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.

REFERENCES

1. Ellington MD, Scott AC, Linton J, Sullivan E, Barnes D. Rectus femoris transfer versus rectus intramuscular lengthening for the treatment of stiff knee gait in children with cerebral palsy. *J Pediatr Orthop* 2018;38:e213–218.

2. Wright J, Hill RA, Eastwood DM, et al. Posteromedial bowing of the tibia: a benign condition or a case for limb reconstruction? *J Child Orthop* 2018;12:187–196.

3. Nielsen E, Andras LM, Skaggs DL. Quantifying the location of the radial nerve in children for intraoperative use. *J Pediatr Orthop* 2018;38:e292–295.

4. Zionts LE, Ebramzadeh E, Morgan RD, Sangiorgio SN. Sixty years on: Ponseti method for clubfoot treatment produces high satisfaction despite inherent tendency to relapse. *J Bone Joint Surg [Am]* 2018;100-A:721–728.

5. Hailer YD, Hailer NP. Is Legg-Calve'-Perthes Disease a local manifestation of a systemic condition? *Clin Orthop Relat Res* 2018;476:1055–1064.

6. Tan SH, Dartnell J, Lim AK, Hui JH. Paediatric lateral condyle fractures: a systematic review. *Arch Orthop Trauma Surg* 2018;138:809–817.

7. Anderton MJ, Hastie GR, Paton RW. The positive predictive value of asymmetrical skin creases in the diagnosis of pathological developmental dysplasia of the hip. *Bone Joint J* 2018;100-B:675–679.

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.

Alpha defensin: not a screening but a confirmatory test X-ref

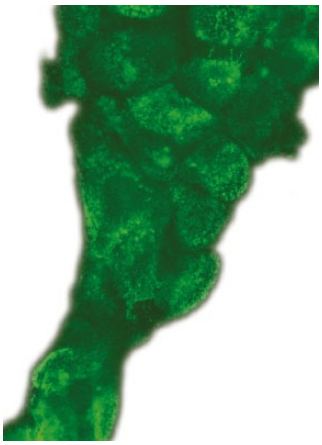
The diagnosis of prosthetic joint infection (PJI) requires multiple tests, and, as already covered in the previous roundup, the problem with many assessments is that there is no gold standard against which to measure them. There has been a genuine interest of, and significant research into, a variety of bedside and laboratory tests. None have generated quite the enthusiasm and general acceptance garnered by the alpha-defensin assays, probably due to a combination of both promising early results and the development of the highly convenient lateral flow assay. However, the literature is now looking much more mixed with regards to the utility of the alpha-defensin lateral flow (ADLF) test in particular. Part of the confusion is likely due to a mixture of alpha-defensin assays in common use combined with some confusion surrounding which 'gold standard' to use. Add in to that the difficulties with slightly conflicting study designs, and there is some significant confusion in the literature surrounding the use or otherwise of the alpha defensin assays. This insightful and timely paper from **Berlin (Germany)** asks a very pertinent question: is the lateral flow assay suitable as a screening test, or should its use be confined to a confirmatory test?[2] The authors report a large prospective cohort series of 212 patients, all of whom had synovial aspiration for suspected periprosthetic infection and a complete further work-up. The authors helpfully classified the patients as having PJI or aseptic failure using three commonly used criteria (Musculoskeletal Infection Society (MSIS), the Infectious Diseases Society of America (IDSA), and the European Bone and Joint Infection Society (EBJIS)). Overall, 71% (151 patients) in the series had a total knee arthroplasty *in situ* and 29% (n = 61) a total hip arthroplasty. The diagnosis of PJI was made in 45 patients (21%) using the MSIS criteria, in 55 patients (26%) using the IDSA criteria, and in 79 patients (37%) using the proposed EBJIS criteria. Using these definitions, the sensitivity of the ADLF test was reported as 84% against MSIS criteria, 67% with the IDSA criteria, and 54% with the proposed EBJIS criteria. The ADLF test showed high specificity with all of the classifications, and represented the most specific preoperative test for PJI. The tests for acute and chronic PJI often require different thresholds. When compared with different definitions of PJI, the alpha-defensin lateral flow tests (currently only available in Europe) had a high rate of specificity, but a lower rate of sensitivity. Thus, alpha-defensin lateral flow test should not be used in isolation but should be used with other tests to rule out PJI.

