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Research

X-ref For other Roundups in this issue that cross-reference with Research see: *Hip & Pelvis Roundup 6; Knee Roundup 8; Wrist & Hand Roundups 5 & 6.*

Detection of total hip prostheses at airport security checkpoints X-ref

■ A common question that pervades all branches of orthopaedic surgery is whether implants will be detected by airport metal detectors. Although this often seems an irrelevant query, it is one of the more practical reminders that patients have of their surgery. To help give a straightforward answer, a team from **Tokyo (Japan)** sought to establish if implant detection rates varied between total hip arthroplasty implants and materials using airport metal detectors.¹ The group identified a retrospective unselected series of 1684 patients who had undergone hip arthroplasty, and questioned them as to their travel activities and security experiences at airports. Of the group, 671 had flown in the intervening period, with 346 reporting implant detection. Patients with unilateral arthroplasties on domestic flights had the lowest detection rate of 23%, whereas bilateral arthroplasty on international flights showed a detection rate of 86%. Subsequent logistic regression showed that cup size and implant material were the most relevant variables on domestic flights, and cup size alone was the most relevant variable for international flights. Although a convincing argument could be made that the detection rate is high in large implants and bilateral surgery cases, it is surprising that the detection rates differ between domestic and international flights, and it is possible that there is a sample size problem here.

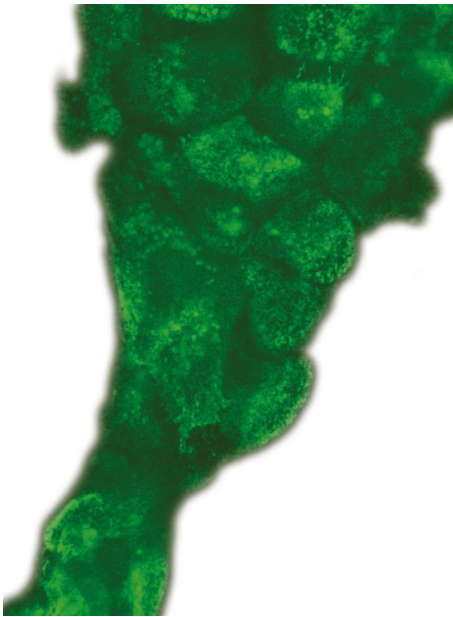
Saline solution lavage and reaspiration in infected total joints X-ref

■ Making the diagnosis of septic arthritis is critical, both in native and prosthetic joints. A plain blind aspirate is usually all that is required. However, particularly in the case of prosthetic joints, this is sometimes not enough. Many surgeons advocate increasing diagnostic accuracy,

particularly of those patients with a 'dry tap', through lavage of the joint. A volume of sterile saline is injected into the joint and reaspirated to get a sample for culture and sensitivity. Although increasingly commonly performed, data to support the practice are relatively scarce. In this study from **Beijing (China)**, the authors sought to evaluate the impact of the technique on diagnostic accuracy for joint infection in both prosthetic and native joints.² The authors based the findings of their study on previously collected data from 268 aspirations performed in a single unit by a single surgeon. If less than 1 ml was aspirated, then 10 ml of saline was infiltrated into the joint, which was then reaspirated. The fluid was subsequently placed into blood culture bottles and inoculated for 14 days. Saline lavage was required in 47 prosthetic and 35 native suspected joint infections, while aspiration alone was used in 99 prosthetic and 105 native joints in this series. Overall, 29% of suspected knee infections and 42% of suspected hip infections underwent lavage. The sensitivity, specificity, positive predictive value, and negative predictive value of culture were 0.795, 0.957, 0.951, and 0.817, respectively. For 'dry tap' cases necessitating lavage, the values were 0.851, 0.857, 0.889, and 0.811, respectively, suggesting that the overall diagnostic accuracy of saline lavage is comparable to a simple tap. Although the results seem impressive, this study utilized a blood culture system to improve the culture yield. While caution should be applied when using lavage to obtain a sample, since a cell count cannot be obtained, surgeons should consider using a blood culture system when attempting to culture a diluted aspirate from a prosthetic joint. It is not quite clear to us here at 360 how the eventual diagnosis of infection was reached and, although a modified version of the Musculoskeletal Infection Society criteria was utilized, the study's inclusion of the test being evaluated in the diagnostic criteria for the endpoint inflates the apparent diagnostic accuracy. This explains the specificity of 0.96 reported for positive culture from plain aspiration.

Enhancement of the chondrogenic differentiation by ghrelin X-ref

■ One of the modern 'holy grails' of surgical practice is harnessing the power of biological regeneration and applying this to a large range of pathologies. *In vitro* cell lineages have been responsible for some of the most fundamental breakthroughs in modern surgical practice, but a current bar to their success is the difficulty in ensuring appropriate cellular differentiation from the stem cells. In an effort to further the research into these cell lines, a study group from **Beijing (China)** have conducted an investigation looking at improving chondrocytic differentiation of mesenchymal cells through enhancing the effect of transforming growth factor (TGF)- β using ghrelin, measured using gene expression analysis, sulphated glycosaminoglycan and collagen assessment, and histological staining.³ In this animal study, rats with cartilage injury were used as the *in vivo* models, with cultivated cell lines used *in vitro*. Following the administration of TGF- β with ghrelin in the injured rats, chondrocytic regeneration was found to be much improved when compared with TGF- β alone after mesenchymal stem cell implantation. When used on cell lines, ghrelin increased the expression of SOX9, aggrecan, and collagen type II, increased the synthesis of sulphated glycosaminoglycan and collagen, and enhanced the phosphorylation of DNA (cytosine-5)-methyltransferase 3A and extracellular signal-regulated kinases 1 and 2. Ghrelin seems likely to improve chondrocyte differentiation protocols and has laid the groundwork for an investigation of the multiple factors involved in chondrocyte differentiation. There is clearly quite a broad scope for improvement of the cellular quality on the 'benchtop' prior to use of these differentiated cell lines in surgical practice. We would also comment that there is potentially huge scope for use of ongoing biological support for cellular therapies after implantation rather than the current approach of simple carriers, such as a collagen fleece.



