Cancer (EORTC) Soft Tissue and Bone Sarcoma Group trials is important, in that it looks at the outcomes of primary treatment with chemotherapy across a range of trials with the focus on the elderly patients.[7] The authors argue, reasonably, that this is of interest as there are few reports of outcomes of metastatic soft-tissue sarcoma (STS) in the elderly, despite half of the patients presenting STS with metastasis being over 65 years old. The authors use a composite of 12 EORTC clinical trials to establish the outcomes of STS in the elderly in terms of overall survival (OS), progression-free survival (PFS), and response rate (RR). Of the 2810 participants in EORTC trials, there were 348 elderly patients, representing 12.4% of the potential study population. The performance status of the patients was usually 0 (n=134; 39%) or 1 (n=177; 51%), and the most common diagnoses was leiomyosarcoma (n=130; 37%). Just over half of the patients presented with lung metastases (52%), and liver metastases were present in 63 patients (18%). The participants received a range of different chemotherapy regimens, which were determined by the primary tumour and the trial they were involved in. The overall RR was low at 14.9%, median PFS was 3.5 months, and median OS was only 10.8 months, all slightly worse than in patients under the age of 65. The authors concluded that this is an under-represented cohort in the ETORC trials, and that the overall survivals, progression-free survival, and response rate were worse, albeit only marginally worse, than those of younger patients.

Can the epiphysis be transferred in primary sarcoma of bone?

■ As outlined in the previous paper on children's sarcoma, there are problems associated with treatment of primary sarcoma. The major potential complication and limitation to eventual function is the lack of an epiphysis and the sometimes dramatic limb-length discrepancy seen. A very attractive option for these patients is reported by surgeons in **Birmingham (UK)**, who described an approach to potentially preserve the growth in the limb.[8] These ingenious surgeons have been using a vascularized fibula autograft, which provides both the potential for bone growth and the rapid incorporation and longevity of the reconstruction at the cost of technically challenging surgery. This present study focused on the potential for maintaining limb length with such a procedure. It describes the graft hypertrophy and annual growth to establish if, when used in the proximal humerus, the vascularized fibular graft allows for retention of any normal growth and development. As perhaps would be expected in such a specialist surgical procedure undertaken in a rare diagnosis, the series presented here contains just 11 patients, all of them with a primary bone tumour of the proximal humerus, presenting over a period of 11 years. Outcomes were assessed annually and follow-up was to an average of five years. The overall survival was 91%; a single patient died of local recurrence a year following the index procedure. The authors of this report found complications occurring in the majority of cases, with seven fractures, four transient nerve palsies, and two cases of avascular necrosis of the graft. There was evidence of growth of the graft in terms of hypertrophy and axial growth in nine of the 11 patients; a single patient suffered a slip of the fibular epiphysis. The rate of growth was not insignificant, with a mean hypertrophy index of 65% and mean axial growth of 4.6 mm per annum. In terms of functional results, at a mean of five years following surgery, the average modified functional Musculoskeletal Tumor Society score was 77% and the authors reported an average Toronto Extremity Salvage Score of 84%. This paper certainly underlines the facility of a free vascularized fibular graft to grow. With an average of 5 mm per annum on average, the arms of these children grew 2.5 cm in the course of the study follow-up, which is certainly not insubstantial. The free vascularized fibular might just be the option that surgeons are looking for. If the complexities of the surgery can be provided, and if patient and surgeon are prepared to cope with the almost certain rate of complications, the eventual functional outcomes are relatively good.

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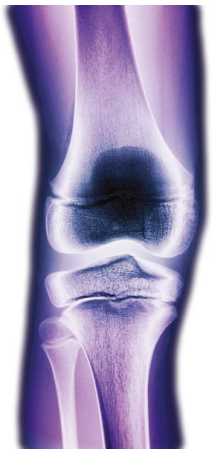
Children's orthopaedics