Outcome instrument responsiveness in joint function

As more and more is being known about patient-reported outcome measures (PROMs), the measurement properties of each are being increasingly clearly defined. Although a PROM is just a few simple questions, the way these questions perform in different settings, with different patients, and at different timepoints has a dramatic effect on the potential outcome measures in a study. There have consequently been a number of new outcome measures developed to flexibly assess patient function, the most high-profile of which is the Patient-Reported Outcomes Measurement Information System (PROMIS) system. PROMIS was funded heavily by the National Institutes of Health (NIH), with the intention of developing a set of patient-centred measures in order to evaluate physical, mental, and social health in adults and children. Alongside the development of PROMIS, a series of adaptive measurement applications were developed that include interactive iPad apps with the intention of reducing the time burden to patients and carers alike. Two relatively new scores are the shorter forms of the Hip Disability and Osteoarthritis Outcome Score (HOOS JR) and Knee Injury and Osteoarthritis Outcome Score (KOOS JR), which are designed to provide a 'light touch' approach, and are specific to joint replacement. We were delighted to see this independent assessment from **Salt Lake City, Utah (USA)** of responsiveness in joint function from the HOOS JR, KOOS JR, and PROMIS Physical Function Computer Adaptive Test (PROMIS PF CAT).[3] Responsiveness is a particular important characteristic in measures used for joint replacement as it allows long-term assessment of treatment effects, which is the primary role of outcome measures in joint replacement. The paper focuses on the outcomes of a cohort of 983 patients seen over a three-year period in an orthopaedic clinic. All three instruments were completed at baseline, and at three- and six-month follow-up visits. The cohort ranged in age from 18 to 90 years, and the responsiveness of each measure was calculated in two ways: as between 80 and 100 days, and as 90 days and beyond. Six-month responsiveness, similarly, was calculated as between 170 and 190 days, and as 180 days and beyond. A large effect size was seen with all three measures, ranging from 0.80 to 1.20, and the standardized response mean was large for each measure and at each timepoint (range 1.06 to 1.53). This article compares the responsiveness of several contemporary patient-reported outcome measures in an adult reconstruction practice. All three of the tested instruments proved useful for assessing treatment change and could be selected in this adult population.

A preoperative risk calculator for prosthetic joint infection following total joint arthroplasty X-ref

The age-old adage that prevention is better than cure could not be more accurate than in the case of periprosthetic infection. The treatment is so difficult, the outcomes so compromised, and the cost so high that many patients and clinicians argue that those who develop an infection following joint arthroplasty would have been better off without treatment in the first place. To this end, there have been a number of papers that have attempted to establish what the risk factors for infection actually are. When counselling patients regarding their risk for prosthetic joint infection (PJI), a common question is: what leads to the highest risk of infection? Up until now, most of the previous studies have listed risk factors that contribute to a higher risk of PJI. It is rare, however, for patients to have just a single risk factor. What has been conspicuous by its absence is any calculators specific to the risk of PJI, and especially to PJI for specific organisms (*S. aureus* and resistant organisms). This study from **Philadelphia, Pennsylvania (USA)** elucidated specific weights for candidate covariate factors.[4] This calculator can be used going forward to counsel patients with regards to their risk for PJI, and to help guide surgeons on who, and who not, to operate on. The Philadelphia group have a special interest in periprosthetic infection, and their retrospective review was performed on a massive 27 717 patients (consisting of 12 086 total knee arthroplasties and 31 167 total hip arthroplasties). Within this institutional cohort, there were 1035 patients with a confirmed PJI, who were treated at a single institution between 2000 and 2014. The authors screened over 40 risk factors for potential associations with eventual development of PJI, and then evaluated candidate variables with a multivariate analysis from which integer scores were produced. The eventual score was then validated using a second unrelated cohort of nearly 30 000 patients from an independent institution. Of the initial screening variables, there were 17 that made it into the eventual model



as a potential risk factor for PJI. These include undergoing a previous open surgical procedure, drug abuse, a revision procedure, and HIV/AIDS. Using receiver operating characteristic curve analysis, the areas under the curves (AUC) were 0.83 and 0.84 for any PJI, 0.86 and 0.83 for antibiotic-resistant PJI, and 0.86 and 0.73 for *S. aureus* PJI in the internal and external validation models, respectively. This represents a good model, and certainly one that has enough diagnostic accuracy to warrant routine use in clinical practice where the clinician wishes to quantify the risk of periprosthetic infection.

Periprosthetic hip and knee infection: an evidence-based and validated criteria

■ In a bumper crop of relevant research into the diagnosis and definition of prosthetic joint infection (PJI) in the recent literature, we would draw *360* readers' attention to a further paper from **Philadelphia, Pennsylvania (USA)**.[5] This is an update of the criteria for periprosthetic infection first defined by the Musculoskeletal Infection Society. These updated criteria have been published following the International Consensus Meeting. They take into account additional and newer diagnostic factors such as alpha-defensin, but remove historical criteria such as a single positive culture. This definition may help guide the diagnosis of PJI, which is a multifactorial process, and is one of the few consensus statements that has relevance both to daily clinical practice and to research use.

