

questions remain over the longer-term outcomes with the technology as yet to be proven in any reasonable series with longer-term follow-up. As always, the Mayo Clinic have been able to assemble an impressive number of 58 cases, all revisions, in which a trabecular metal revision acetabular shell was used with augmentation. The authors present their results with five years of radiographic data. The bottom line is that, in this series, a survivorship of an impressive 97% was seen. The authors did, however, discern a not insignificant incidence of radiolucent lines (with 10% of revisions demonstrating a Zone 3 radiolucent line). The authors note

that the presence of a radiolucent line is not necessarily indicative of implant failure. From a clinical perspective, the pre-operative mean Mayo Hip Score of 35.7 improved to 61.9 immediately post-operatively and there was little change (mean 61.7 minimum five-year follow-up). These results are promising, and although longer-term follow-up of these implants is clearly required, there are enough data here to support the use of acetabular tantalum shells and augments in the revision hip setting.

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Knee

X-ref For other Roundups in this issue that cross-reference with *Knee* see: *Hip Roundup 3; Trauma Roundups 1 and 3; Research Roundups 1, 2, 3 and 7.*

How many cultures in arthroplasty infections? X-ref

■ Identifying the infecting organism from fluid and tissue cultures at the time of surgery is vitally important in the treatment of periprosthetic joint infection. Although RNA PCR has added significant sensitivity to diagnosis, it doesn't yield the same information as direct culture. Knowing the organism and making the appropriate selection of antibiotics can provide prognostic and treatment information. However, failure to identify the infecting organism, with a failure rate as high as 11.9% in some series, remains a significant barrier to successful infection eradication. There is, however, some debate surrounding the optimal number of samples to maximise sensitivity, with excessive samples adding to cost and an increased risk of a false positive culture result. These authors from **Philadelphia, Pennsylvania**

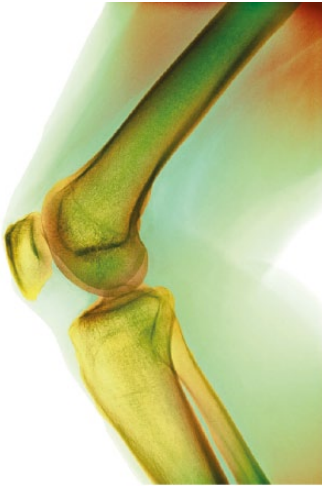
(USA) included the results of 74 consecutive infected joint arthroplasties.¹ As well as synovial fluid, multiple tissue samples were taken from the synovium, intramedullary tissue and the prosthetic interface, as well as tissue from adjacent bone. One specimen from each case was identified as the 'best culture' and was tested for atypical organisms such as mycobacterium and fungus. The average number of cultures taken was 4.2 (1 to 10) and the median was four. The authors of this paper concluded that the optimal number of cultures necessary to identify an infecting organism was four, which included synovial fluid cultures. At this threshold, the sensitivity and specificity was 0.63 and 0.61, respectively. Although increasing the number of samples increased the sensitivity, it was to the detriment of the specificity, with an increasing number of false positive results. The single 'best culture' at the time of surgery did not appear to increase the likelihood of a positive culture. Interestingly, intra-operative synovial fluid collection was equally as sensitive as

tissue cultures from multiple areas in diagnosing infection. What was a little disappointing from a study that was looking at the optimal number of samples to obtain at surgery was that there was no 'sonication' of the implants removed at the time of surgery. Some have argued that this can improve the sensitivity in detecting organisms. While the study does have its weaknesses which the authors address in their discussion, it is one of the more recent papers to assess the optimal number of intra-operative samples that should be taken without compromising the specificity. It would be interesting to repeat this study to include some of the innovative ways to help reduce the chance of negative culture results. I would also agree with the authors that, should this study be repeated, the methods for taking tissue samples, as well as collection and processing, should be standardised.

Skin closure after total knee arthroplasty: what is the best method?

■ Although there have been many studies looking at wound closure in

total knee arthroplasty (TKA), these are somewhat varied in their design and conclusion, and there has been no recent meta-analysis. This paper from **New York, New York (USA)** goes to great lengths to compare the best methods of wound closure following TKA.² Surgical wound problems are responsible for an increased length of hospital stay, higher re-admission rates, more complications, and, with that, increased healthcare costs, as well as the cost to the patient. Wound appearance may also have an impact on patient satisfaction rates. The authors performed a meta-analysis of articles published between 2000 and 2016, including the outcomes of 828 TKAs, of which 366 were closed using sutures and 462 with staples. The bottom line here is that there was no statistically significant difference between the two groups in the incidence of superficial and deep wound infection, abscess formation and prolonged wound discharge. There was an increased risk of wound dehiscence in the suture cohort and, unsurprisingly, wounds closed with sutures took up to 14 times longer than wounds closed with staples.