Rectus femoris in stiff knee gait: transfer or lengthen? X-ref

■ Stiff knee gait is common in spastic diplegic cerebral palsy, resulting in a compressed total knee motion arc throughout the stance and swing phases of the entire gait cycle. Abnormal firing of rectus femoris through this period has been implicated as a contributing factor and, in recent years, the distal rectus transfer has been the accepted surgical intervention of choice. Theoretically, transferring rectus femoris to hamstrings offered the advantage of converting a knee extensor into a flexor, although debate has been ongoing about whether it is actually clinically effective in producing a flexion moment. The release of the extensor may therefore be the therapeutic component of this procedure, and this group from **Houston, Texas (USA)** hypothesized that rectus femoris intramuscular lengthening and rectus femoris transfer would have equivalent clinical outcome.[1] Their technique involved a mid-substance resection of the rectus aponeurosis, leaving the surrounding muscle intact, and



they retrospectively compared the results of 84 procedures carried out in 46 spastic diplegic or triplegic cerebral palsy children performed over a 12-year period. The authors undertook a matched cohort analysis and therefore report on the results of 23 patients who were enrolled in each surgical group, with a mean age of 10 years and a mean follow-up of 1.2 years post-surgery. Clinical examination, 3D kinematics, and parent-reported outcome measures were analyzed and found to be equivalent between the groups, with the exception of the Duncan–Ely test for rectus spasticity and the time to achieve 90° of passive knee flexion postoperatively. The Duncan–Ely test was significantly less positive in the transfer group, likely attributable to the altered axis of pull and postoperative scarring in the lengthening group. Knee flexion was achieved faster in the lengthening group, indicating a possible shorter rehabilitation time. Overall both procedures resulted in increasing total knee range of motion in gait and in swing, and decreasing time to peak knee flexion in swing, therefore meeting the objective of the surgery, which was to improve stiff knee gait. The lengthening has advantages from the point of view of less technical difficulty and earlier return of knee flexion, whilst having similar outcomes. However, we are aware that these results are only at one-year post-surgery. Longer-term studies are required to assess whether the outcomes remain equivalent, but, if so, the simpler procedure would most likely be advisable.

Posteromedial bowing: leave alone or intervene? X-ref

Posteromedial bowing of the tibia is generally considered a relatively benign condition due to the potential of the paediatric tibia to remodel overtime; however, leg-length discrepancies do occur and may increase with age, being not uncommonly up to 7 cm at skeletal maturity. There are advocates in the orthopaedic community for a greater role of reconstructive surgery in the management of these patients, rather than just simple epiphysiodesis, which treats the leg-length discrepancy. In this study performed at two large tertiary referral centres in **London (UK)**, the authors sought to review the initial deformity and subsequent remodelling in posteromedial bowing of the tibia, and also to examine the outcomes of patients who underwent limb reconstruction.[2] This was the largest published series to date; 38 patients were identified who were treated over a 16-year period and followed up to a mean of 78 months. On initial review, 22 patients were under six months of age and had a mean medial bow of 43° and a mean posterior bow of 35°, with the greatest rates of correction seen within the first year of life. The mean percentage tibial shortening was 14% of total length but ranged from 4% to 25% and, importantly, was stable over time. No clear point where correction ceased was identified, but four years seemed a cut off, beyond which there was no clinically important remodelling. At this age, the authors conclude that the quality of radiographs and the absolute size of the patient allow for sufficiently accurate prediction of final leg-length deformities to develop a surgical plan. Smaller LLDs were managed in this series, with epiphysiodesis in four cases, and a further four awaiting this treatment. A total of 17 patients in this group have undergone limb lengthening, with a further three awaiting surgery. From the 19 surgeries in these patients, all but one achieved the planned length with a healing index of 42 days/cm. The risks of recurrent length deformity are noted to be significantly higher when lengthening is performed before ten years of age, due to ongoing growth inhibition. Correcting to compensate for this would require overlengthening the tibia and so the requirement for further procedures at a later date must be accepted. It is worth noting that these two large tertiary centres are likely to be exposed to the cases with greater deformity, and hence overestimate the general severity of leg-length discrepancy seen across the wider population. However, rather than the benign condition that posteromedial bowing is commonly thought to be, this paper highlights the risk of significant ongoing leg-length discrepancy in these patients, and is helpful for counselling parents of affected children and planning for those who require eventual leg-length equalization, the timing of which should be carefully considered.

