Children's orthopaedics

X-ref *For other Roundups in this issue that cross-reference with Knee see: Spine Roundup 4; Trauma Roundup 1; Oncology Roundup 3.*

Hip surveillance for children with cerebral palsy X-ref

There is no internationally agreed protocol for surveillance of the hips in children with cerebral palsy (CP). The current literature suggests that the overall incidence of hip dysplasia in children with CP is approximately 35%. However, this is not a linear risk, and the current body of evidence would suggest that the risk of hip dislocation is directly related to the child's Gross Motor Function Classification System (GMFCS) level (with increasing risk at the higher classifications). Given the high incidence and profound effect on quality of life and independent living that dislocated hips can have on CP patients, there is little argument that this condition warrants regular surveillance. Most countries have some form of surveillance programme, although these do vary in quantity and quality. However, there is currently no programme in place in the United States. The aim of these surveillance programmes is to ensure that progressive hip displacement is detected early enough to enable timely orthopaedic referral and appropriate intervention. These authors from **Boston, Massachusetts (USA)** surveyed members of the Pediatric Orthopaedic Society of North America (POSNA) in order to identify the baseline practice for hip surveillance in this patient population.[1] With a response rate of 27%, drawing conclusions is somewhat difficult. Only 18% of those who responded to the survey provided patients with a regular surveillance programme but, at the same time, 93% of the surveyed doctors felt that such a programme should come into effect.

Recurrent patellar instability in children and adolescents

A patellar dislocation is among the most common of acute knee injuries in children and is estimated to have an incidence of 43 per 100 000/year in children below the age of 16. First-time dislocations are typically managed conservatively; usually, a policy of brief immobilisation, optional bracing, and a course of physiotherapy will resolve the issue. However, in certain cases where there is a substantial chondral or osteochondral injury, operative intervention may be required. The history of most patellar dislocations and subluxations is of natural resolution with time, although some patients do go on to develop recurrent dislocations. Recurrent patellar instability rates are estimated at between 15% and 44% of patients. In those who are likely to suffer recurrent dislocation, more intensive physiotherapy – or even surgical intervention, on occasion – is required. One of the difficulties we face in clinic is knowing which children to keep an eye on and which can be safely discharged. In a timely study from **Cincinnati, Ohio (USA),** the authors examined the risk factors in 250 patients suffering 266 dislocations over an 11-year period to see if a risk model could be established.[2] In patients with first time dislocations in this study, the recurrence rate after non-operative treatment of a first-time patellofemoral dislocation was 34.7%. The authors recorded a range of potential covariate factors including demographic risk factors (age, gender, laterality, mechanism of injury, and history of contralateral patellar dislocation) and radiological risk factors (increased patellar height, trochlear dysplasia, and skeletal immaturity). Significant risk factors for recurrence in this non-operative group were trochlear dysplasia, skeletal immaturity, Caton–Deschamps Index > 1.45, and a history of contralateral patellar dislocation. There was an 88% predicted risk of recurrent instability for patients who had all four factors present. The authors argue that, given the high positive predictive value of these characteristics, early surgical intervention should be preferred over the classic non-operative treatment in these 'high-risk' cases. We are perhaps a little more conservative here at *360*; nonetheless, patients with these risk factors should clearly be treated with care and followed up closely with perhaps a lower threshold for intervention if indicated.

