

**X-ref** For other Roundups in this issue that cross-reference with Research see: *Trauma Roundup 2; Children's orthopaedics Roundup 4.*

## **Mechanically induced periprosthetic osteolysis: a systematic review X-ref**

■ Osteolysis around implants is a common cause of morbidity and subsequent revision surgery. Although traditionally we have considered biological and, to a lesser extent, chemical factors to cause this phenomenon, mechanical stimulation through fluid pressure at the bone-cement interface has the potential to be a significant cause. The evidence for this mechanism is growing; however, a synthesis of the literature has yet to be produced. The authors from **New York, New York (USA)** reviewed the evidence that supports the concept of mechanically induced osteolysis, and explored how the mechanism of mechanically induced osteolysis differs from that of particle-induced osteolysis.<sup>1</sup> PubMed, Web of Science, and expert opinion was used to identify 49 articles that support the hypothesis that mechanical stimulation of periprosthetic bone from fluid pressure and flow can induce osteolysis. Articles were reviewed and their conclusions were extracted. The authors state that mechanical stimulation of periprosthetic bone from fluid pressure and flow can cause osteolysis based on the experimental evidence from these studies. Furthermore, the mechanism appears to be distinct from particle-induced osteolysis, although these run in parallel. The study concludes by noting that elucidation of the exact mechanism warrants more research in order to reduce the surgical morbidity of compromised implants. Given the volume of evidence supporting an active biological process, it seems unlikely that the mechanical theory provides an 'alternative explanation', but there is enough evidence here to give pause for thought; perhaps loosening is a mixed effect.

## **Radiation exposure in paediatric scoliosis X-ref**

■ Surgeon safety is critical, and probably does not receive the attention it deserves from the wider community. Bringing our attention back to the topic, this group of authors hailing from **New York, New York (USA)** analyzed radiation exposure to both surgeons and patients during fluoroscopic-guided pedicle screw placement for paediatric scoliosis.<sup>2</sup> Traditionally, fluoroscopy

has had a good reputation for low total dosage and, due to the columnated nature of the technique, assuming there is little or no scatter, a low operator dosage. The authors of this study took on the thorny topic of radiation exposure in children and their surgeons during a posterior scoliosis correction procedure. Due to the soft-tissue mass of the abdomen and thorax, the dosage of the fluoroscopy machine can be higher than in other procedures. Combined with the length of the procedure and the numbers of pedicle screws that need placing, this adds to the potential for surprisingly high radiation exposure. In this prospective study, the authors report the radiation exposure in a large series of paediatric scoliosis procedures. In all cases, fluoroscopy was used to place screws throughout the procedure, and dosimeters were placed both inside and outside personal protective equipment. A total of 30 patients were included in the experiment, with a mean of 23 screws per patient being placed. It has been noted by previous epidemiological studies that orthopaedic surgeons have increased risk of cancer when compared with the general population. Results of this study are, however, reassuring. Measurements showed that, in general, radiation exposure to the surgeon and patient was low. The only area that received much higher doses compared with other body areas were surgeon's hands. As a result, the authors call for attention and use of radiation-reducing gloves in order to further protect ourselves.

## **Factors affecting time off work in patients with traumatic hand injuries X-ref**

■ To gain a greater understanding of the social and societal impact of hand injuries, members of the Lighthouse Project Hand Consortium in **Germany** have been investigating why patients return to work at different times following hand injuries.<sup>3</sup> This is an important question to consider. Hand injuries commonly lead to prolonged time from work due to immobilization, loss of function, and pain. As such, they impart significant societal costs in terms of lost working days and sickness benefits. The reasoning behind why patients with similar injuries and occupations may return to work at very different times is poorly understood. By using a prospective cohort of hand injury patients, the group sought to determine the factors associated with time off work. Over 18 months, 231

patients were included in the study, with the majority reported being working-age men. The majority had sustained soft-tissue defects, fractures, tendon injuries, or amputations. They were followed for a maximum of 200 days to assess their time off work. During this time, 77% returned to work at a mean of 83 days. Unsurprisingly, those patients with jobs that demanded a heavy strain on the hand required a prolonged period from work compared with those with lower work-related strain on the hands. The use of vibrating tools at work also predicted a prolonged time off work period. Those injuries that led to stiffness in the joints of the hand also apparently led to a prolonged time off work. The best predictors for time off work in this series were "hand strain at work", "mobility of joint functions", and "sensory function related to temperature and other stimuli". These three components of the International Classification of Functioning, Disability and Health (ICF) have potential for aiding our patients in returning to work sooner. Attempting to address some of the independent factors highlighted may, therefore, facilitate a more rapid return to work. Appropriate hand therapy and restoring normal sensibility are potential targets that we as surgeons should be considering. Where employers are able to change the nature of work to facilitate less strain on the hand, this may also help.