The course of the paediatric radial nerve

The proximal extension of a lateral approach to the distal humerus should always arouse some angst due to the proximity of the radial nerve where it pierces the lateral intermuscular septum and is therefore at risk of injury. These concerns are corroborated by the frequency of iatrogenic injury reported in the literature. In adults, a 'safe zone' has been described by various authors, typically a minimum of 6 cm proximal to the lateral epicondyle. In the paediatric population, these measurements will obviously not hold true, and previous papers have used multiples of the transepicondylar distance as an attempt to scale these measurements in this population. This is, however, not an especially practical solution, requiring X-ray calibration and accurate measurement preoperatively. This simple but elegant study from **Los Angeles, California (USA)** proposes a solution to this problem.[3] MRI scans from 20 patients were used to assess the location of the radial nerve on the lateral aspect of the elbow, with measurements taken proximally from the distal humeral physis and orthogonal slices compared to see where the nerve crossed in the coronal plane. All patients aged over six years had measurements falling into the adult range of greater than 6 cm. Below six years of age, the measurements demonstrated a linear correlation between location of nerve and age, such that when age was multiplied by 1 cm to define a predicted safe zone, all radial nerves were found proximal to this. It should be noted that this is a relatively small sample size, but MRIs of the elbow are infrequently performed in the younger age groups except in more serious pathologies, and many of these scans in this centre were unfit for inclusion due to the potential distortion introduced by the pathology itself. This, however, is a simple rule of thumb that elegantly describes the potential safe zone in younger children. Larger studies would therefore be beneficial to validate this rule, but in this study the age × 1 cm rule never overestimated the safe zone and is quick and easy to use intraoperatively.

The Ponseti method hits 60

The Ponseti technique has been the method of choice for idiopathic clubfoot deformity treatment since the late 1990s, and very little has changed since the original description. There are, however, few intermediate and long-term outcome studies emanating from centres outside the originating institute; as such, given the 60 years since the introduction of the Ponseti method, it is timely to see the publication of the current report. This group from **Los Angeles, California (USA)** report the outcome of patients managed with the Ponseti method

followed to over five years of age, in order to provide independent data for outcome and expectation-setting for parents and for clinicians managing infants patients with idiopathic clubfoot.[4] A total of 101 patients with congenital talipes equinovarus were prospectively studied and were followed up to a minimum of five years of age with a mean follow-up of 81 months. The mean initial severity was 13.2 (SD 2) on the Diméglio system. Patients were manipulated using the Ponseti method. Heel cord tenotomy was performed if there was less than 15° of ankle dorsiflexion, followed by final casting for three weeks. A Mitchell–Ponseti brace was then used 23 hours daily for three months, then following this at naptime and night. The brace was recommended until the age of four, or until the age of five if there was a relapse. The Dallas outcome criteria and the Roye disease-specific instrument (DSI) were used to allow comparison both with earlier studies and with up-to-date improved metrics. Initial correction was achieved in all feet but 95% of patients required a heel-cord tenotomy. Assessing outcomes with the Dallas criteria, 62% had outcomes rated as good, 38% had outcomes rated as fair, and no patient had an outcome rated as poor. With the Roye DSI, most families were generally very satisfied with the function and appearance of the feet, with scores of over 80% in each domain. Patients wore the brace until a mean age of 3.9 years, but those patients with a good Dallas outcome continued until 4.1 years compared with the fair group, who continued until a mean of 3.7 years. Overall, the outcomes seem good, but there was almost a 70% rate of relapse and almost 40% required tibialis anterior tendon transfer surgery eventually. These results are, however, comparable to previous reports, including those from the designer centre series. Despite the high recurrence rate requiring surgical intervention, the majority of patients achieved good outcomes. This is a very useful review for counselling parents regarding the expected course of their child's treatment, and we will be pleased to see the outcomes published of this cohort and others at skeletal maturity to further inform our understanding.

Perthes disease: a local manifestation of a systemic condition?