Quengel casting for paediatric knee flexion contractures

A group of authors from **Dallas, Texas (USA)** present their experience with Quengel casting in the management of knee flexion contractures in the paediatric population.[3] Although this is a relatively big series in comparison with others in the literature, this paper discusses the treatment of just 18 paediatric patients (26 knees) treated over a course of 26 years. Originally used in haemophilic arthropathies, the Quengel hinge consists of an extension desubluxation hinge fixed to a hard cast, allowing for gradual correction of a flexion deformity while, at the same time, preventing posterior subluxation of the tibia. The mean contracture in this retrospective series prior to casting was 51° (15° to 100°) in children aged, on average, eight years. The authors were able to achieve a dramatic improvement to a mean of 6° (0° to 40°) at cast removal. The series reports follow-up to a year following initiation of casting, and, overall, 50% of patients were treated successfully using the technique. According to the authors, Quengel casting may be useful in the treatment of paediatric knee flexion contracture, either as an isolated treatment or in conjunction with soft-tissue releases. It can improve knee flexion contractures in children by a mean of 44.2° at intermediate follow-up. However, given the nearly 50% failure rate, which is predominantly recurrence within a year of cast removal, surgeons, patients, and parents must be aware that there is a not insignificant risk that further, more complex intervention will be required. This said, the authors of this series point out that this is a safe and non-invasive treatment modality that remains an asset in the paediatric orthopaedist's armamentarium.

Late hip dysplasia after normal ultrasound? X-ref

The change in common parlance from congenital dysplasia of the hip (CDH) to developmental dysplasia of the hip (DDH) reflects the change in understanding that hip dysplasia is a dynamic and developmental entity rather than a congenital one. The push for hip surveillance programmes has cut the incidence of 'missed' DDH but it has also deepened our understanding of the subject, with more recent papers suggesting that late dysplasia, where a normal ultrasound has been obtained post-partum, may have an incidence of 29% in breech babies. In an excellent paper on the subject from **Southampton (UK),** the authors set out to establish whether breech presentation is indeed a risk for late dysplasia or, as is suggested elsewhere, is predictive of spontaneous stabilisation.[4] These authors followed 90 babies over a two-year period, all born with a breech presentation. All babies had a normal presentation examination and normal ultrasound screening as part of the local hip surveillance programme. The babies were then randomised to either observation or prophylactic treatment with the Healthy Hip Diaper (HALO,

Minnetonka, Minnesota). Follow-up included regular clinical examination, and a single anteroposterior pelvis radiograph and ultrasound scan. There was a high rate of treatment crossover, with 63% crossover in the observation group and 28% in the prophylaxis group, leaving a 60:40 bias in favour of prophylaxis. The overall rate of late radiological dysplasia was 7.4%, which was seen as 5% in the Healthy Hip Diaper group and 8.3% in the observation group. While the abduction nappy superficially seems like a great idea, compliance rates were low, as was efficacy in this study. Although this was originally designed as a randomised trial to test the efficacy of the Healthy Hip Diaper, there isn't that much that can be concluded about the Healthy Hip Diaper itself – what we can conclude is that further follow-up of breech babies with normal ultrasound and physical exams is warranted as residual acetabular dysplasia is found in 7.4% of all breech babies.

Pavlik regimes in Ortolani-positive hips

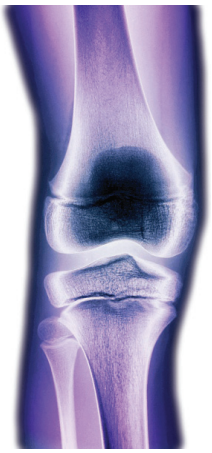
■ The Pavlik harness has been a revolution in the treatment of reducible developmental dysplasia of the hip (DDH) (i.e. Ortolani-positive hips). It allows for better care for the infant, is less of a bar to development than many alternatives, and, in addition, has none of the potential side effects associated with surgery. The long-term follow-up data for the Pavlik are impressive and it has become and remained the standard of care for many years. What is different between centres these days is not the acceptance that the Pavlik is an excellent treatment, but that there are small variations in the daily wear duration and frequency of follow-up visits. Researchers from around the USA, including a paediatric centre in **Honolulu, Hawaii (USA),** undertook a novel study with the aim of determining whether there were any effects on outcome of reducing wear from 24 hours per day to 23 hours per day, and whether there were any benefits associated with differing frequency of follow-up regimes in terms of eventual hip outcome.[5] The authors prospectively recruited patients with a diagnosis of DDH presenting under the age of six months with reducible hips for which the Pavlik harness was the intended treatment. Outcomes were assessed based on the authors' definition of 'clinical success': a stable hip that did not require reduction (either open or closed) or the use of an abduction orthotic. In addition, the radiological success (defined by the acetabular index) was also noted for each participant. In all, 62 patients were reported as part of this series, and the overall clinical success rate at two years was 84%. The authors could find no difference in success rates between those patients who were told to wear the harness for 23 or for 24 hours, and, similarly, there was no improvement in terms of outcomes between those patients seen weekly and those seen less frequently. It therefore appears that a 24/7 regimen with weekly follow-up for Ortolani-positive hips is no better than 23/7 with a fortnightly follow-up, and considerably less acceptable for the patient.

