show sufficient cover of the femoral head after a Chiari osteotomy, whereas, in fact, the cover may be not perfect, especially anterolaterally. It is clear that the post-operative 3D-CT is beneficial for evaluating the outcome of a Chiari osteotomy, especially when the anterolateral coverage of the femoral head is insufficient pre-operatively.

Trampolines and children's forearms appear incompatible

■ It appears that the incidence of children's forearm fractures is increasing worldwide, despite the apparent obsession by most developed countries with health and safety. Surgeons in **Oulu (Finland)** have delved further into this, as the reason for the increase is unknown. Diaphyseal forearm fractures comprise between 3% and 6% of all paediatric fractures and are frequently a challenge to treat. The purpose of this study was to evaluate the incidence of diaphyseal both-bone forearm fractures in children during the last decade in Northern Finland. Another objective was to study the background factors, treatment, and redisplacement of these fractures. Over a ten-year period 168 children were admitted to the authors' paediatric trauma centre with diaphyseal both-bone forearm fractures. The type of injury, background factors,

radiological findings, treatments and redisplacements were reviewed. The age-related incidence rates were also assessed. The incidence of diaphyseal both-bone forearm fractures increased 4.4-fold over the study period. This increase was accelerating and the overall increase was 338%. Meanwhile, the incidence of surgical treatment for diaphyseal fractures increased 4.2-fold, which is in relation to the increasing number of fractures. However, internal fixation increased from 13.3% at the start of the study period to 52.7% by the end, as an alternative to conservative treatment. The redisplacement rate was high (29.9%) among the patients with conservative treatment compared with those who underwent invasive surgery (1.4%). Trampolining was the most common reason for the fractures. At the beginning of the study, there were no trampoline-related fractures, but towards the end of the study between 30% and 41% of the fractures were caused by trampolining.² 360's view? Keep those children away from trampolines. You know what will happen once the kids start jumping.

Forearm fractures and the Rush pin

■ Fixing paediatric forearm fractures is clearly very popular, or so it seems to 360. A paper from **Dhulikhel (Nepal)** highlights this popularity. Although the authors agree that most paediatric diaphyseal forearm fractures can be treated with closed reduction and cast application, indications for operative intervention in paediatric both-bone

forearm fractures include open fractures, irreducible fractures, and fractures that are unstable. Controversy exists as to what amount of angulation, displacement, and rotation constitutes an acceptable reduction. Consequently, the authors sought to review the time to union and functional outcome of paediatric diaphyseal forearm fractures managed with an intramedullary Rush pin by closed or open reduction. They assessed 50 patients with both-bone fractures of the forearm who were treated with an intramedullary Rush pin by closed or open reduction. The patients were followed up for a minimum of six months in order to assess their radiological and functional outcomes. Of the 50 patients, 31 underwent closed reduction and 19 open reduction. All fractures maintained good alignment post-operatively. There were 47 patients who demonstrated excellent results, with a normal range of movement at the elbow and normal forearm rotation, and there were three patients with good results. In all patients good radiological union was seen by three months after surgery. There were eight patients who had minor complications, including skin irritation over prominent hardware, backing out of the ulnar pin, and superficial skin breakdown with exposed hardware. There were 23 patients (46%) who had undergone implant removal at a mean of six months, under regional or general anaesthetic.³ 360 notes the authors' conclusion, which is logical and straightforward. Fixation

of these fractures with an intramedullary Rush pin for forearm fractures is an effective, simple, cheap, and convenient way to manage them in this paediatric age group.

The fractured distal radius - get it right first time

■ Redisplacement after manipulation can occur in fractures of the distal radius, a paper from **Redditch (UK)** reminds us. The authors performed a retrospective study of 73 patients undergoing manipulation with or without K-wire fixation. From the pre-, intra- and post-operative radiographs they measured anteroposterior and lateral angulation and translation. Re-angulation of each fracture was calculated. Factors demonstrating significant correlation with re-angulation were age, initial radial translation, ulnar fracture, distance from fracture to physis and inadequate correction of translation or angulation. This paper emphasises the importance of adequate fracture reduction. In those cases in which translation or angulation cannot be fully corrected at manipulation, fixation with K-wires may be appropriate.⁴ This is a small and simple paper, we think at 360, not rocket science, but still helpful in reminding us that an adequate and stable reduction is essential before returning the patient home.