Triclosan-coated sutures a randomized trial X-ref

■ Triclosan coating on sutures is one potential approach to reduce the rate of infection following surgery, the logic being that the suture provides a potential nidus for infection, particularly those where there is a braided suture. Hence, the risk of infection is elevated by the presence of an ideal foreign body in which any present bacteria can survive. The problem with all of these small innovations is that the evidence is often weak or circumstantial. We were delighted to see this fantastic paper from **North Shields (UK)**, from the late Andrew Sprowson.[6] Reasoning that the risk of surgical site infection (SSI) is about 1% in the United Kingdom, the authors devised a large, double-blinded randomized controlled trial involving 2546 patients undergoing total hip arthroplasty (THA) and total knee arthroplasty (TKA) at three hospitals in the United Kingdom. The rates of superficial SSI were 0.8% in the control group and 0.7% in the intervention group; when deep and superficial SSIs were combined, the rates were 2.5% and 1.8%, respectively. The length of stay in hospital and the rates of medical complications did not differ significantly between the groups. There is no evidence from this study that triclosan-coated sutures reduce the risk of infection in this double-blind randomized controlled trial for THA and TKA.

Age and sex of surgeons and mortality of older surgical patients

■ The outcomes following surgery are a complex and multifaceted thing. Our interest was piqued by this paper from **Boston, Massachusetts (USA)**, which could be summarized as reporting that older surgeons have lower mortality; female surgeons in their 50s have the lowest.[7] It is an interesting observational study that tells a little more than just this simple headline. The authors looked at all Medicare fee-for-service beneficiaries aged between 65 and 99 years who underwent one of 20 major non-elective surgeries between 2011 and 2014. The outcome measure was operative mortality defined as 30-day mortality. The authors undertook an adjusted assessment of the patients' and surgeons' characteristics. There were 892 187 patients who were treated by 45 826 surgeons included in this report. The patient mortality was lower for older surgeons than for younger surgeons: the adjusted operative mortality rates were 6.6% (95% confidence interval (CI) 6.5 to 6.7), 6.5% (95% CI 6.4 to 6.6), 6.4% (95% CI 6.3 to 6.5), and 6.3% (95% CI 6.2 to 6.5) for surgeons aged under 40 years, between 40 and 49 years, between 50 and 59 years, and 60 years or over, respectively. The authors went on to stratify their results by sex of surgeon. Overall, patients' mortality declined with age of surgeon for both male and female surgeons (aside from female surgeons aged 60 or older). Overall, female surgeons in their 50s had the lowest operative mortality. What is most interesting is that the results are related only to unplanned surgery, so the traditional argument about risk aversion in patient selection probably doesn't apply here. It seems unlikely that this effect is due to physical technical skill, as psychomotor skills are known to start to decline in those aged around 55 years. It leaves us wondering here at *360* if this observation is due to less risky behaviour whilst operating or better judgement in the postoperative period.

REFERENCES

1. Partridge DG, Winnard C, Townsend R, Cooper R, Stockley I. Joint aspiration, including culture of reaspirated saline after a 'dry tap', is sensitive and specific for the diagnosis of hip and knee prosthetic joint infection. *Bone Joint J* 2018;100-B:749-754.

2. Renz N, Yermak K, Perka C, Trampuz A. Alpha defensin lateral flow test for diagnosis of periprosthetic joint infection: not a screening but a confirmatory test. *J Bone Joint Surg [Am]* 2018;100-A:742-750.

3. Hung M, Saltzman CL, Greene T, et al. Evaluating instrument responsiveness in joint function: the HOOS JR, the KOOS JR, and the PROMIS PF CAT. *J Orthop Res* 2018;36:1178-1184.

4. Tan TL, Maltenfort MG, Chen AF, et al. Development and evaluation of a preoperative risk calculator for periprosthetic joint infection following total joint arthroplasty. *J Bone Joint Surg [Am]* 2018;100-A:777-785.

5. Parvizi J, Tan TL, Goswami K, et al. The 2018 definition of periprosthetic hip and knee infection: an evidence-based and validated criteria. *J Arthroplasty* 2018;33:1309-1314.e2.

6. Sprowson AP, Jensen C, Parsons N, et al. The effect of triclosan-coated sutures on the rate of surgical site infection after hip and knee arthroplasty: a double-blind randomized controlled trial of 2546 patients. *Bone Joint J* 2018;100-B:296-302.

7. Tsugawa Y, Jena AB, Orav EJ, et al. Age and sex of surgeons and mortality of older surgical patients: observational study. *BMJ* 2018;361:k1343.

 DOI: 10.1302/2048-0105.74.360627