■ While many different risk factors and associations have been described for Legg–Calvé–Perthes disease, the underlying aetiology is still not fully understood. This 'big data' paper from **Uppsala (Sweden)** makes use of the Swedish Patient Register and the Swedish Total Population Register to investigate if patients have an increased risk of osteochondrosis at other sites distant to the hip, and also the extent to which the theory of a systemic aetiology is supported by an association with obesity and hypothyroidism.[5] From this database, over 4500 patients with Legg–Calvé–Perthes disease were retrospectively identified in a 47-year period and each was matched with ten controls by gender, age, and area of residence. Patients with other paediatric hip diseases, such as developmental dysplasia or slipped capital femoral epiphysis, were excluded. The prevalence of secondary osteochondroses, obesity, and hypothyroidism were calculated and logistic regression analysis was performed to find the adjusted relative risk between patients with Legg–Calvé–Perthes disease and their matched control subjects. The overall incidence of secondary osteochondrosis was found to be significantly higher in the Legg–Calvé–Perthes group *versus* controls (3.11% to 0.31%). In addition, the adjusted risk ratios showed that Legg–Calvé–Perthes patients were almost three times as likely to have hypothyroidism or obesity. The methodology does have some problems of data accuracy, as large data studies usually do, and this must be accepted to some extent. The sensitivity is purported to be over 90% but, interestingly, the positive predictive value of the diagnostic coding in the past has been as high as between 85% and 95%, meaning that between 5% and 15% of patients recorded to have a condition potentially don't. In addition, the examination of confounders such as socioeconomic background was not possible. The advantage of the database, however, is that the whole Swedish population is included. The authors conclude that evidence is found to strengthen their hypothesis that Legg–Calvé–Perthes disease is the local manifestation of a systemic disease. In some cases, this may be so, but here at *360* we are not sure of the causal strength of this conclusion and more research is definitely required. Surgeons should, however, certainly be cognizant of the association with osteochondrosis at other sites.

Paediatric lateral condyle fractures: a systematic review X-ref

■ Lateral condyle humeral fractures are amongst the more common paediatric fractures and are not infrequently associated with complications. This useful systematic review conducted in **Singapore (Singapore)** studied the epidemiology, management, and complications of paediatric lateral condyle fractures. A total of 44 studies with 2440 patients were included; the mean patient age was six years, with male gender and left-sided injuries more common.[6] A multitude of classification systems were reported and frequencies were documented; the most commonly used were Milch and Jakob, but Rutherford, Badelon, Lagrange, Weiss, and other novel systems also appeared. This highlights a growing phenomenon of multiple classification systems for a relatively rare injury, which potentially limits the ability to meaningfully pool data and permits comparison between studies. In terms of the threshold for recommending fixation, most studies chose the classical limit of 2 mm displacement, but this has been challenged recently where a cut-off of 4 mm has been proposed. This is based on a study demonstrating that all injuries with less than 4 mm displacement had intact articular cartilage on arthrogram, and the view that these injuries may be safely treated with closed reduction and percutaneous pinning. When fixation was indicated, wiring was the treatment of choice in over 80% of case. Cases treated with threaded wires had fewer carrying angle abnormalities *versus* smooth wires, but were otherwise comparable. The use of two wires instead of three permitted improved range of motion and decreased lateral prominence but increased malunion rates. Risk of infection was similar between exposed and buried wires, suggesting that these should be left exposed to eliminate need for further surgery for removal. Bio-absorbable implants made no difference to radiographic or functional outcomes. Two studies were included comparing the use of Kirschner (K)-wires and screw fixation, with both recommending the latter on the basis of ability for earlier mobilization and better range of motion. However, the large series reported in this year's June issue of *360* was published too recently for inclusion in this particular review and this showed no difference in outcomes except a higher nonunion rate with K-wires, which was successfully treated later with screw fixation, and a higher cost to screw treatment. A summary of complications and their incidence is provided in the paper and is useful for patient counselling. Highlights include a cubitus valgus or varus occurring in 14% of cases but mostly of minor significance and a fishtail deformity rate of 14%. Union occurred at a mean of six weeks and there was no evidence of increased infection rates in studies removing wires at six weeks compared with earlier. Misdiagnosis occurred in 16% of cases, which led to a significant morbidity

burden. Unsurprisingly, most studies show low or no complication rates for conservative management of fractures displaced less than 2 mm. If position was maintained at one-week follow-up, there was no utility to further radiographs. Overall, this paper provides useful pooling and quantification of the not-insignificant risks of complication with this injury, as well as giving some recommended algorithms for management and follow-up.