Monolateral external fixation *versus* motorised intramedullary nail in congenital femoral deficiency

■ Paedatric orthopaedic surgeons have traditionally been fans of external fixators for limb-lengthening. Having the advantage of accurate correction, and no issues with the potential for growth arrest, both monolateral and circular fixators have found employment across the board in paediatric applications. In adult deformity work, however, motorised nails are having a resurgence. It is interesting to see this paper from **Cairo (Egypt)** examining the outcomes of the more modern, motorised nails in congenital femoral deficiency.[6] The authors have assembled an impressive 62 patients, all with congenital femoral deficiency (CFD), with or without fibular hemimelia. The patients underwent either a monolateral external fixation (n = 32) or an internal lengthening nail (n = 30). This was a retrospective cohort series rather than a randomised trial, but still has significant value given the rarity of the diagnosis and the impressive numbers reported. There were, as would be expected, some differences in demographics given the non-random nature of the allocations, with the mean age of the monolateral external fixation group at 9.4 years, while the internal lengthening group were significantly older, with a mean of 15.4 years. A similar amount of lengthening was achieved at just over 5 cm in both groups, and an identical distraction index of 0.7 mm/d. However, although there were a similar number of complications in each group, there were poorer ranges of movement in the external fixation group after lengthening and consolidation, compared with the internal lengthening group. This paper shows a new and superior technique compared with lengthening by monolateral fixator, even allowing for the disparities between the groups. The intramedullary nail group recorded a better range of movement during lengthening and a better consolidation rate, while maintaining similar distraction and healing indices to those of monolateral external fixation.

MRI in post-reduction evaluation of developmental dysplasia of the hip

■ The iatrogenic neoplasia rate associated with infant and toddler CT scanning is nothing short of frightening. Some papers show a lifelong risk in the young child as high as 20%. However, these are still used in many centres throughout the world to assess the post-operative reduction following surgery for developmental dysplasia of the hip (DDH). The authors of this thought-provoking paper from **Trieste (Italy)** ask the



question: could we use MRI instead?[7] The authors describe their experience of MRI as a method of assessing hip concentricity following closed reduction. They report the outcomes of 25 patients presenting with 29 DDH hips (all Graf type IV hips). These were treated with closed reduction at a mean of 3.4 months, and MRI scans were obtained as a method for assessing reduction. All of the MRI scans performed within 24 hours were diagnostic, and demonstrated a concentric reduction in all but one hip. Perhaps most interestingly, the authors did not use sedation during the MRI scans, yet were able to achieve diagnostic quality images. For us here at *360* this is a fairly clear-cut paper. We should stop irradiating the infant pelvis (with CT) to confirm reduction of the hip. If cross-sectional imaging is required, clearly MRI is equally efficient and can be achieved without sedation or anaesthetic in the neonate once the hip is reduced.

Rebound deformity after growth modulation in patients with coronal plane angular deformities

■ Growth modulation is the technique of choice for correcting simple angular deformities. The technique is so successful that it has become the 'default' option in many paediatric orthopaedic practices. However, despite the well described nuances of calculating the appropriate time to intervene