Elastic stable intramedullary nailing for long-bone fractures

■ From **Split (Croatia)** comes an interesting study on the effectiveness of intramedullary fixation of displaced long-bone shaft fractures in skeletally immature children using elastic stable intramedullary nails. The authors reviewed the case records of 173 children who underwent fixation with titanium intramedullary nails because of a long-bone fracture. The mean age of the patients was 11.7 years and the mean follow-up was 41.3 months. There were 55 humeral, 42 forearm, 42 femoral and 36 tibial fractures. Subjective satisfaction was assessed. All patients achieved complete healing at a mean

of 7.5 weeks. Complications were recorded in 11 (6.3%) patients and included one neuropraxia, six entry-site skin irritations, two wire protrusions through the skin and two skin infections at the entry site. In a subjective measure of outcome at follow-up, 89% of patients were very satisfied and 11% satisfied; no patient was dissatisfied. The implants were removed at a median of six months after the index operation.⁵ 360 agrees that elastic stable intramedullary nailing is the method of choice for paediatric patients, because it is minimally invasive and shows very good functional and cosmetic results. It allows an early functional and cast-free follow-up with a rapid reduction in pain.

Aponeurotic recession for the equinus foot

■ One of the most common deformities in patients with spastic diplegia cerebral palsy is the equinus deformity of the foot at the ankle. This can lead to gait disturbances and secondary deformities. The problem is commonly corrected by calf muscle lengthening, such as a gastrocnemius-soleus intramuscular aponeurotic recession. Various studies have described satisfactory short-term results after this procedure. However, there is no evidence that the equinus correction is maintained because of the small and heterogeneous case series and short follow-up times reported elsewhere. A study from **Heidelberg (Germany)** now provides long-term results after gastrocnemius-soleus intramuscular aponeurotic recession as a part of multilevel surgery for the treatment of equinus. The investigation involved 44 patients with spastic diplegia who were able to walk (48 legs had lengthening of the gastrocnemius and 34 had lengthening of the gastrocnemius and soleus).



Standardised 3-D gait analysis and clinical examination were undertaken pre-operatively and at one year, three years, and nine years after surgery. Significant improvements in kinematic and kinetic ankle parameters on gait analysis, as well as better passive dorsiflexion on clinical examination, were found one year after surgery. While there was a significant loss of passive dorsiflexion at the time of long-term follow-up, the improvements in gait were maintained. This was accompanied by a persistent increase in dorsiflexor muscle strength without loss of plan-

tar flexor strength. There was a tendency for some deterioration of gait to occur over the nine years and the equinus deformity recurred at the ankle in 24% of legs. Early-onset calcaneal gait was found one year after surgery in seven legs (9%), but without secondary crouch gait, and there was recovery by nine years. Late-onset calcaneal gait was seen at the nine-year follow-up in eight legs (10%), of which four

had an accompanying crouch gait. It thus appears that gastrocnemius-soleus intramuscular aponeurotic recession, as a part of multilevel surgery, leads to satisfactory correction of mild and moderate equinus deformity in children and adolescents with spastic diplegia.⁶ There seems little risk of overcorrection and 360 agrees that this method should be chosen in preference to lengthening of the tendo Achillis, in order to avoid overlengthening. The good long-term results in this study demonstrate that the improvements can be long lasting, although individual patients tend to develop a recurrence and may need a secondary gastrocnemius-soleus intramuscular aponeurotic recession at a later date.

The torn medial patellofemoral ligament and the adductor tubercle

■ At 360 we love to read papers that report a negative result. These seem to be so rare in modern orthopaedic publishing. How good it was to see, therefore, a paper from **Jacksonville (USA)** whose aim was to determine whether the location of a tear of the medial patellofemoral ligament (MPFL) was different for children as opposed to adults. The authors' hypothesis was that, in children, these tears did not occur predominantly at the adductor tubercle. Of course, this is where they commonly occur in adults. This was a Level II prognostic study where the authors retrospectively reviewed 113 children, between the ages of five and 17 years, who had been surgically treated for a patellar dislocation. All patients had confirmation of a patellar dislocation or severe subluxation. Imaging studies, clinic notes and operation notes were used to determine the location of the MPFL injury. The results were simple and very clear. The percentage of MPFL tears at the adductor tubercle was 73% of the cases studied. This was a slightly lower rate than the MPFL tear location in an adult population, which has been reported to be between 80% and 100%. However, the authors' hypothesis that the location of MPFL tears in adolescents and children is not predominantly at the adductor tubercle was proven false.⁷ This study clearly has clinical applications for treatment recommendations and planning surgical approaches for the paediatric patient with a tear of the MPFL. How refreshing it was to see a negative finding published.