Asymmetrical skin creases and DDH

Developmental dysplasia of the hip (DDH) is a devastating diagnosis to miss. In the UK, asymmetrical skin creases are included in the newborn and infant physical examination guidelines as an independent positive screening sign. However, the importance of this sign in the absence of unilateral limitation of abduction of the hip in flexion has been questioned in the literature, with the suggestion that referrals for this sign in isolation are unnecessary, and that they increase the burden in the clinics to which they are referred. So we were interested to read this well conducted study from **Blackburn (UK)** examining the utility of this clinical sign.[7] Data was prospectively collected in the unit's DDH one-stop clinic and referrals over a 20-year period were studied. All patients had clinical and sonographic examination by the senior author of the paper. This included Ortolani and Barlow manoeuvres and assessment for unilateral limitation of abduction of the hip in flexion or apparent leg-length discrepancy using the Galeazzi sign to examine for a short femur and assessment of leg length. Ultrasound examination was defined as pathological when demonstrating a modified Graf type III or IV hip. From over 7000 referrals, 105 had asymmetry of the inguinal, adductor, or gluteal folds and were included in the study. Cases with a neurological aetiology were excluded. Only two of the patients identified to have asymmetrical creases actually had a pathological DDH and, interestingly, both of these patients also had unilateral limited abduction of the hip in flexion and a positive Galeazzi sign with apparent leg-length discrepancy. As a result, if the remainder of the examination for patients with asymmetrical skin creases was normal, the positive predictive value for DDH was 0%. The authors therefore reasonably conclude that isolated asymmetrical skin creases are an unreliable clinical sign in the diagnosis of pathological DDH, and argue that guidelines should emphasize the presence of additional clinical signs to guide further screening. This is a diagnosis never to miss, but this does seem a safe and sensible suggestion that could help reduce the consequences of unnecessary referral, including parental anxiety and the clinic workload burden.

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Research

X-ref *For other Roundups in this issue that cross-reference with Research see: Hip & Pelvis Roundup 8.*

Joint aspiration is sensitive and specific for infection X-ref

There are widely varying views regarding the best method for diagnosis of prosthetic joint infection (PJI), both in general terms and with specific regard to the role of joint aspiration. Whilst much research abounds, there is little definitive scientific evidence and, as such, we tend to rely on consensus statements and professional opinion. This paper from **Sheffield (UK)**, whilst retrospective, is quite effective in its simplicity.[1] It asks a very straightforward question, namely: how sensitive/specific is joint aspiration as part of the work-up for revision surgery for infection? The authors identified all patients at their unit who had undergone hip or knee aspiration on account of a high index of clinical suspicion for PJI (based on clinical and haematological parameters) over an 11-year period, and then went on to compare the findings of preoperative aspirates against the eventual results of intraoperative tissue sample analysis. Confirmed diagnosis of infection was defined by at least three out of five samples harvested at the time of revision surgery growing the same organism, with the same antibiotic sensitivities. Where only three or four samples were taken, two had to demonstrate the same microbiological findings to be considered diagnostic. Of a total of 961 aspirates, 381 were excluded either because revision surgery was not subsequently undertaken, or because fewer than three intraoperative tissue samples were sent intraoperatively. In 267 of the remaining 580 (46%), initial aspirate was dry, so a saline injection-reaspiration technique was employed to obtain the aspirate sample. From these 580 aspirates (543 patients) where the joint then underwent revision surgery, 192 aspirates (178 patients) subsequently met the above definition for PJI. Wet and dry aspirates respectively demonstrated sensitivities of 81% and 87%, and specificities of 90% and 79%. Whilst acknowledging the limitations of even intraoperative tissue sampling in identifying PJI, as well as those of any retrospective study, the authors' claim that this supports aspiration as a key part of the workup for patients in whom infection is suspected, is backed up by their data. The point of particular interest here relates to the role of saline injection-reaspiration, which some surgeons have long questioned as a valid technique. This paper suggests it should be undertaken as a matter of routine if patients have been deemed to require aspiration, but the initial tap is dry due to acceptable sensitivity and specificity. Of course, the major confounder here is that it is widely recognized many infected arthroplasties are 'culture negative' and, as such, this paper represents just a subset of the overall population.