However, patients whose wounds were closed with staples had a significantly longer length of stay, a somewhat surprising finding. There was no significant difference in cost between staples and sutures when the time taken to close a wound was taken into account, as well as the increased length of stay associated with staples. Increasingly, we are all having to re-evaluate our peri-operative pathways, from the little things to the big ones, particularly regarding the delivery of efficient high quality care. Enhanced or integrated pathways have become the norm. With this has come an increased focus on the length of stay, post discharge care and rehabilitation. While we would all agree that closing with sutures takes longer than closing with staples, the significantly increased length of stay following wound closure with the latter needs to be investigated.

Multimodal periarticular analgesia and adductor block after total knee arthroplasty?

■ Analgesia after total knee arthroplasty has been a hot topic of research, as these patients often have more pain than total hip arthroplasty patients, and, more importantly, pain is one of the single biggest bars to discharge. The authors of this paper from **Baltimore, Maryland (USA)** have used a single-surgeon series of just 127 patients, with the aim of comparing lengths of stay and post-operative pain between patients who received an adductor canal only block

and those who received it in combination with periarticular analgesia.³ This was not a randomised series, however, 52 had been managed with the adductor canal block in isolation, and 75 in combination with periarticular analgesia. There were no obvious differences between the groups, either in terms of analgesic effect or length of stay. Many studies have previously compared different analgesia modalities separate from one another. Although demonstrated in isolation to be effective, the results of this small study would suggest that there was no difference between adductor canal blocks with and without the addition of periarticular injections. In this age of bundled payments, there is no need to add additional cost to the procedure, and adductor canal blocks alone may be sufficient.

Bone wax is effective in reducing blood loss after total knee arthroplasty

■ We were delighted to see this simple paper from **Simei (Singapore)** which crossed the editorial desks here at 360.⁴ The authors set out to establish if the use of bone wax reduced post-operative bleeding. Although a widely used intervention, there is surprisingly little evidence to support its use. These authors designed and conducted their own prospective randomised controlled study to answer the question. They included all consenting patients undergoing a primary unilateral total knee arthroplasty (TKA) over a four-month period, and randomised the patients to either bone wax (2.5 g applied to the uncovered bone around the prosthesis) or no bone wax (standard care). The bone wax was applied to all exposed bone prior to tourniquet release. Outcomes were assessed using haemoglobin balance. The drop in serum haemoglobin levels was significantly in favour of the bone wax group at 24 hours post-operatively (1.6 ± 0.9 vs 2.1 ± 1.1 g/dL) and at 72 hours post-TKA (2.7 ± 1.1 vs 3.6 ± 1.2 g/dL). This equated to a reduction in blood loss of around 200 ml in

the bone wax group, a surprising difference for a simple intervention that many feel to be ineffective. Perhaps less surprisingly, there were no adverse events associated with the use of bone wax at the three-month follow-up point. There is significant blood loss associated with TKA, even with the use of a tourniquet. While bone wax was effective for decreasing total blood loss and haemoglobin drop after TKA, and this has been shown quite effectively, this did not translate to significantly fewer blood transfusions. While this practice is interesting, it may not be as clinically meaningful as it may appear at first glance. On the flip side, we know that controlling bleeding into the knee has some significant advantages. It reduces the need for post-operative analgesia and increases early flexion with physiotherapy. Bone wax may have more of a role in accelerated discharge programmes than in reducing post-operative transfusions.

Degenerative knee arthritis and meniscal tears: a clinical practice guideline

■ In an age of somewhat difficult decision making surrounding arthroscopy for degenerative knee arthrosis, we were delighted to read this paper from **Ontario (Canada)** which represents a potential final nail in the coffin of arthroscopic treatment for degenerative meniscal disease.⁵ This is a massive paper with strong opinions and, given its publication in the *BMJ*, is unlikely to be ignored by healthcare funders. The authors essentially conclude that surgeons and managers are advised to look at their waiting list and cancel their knee arthroscopy operations! The gist of this paper, and the interpretation of the evidence as it stands, is that, based on the current evidence, there is no indication in degenerative tears for knee arthroscopy. The authors make a number of simple recommendations: - "A strong recommendation against the use of arthroscopy in nearly all patients with degenerative knee disease, based on linked systematic

reviews; further research is unlikely to alter this recommendation"

- "This recommendation applies to patients with or without imaging evidence of osteoarthritis, mechanical symptoms, or sudden symptom onset"
- "Healthcare administrators and funders may use the number of arthroscopies performed in patients with degenerative knee disease as an indicator of quality care".