Slipped capital femoral epiphysis – no room for delay

■ A slipped capital femoral epiphysis (SCFE) can be a disastrous event, so what are the chances of developing avascular necrosis (AVN) as a result of a slip? 360 was interested to see a paper from **São Paulo (Brazil)** on the complication rates after the treatment of the condition. The authors reported on 26 patients with SCFE who underwent reduction

and fixation with a single screw or multiple wires. The prevalence of avascular necrosis (AVN) of the hip or chondrolysis was 14.8% and 3.6%, respectively. The degree of SCFE, and reduction before the seventh day after the slip, were associated with AVN.⁸ The message? As soon as a SCFE comes through that door, do not dither. Get the job done.

Paediatric wrist arthroscopy – a very subspecialist technique

■ Wrist arthroscopy is not widely performed and wrist arthroscopy in children even less so. This has been the topic of a recent paper from **Vienna (Austria)**. The authors wished to report their experience of wrist arthroscopy in children and adolescents with chronic wrist pain in a retrospective single-surgeon series. This allowed technical differences and obstacles compared with standard wrist arthroscopy in adults, as well as complications, to be highlighted. A retrospective data review of all patients undergoing wrist arthroscopy between 2002 and 2011 was performed. The basic inclusion criterion was chronic, refractory wrist pain for more than three months in children and adolescents aged 18 years or less. In total, 34 arthroscopies in 27 girls and six boys were reviewed. The mean age at the time of arthroscopic exploration was 14.6 years. A total of 28 wrists (82.4%) showed a tear of the triangular fibrocartilage complex (TFCC). In 26 of 34 (76.5%) procedures, additional pathology besides a TFCC

tear was documented. Surgically, 14 arthroscopic TFCC resections, two arthroscopic TFCC repairs and seven open resection arthroplasties were performed. Other associated procedures (e.g., ulnar shortening) were performed in 25 patients (26 wrists) because of predisposing malformations. No intra- or post-operative complications related to the arthroscopies were observed. Indeed, no relevant technical differences to wrist arthroscopy in adults were experienced apart from some cases of major anatomical malformations. This paper demonstrates that wrist arthroscopy is a safe procedure that can detect and treat paediatric disorders of the wrist.⁹ Nevertheless, and 360 can only stress the authors' own conclusion, it is a procedure that should only be performed by well-trained, experienced surgeons.

Pirani scores and clubfoot – surgeons and physiotherapists agree

■ Clubfoot is clearly a global problem, especially in the developing world. As with so many orthopaedic issues, to be able to classify the deformity is extremely helpful when it comes to treatment and follow-up. As a result, a paper from **Khartoum (Sudan)** and **New Westminster (Canada)** particularly interested 360. It is perhaps now widely accepted that the Ponseti method is a suitable standard of care for congenital clubfoot. It is equally effective whether provided by orthopaedic surgeons or orthopaedic paramedics. It is thus

particularly suited to under-resourced nations that have a lack of surgeons and physicians. At the Sudan Clubfoot Clinic, physiotherapy assistants (three-year diploma nurses with additional physiotherapy experience) are part of the Ponseti clubfoot treatment team, with the role of assessing the degree of deformity by the Pirani score in order to assist the team in providing treatment. However, the reliability of Pirani scores measured by physiotherapy assistants in this context is unknown. After obtaining informed consent, the authors thus measured the interobserver reliability between a physiotherapy assistant and an orthopaedic surgeon in measuring Pirani scores in 91 virgin clubfeet in 54 infants (41 boys and 13 girls). Scores were measured independently before the onset of treatment and analysed by the kappa statistic for interobserver reliability. The mean agreement percentage of both observers for all Pirani components was 83%. The authors found moderate to substantial interobserver reliability for the Pirani clubfoot severity score and all its subcomponents.¹⁰ 360 thus notes that properly trained physiotherapy assistants are efficient in assessing the degree of severity of clubfoot. This is particularly useful in developing countries, where orthopaedic surgeons are few.

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