in order to correct the deformity successfully, sometimes things just don't quite work out right – usually due to 'rebound' growth when the implant is removed. Yet again, the paediatric team in **Dallas, Texas (USA)** have stepped up to the plate and offered their insights into the magnitude of rebound growth seen in this circumstance based on a retrospective review of their series of 67 limbs, all treated with a tension band plate to correct an angular deformity.[8] The authors collected a range of radiological parameters including mechanical lateral distal femoral angle, mechanical medial proximal tibial angle, hip-knee-ankle angle (HKA), and mechanical axis measured before growth modulation, before implant removal, and at final follow-up. These, in combination with demographic details, were screened for factors predictive of rebound growth. The mean age of the patient cohort was 9.8 years at surgery and 11.4 years at implant removal. Around half of the patients suffered rebound growth of more than 5°, and 30% suffered rebound growth of more than 10°. In terms of prognostication, younger children (girls under ten and boys under 12) were more likely to rebound, as were patients with a higher initial deformity. The findings of this paper suggest that we should consider overcorrection in younger patients with higher initial deformity and watch all patients for recurrence of the deformity.

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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; Shoulder & Elbow Roundup 3; Spine Roundup 2; Trauma Roundup 4.***

GIRFT and regional knee arthroplasty services X-ref

The 'Getting it Right First Time' (GIRFT) report in the United Kingdom has many admirable attributes and is widely seen as part of the key to addressing the healthcare needs of an ageing and increasingly frail population. One of the principles of this report, published in September 2012, was the suggestion of changing how health care is delivered in a geographic region. This included the introduction of the minimum number of procedures for a specific operation to be undertaken by a surgeon and the centralisation of complex procedures to those units with the necessary expertise. This study from **Bristol (UK)** tracks the 'real-life' impact of such a policy on the delivery of orthopaedic care in a specific region.[1] Primary total knee arthroplasty (TKA) was performed by all surgeons in the study with a median annual volume of 33 TKAs (2 to 180). There were 21 surgeons (22%) who performed fewer than 13 cases (low-volume surgeons), resulting in 125 cases being performed by low-volume surgeons. The median unit volume of TKAs was 184 (7 to 527). Primary unicondylar knee arthroplasties (UKA) were performed by 48 surgeons in the region with a median of ten per annum (2 to 64). However, 26 surgeons performed fewer than 13 cases per annum and this resulted in 108 cases performed by low-volume surgeons. Patello-femoral joint (PFJ) arthroplasty was performed by 20 surgeons and the majority of these performed fewer than 13 procedures per annum. Revision TKA was performed by 50 surgeons and the median number per surgeon was five (2 to 57), while 37 surgeons performed fewer than 13 revisions per year. The authors then modelled the impact of introducing minimum surgeon thresholds to the Severn region, and what the additional workload would be, on the high-volume surgeons. The additional workload for higher-volume surgeons for primary TKA and UKA would be 3% and 17%, respectively. However, the increase in workload in the case of the PFJ arthroplasty and revision TKA would be 137% and 53%, respectively. The authors suggest a possible alternative approach: to rationalise the distribution of cases between surgeons who are currently operating within the grey area of between ten and 13 cases per year. If this was the case, the impact would reduce from 3% to 1.4% for primary TKA, 11.3% for UKA, and 31% for revision TKA. However, the introduction of this measure would not make any difference in the case of PFJ arthroplasty. The minimum unit volume was established following research into UKAs, where an inverse relationship between the number of cases and revision rates has been established. From this research, it was calculated that the minimum number of UKAs required per year in order to avoid a revision rate above the mean was 13. The authors of this study then extrapolated this figure to that of TKAs, revision TKAs, and PFJ arthroplasties. While an association has been established between surgeon volume and patient outcome with higher infection rates, higher transfusion rates, and longer lengths of stay in lower-volume surgeons, a specific minimum number of cases has not yet been recommended. The relationship between surgeon volume and outcome may be less pronounced than this study assumes. The authors did point out that research from the Scandinavian registry even suggested that the number of cases and the effect on revision rate varied according to which type of UKA was being undertaken. The recommendations from the GIRFT report are, without question, a step in the right direction. Most regions throughout the UK are currently assessing how best to deliver their orthopaedic services through their own Sustainability and Transformation Plans (STPs) and potentially changing regional practice, resulting in changes to the case-mix of some units. The GIRFT report is gaining traction with regional STPs adopting its philosophy. From this study, the take-home message was clear: all orthopaedic units need to be engaged with these discussions so that they feel part of the