Triamcinolone versus intra-articular saline in knee arthritis

■ Things are not looking good for the treatment of early degenerative knee disease. Investigators in **Boston, Massachusetts (USA)** have published the outcome of their timely randomised controlled trial investigating the potential efficacy of triamcinolone when compared with saline.⁶ Their randomised placebo-controlled trial enrolled 140 patients and aimed to establish the benefits or otherwise of triamcinolone over placebo (saline) in terms of pain progression and cartilage loss. The authors undertook a very aggressive protocol of three monthly injections of either intra-articular triamcinolone or saline, and patients were enrolled who presented with Kellgren-Lawrence grade 2 or 3 osteoarthritis of the knee. The primary outcome measure for this study was MRI findings with measurement of the visible cartilage volume. Symptoms were assessed using the Western Ontario and McMaster Universities Osteoarthritis index collected every three months. The study demonstrated that among the 140 participants, those with regular triamcinolone injections suffered from significantly greater loss of cartilage volume (-0.21 mm vs -0.10 mm). Although this difference was seen on imaging, there were no differences in the pain scale or adverse events between the groups. While we would wholeheartedly agree with the authors of this well designed study

that there was no benefit to be seen in steroid injections into the knee, we would be slightly more cautious in our interpretation of their findings. The MRI scanning sequences measured cartilage width, not cartilage quality. The authors have also chosen a rather aggressive treatment policy. Although there are surgeons in the world who would offer steroid injections every 12 weeks for two years, there are plenty who wouldn't, citing the potential for the side effects seen here. It is known that steroids do have an adverse effect on cartilage, and that they can crystallise when used too aggressively in the joint, leading to pain and inflammation. We would venture that this protocol is far too aggressive, and all that the authors have demonstrated is that when using an aggressive protocol there is no advantage over placebo. What they have not demonstrated is whether this is due to 'overdose', and thereby the risks (which are cumulative with exposure) have outweighed the benefits.

Open or arthroscopic treatment of acute septic arthritis of the native knee

■ Acute native septic arthritis of the knee is an acute orthopaedic presentation, and in most centres in the world the final common pathway for recalcitrant infection is surgical washout and debridement. Although there is some evidence that medical treatment with antibiotics and serial aspiration may be as good (or possibly even better) as primary surgical treatment,⁷ primary treatment in many centres revolves around either open arthrotomy or arthroscopic debridement. Where there is something of an evidence gap is whether lavage with an arthroscope or formal open debridement is the preferred treatment of choice. Surgeons in **Newcastle (Australia)**⁸ have shared their results of 166 knees treated in their institution with either arthroscopic debridement (n = 123) or open arthrotomy (n = 43) over a

five-year period. Although this was not a randomised study, and with two treatments in common use, one could make some inference about selection biases. The paper is based on the retrospective evaluation of these patients and, in particular, their clinical course, and laboratory and microbiology results, as well as radiographs and eventual outcomes, were compared in an attempt to establish whether patients with one treatment had superior outcomes over the other. There was a high rate of repeat intervention, with 71% of the arthrotomy group requiring a repeat washout compared with 50% in the arthroscopic treatment group. The authors undertook an adjustment for potential confounders. However, the arthroscopic procedure still fared better than the open procedure, with an odds ratio of 2.56 and a success rate (after up to three procedures) of 97% in the arthroscopic group, and just 83% in the open group. This, combined with a better mean post-operative range of motion, fewer operations and a shorter median length of stay, leaves a clear answer. This is good evidence that, for the on-call orthopaedic surgeon, a septic knee is best treated with a washout using an arthroscopic technique as most of the time they settle down. As with everything, however, there is the occasional caveat to make, and in this case it is the selection bias. It seems likely that those patients selected for open arthrotomy, when managed in a centre that offers both procedures, will have started with a more challenging condition to treat.

Are the causes of knee revision changing?

■ It is no secret that the revision burden for total knee arthroplasty (TKA) is rising. The combination of an ageing population, wider healthcare provision and increased expectations for an active retirement have led to what some commentators and researchers are predicting will be a 'perfect storm'

of exploding requirement for revision arthroplasty at a time when health care is looking increasingly unaffordable in many countries. The missing piece to the jigsaw in most analyses of the situation is what has been happening with the knee replacements themselves. We know contemporary implants are better than the older generation, and that in fact they are much more long-lived. What we don't know is what has been happening with the causes for revision. We were delighted to see this analysis from the Norwegian Arthroplasty Register from **Bergen (Norway)** which aims to assess the changing face of revision knee arthroplasty as the evolution of implant technology and surgical technique has occurred.⁹ The authors of this paper describe the outcomes of 60 623 total knees with 2426 revision procedures and 7648 unicompartmental knee arthroplasties (UKAs) with 725 revisions performed over a 20-year period. As these were all linked procedures, the authors were able to divide the analysis into two decades based on the date of primary surgery. Analysis of survival using Kaplan-Meier and, in addition, Cox proportional hazards modelling, was undertaken with appropriate adjustment for survival. The overall survival results for TKAs were encouraging, with ten-year survivals improving between the two decades from 91% to 94% overall survival, with a reduction in revision for mechanical failure or loosening (and revision for aseptic loosening, polyethylene wear/breakage, patellar dislocation, and unexplained pain all decreasing over the study period). However, somewhat worryingly, revision for infection increased over the time period of the study. UKAs didn't really show much change in overall revision-free survival (at around 80% in both time intervals) and, similarly, there were fewer revisions for mechanical failure, however, these were compensated for with an increase in revisions for progression

of arthritis between the two time intervals. It is clear that the pattern of survival for knee arthroplasty is changing in both UKAs and TKAs. It is heartening to see that the improvements in tribology and biomechanics are translating into longer survivals, but somewhat disappointing that this has been offset by other causes for revision.

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