Natural history of slipped capital femoral epiphysis X-ref

■ Slipped capital femoral epiphysis (SCFE) is a comparatively uncommon injury in children, affecting between one and two children per 10 000 patients. In this review, a team from **Rochester, Minnesota (USA)** present the results of a systematic literature search in order to describe the natural history of the condition.⁴ The team concludes that the outcomes of SCFE are acceptable if the slip is not severe and is not complicated by avascular necrosis (AVN) or chondrolysis, with an overall conversion to total hip arthroplasty of 5% at 20 years. *In situ* pinning without a closed reduction scored similarly well. AVN has a greater association with unstable slips, with a rate of between 15% and 50%. Some studies reported in this review suggested that up to one-third of patients had persistent hip pain into adulthood, and that SCFE is a rare indication for total hip arthroplasty in the absence of AVN. The authors further describe the differences between idiopathic femoroacetabular impingement and SCFE, and emphasize that managing weight and blood pressure should be considered at the time of SCFE diagnosis. Finally, the team go on to conclude that in comparing *in situ* pinning to realignment surgery, the natural history and long-term outcomes need to be considered, as well as residual symptoms and the need for additional surgery. This sort of natural history paper is incredibly valuable in giving an overview of relatively common conditions.

Prophylactic antibiotics: once or more than once?

■ Prophylactic antibiotics are now routine prior to implant surgery, and are an essential part of

preventing infection. There have historically been many thoughts on the timing and duration of prophylaxis. The potential advantages of repeated dosage are obvious, but there are also possible downsides, such as *Clostridium difficile* and development of antibiotic resistance. It is therefore heartening to see this systematic review from a team from **Philadelphia, Pennsylvania (USA)**. The authors reviewed on data from 14 randomized controlled trials (RCTs) that compared a single dose versus multiple doses of preoperative antibiotics for orthopaedic implant surgery, in order to see which is the best strategy overall for controlling infection.⁵ The team searched all the usual databases for all studies between 1980 to 2017 that reported an evaluation of antibiotic prophylaxis in procedures where implants were being placed. In total, 14 studies, representing the results of 9691 patients, were identified and critically appraised. The group used high-quality methodology for their review and assessed for both publication bias and bias within the reviews themselves, followed by random-effects analysis to account for the heterogeneity in the studies. The quality of published evidence here was found to be low, despite the nature of included studies and the numbers of patients. The authors went on to find that there were no differences in infection risk between single- versus multiple-dose groups in this meta-analysis of nearly 10 000 patients. The team concluded that a RCT with a sufficient sample size should be carried out before universal agreement of a single antibiotic dose.

Povidone-iodine irrigation prior to wound closure: good, bad, or indifferent?

■ Sticking with the theme of prevention of infection, another topical study concerns the use of antiseptics prior to wound closure. The authors undertook a review of nearly 12 000 cases, with the aim of establishing if povidone-iodine (PI) application to the surgical wound prior to closure improves infection prevention. In this study from **Rochester, Minnesota (USA)**, the authors compared the rate of any reoperation for infection in primary total hip arthroplasty (THA) and primary total knee arthroplasty (TKA) among patients who did and did not receive PI irrigation prior to wound closure.⁶ They did not, however, include superficial wound infection not requiring operation in their outcomes. The rate of reoperation for infection was similar between the two groups, both at three months and at one year. For TKA, the rate of reoperation was similar between the two groups at three months, but there was a

greater rate of reoperations for infection among those who received dilute PI irrigation at one year. However, there was no difference in the risk of septic reoperations between the groups. Overall, this analysis includes 5534 primary THA and 6204 primary TKA procedures undertaken over a five-year period. A subgroup of 24% of cases underwent irrigation with one litre of 0.25% PI prior to closure. Outcomes were assessed at the three-month timepoint. Reoperation rates were comparable following THA in the dilute PI irrigation group and control group (0.9% vs 0.7%), with results unchanged at one year. In terms of TKA, where the poorer soft-tissue envelope and higher rate of infection might lead one to expect PI irrigation to have a beneficial effect, there was a higher (but not quite significant) infection rate in the PI irrigation group at three months (0.8% vs 0.3%). By a year, this difference had become significant (1.2% vs 0.6%) in favour of the control group. These differences disappeared after use of propensity score matching. The authors conclude that there does not appear to be a benefit to using PI at the conclusion of arthroplasty surgery; however, it is worth considering whether these results can be extrapolated to more extensive incisions, such as those in tumour excision or spinal surgery. We would counsel some caution in those who do use PI wash, as although the differences disappeared when propensity score matching was used, it is worth considering that – in TKA, at least – there appears, if anything, to be a higher infection rate.

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