## **Alpha-defensin, leucocyte esterase, C-reactive protein, and leucocyte count in synovial fluid for preoperative diagnosis of prosthetic joint infection X-ref**

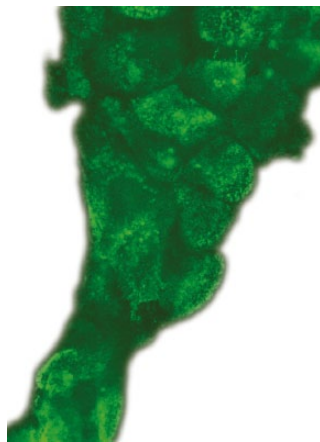
■ The diagnosis of prosthetic joint infection (PJI) is essential in differentiating aseptic from septic prosthetic failure, as their management both intraoperatively and postoperatively is significantly different. A number of biomarkers have been identified that can be measured in the synovial fluid and can help in making this diagnosis. They include leucocyte esterase, alpha-defensin, C-reactive protein (CRP), and white blood cell (WBC) count. This paper from **Milan (Italy)** reviews the synovial markers that are measured to help diagnose a late PJI in a cohort of patients.<sup>4</sup> The authors reviewed a total of 66 patients with suspected late PJI who had either a total knee arthroplasty (45 patients) or a total hip arthroplasty (21 patients). The diagnosis of a PJI was made retrospectively based on the definition reached by International Consensus Meeting of Philadelphia in 2014. Of the 66 patients, 32 were

diagnosed as infected and 34 were not. Synovial alpha-defensin had a sensitivity of 84.4% and a specificity of 94.1%. Synovial CRP levels were significantly higher in the infected group, with a sensitivity of 87.5% and specificity of 97%. Synovial leucocyte esterase test achieved a sensitivity of 93.8% and a specificity of 97.1% when the cut-off was 1+. If 2+ was considered the cut-off, the specificity increased to 100%. Alpha-defensin was not found to be as sensitive as in previous reports. This paper further highlighted the increasing importance of leucocyte esterase as a useful synovial marker in the diagnosis of PJI. It had the highest diagnostic accuracy when a 1+ cut-off was applied. However, as with all of these tests, it would be unwise to use it to diagnose PJI in isolation. Alpha-defensin did not fare too well in this paper, but leucocyte esterase, CRP, and WBC count used together may provide more useful information to guide clinicians with an interest in PJI in patients' management.

### Should cannabinoids be added to multimodal pain regimens after total hip and knee arthroplasty?

■ Cannabinoids are currently a topical subject in social, political, and medical circles. Despite some promising basic science work surrounding the cannabinoid receptors and their potential to modulate nociceptor function in the joints, there is next to no clinical data. Their use in orthopaedic surgery has, until now, been incompletely explored. We were delighted to see this paper from a group in **New York, New York (USA)** who have explored the use of dronabinol in patients with total joint arthroplasty in treating pain and nausea, and in reducing length of stay following elective total joint arthroplasties.<sup>5</sup> In a society with one of the largest opioid addiction problems in the world, the potential to use cannabinoid derivatives to manage postoperative pain is an attractive one. In this prospective case series, the authors report 81 consecutive patients who underwent lower limb joint arthroplasty. Patients were given dronabinol twice each day for postoperative pain and compared with a cohort of 162 similar patients treated with standard analgesic regimens. Outcomes were assessed using clinical records, physiotherapy performance, discharge destination, and visual analogue scale (VAS). No significant differences were found in the demographics between each group, VAS, nausea or vomiting, physiotherapy performance, or discharge destination. Length of stay was, however, significantly shorter in the dronabinol group by almost a day. It may be worth noting that no side effects of dronabinol were encountered. The findings of this

study suggest that dronabinol might well be useful in managing the postoperative course in total joint arthroplasty. Further investigation into the use of cannabinoids would be useful in developing these treatments. All that can be said with the current study is that there are no apparent differences in a comparative cohort study. This paper is important, however, in that it provides some of the only data suggesting clinical efficacy. We are sure we will be seeing more evaluations of this treatment over the coming months and years.



### Stepcounters and rehab X-ref

■ Wearable technology provides an opportunity for patients to engage in their rehabilitation. In order to see how wearable devices influence activity following surgery, a group from **Sydney (Australia)** fitted devices to patients undergoing total knee or hip arthroplasty.<sup>6</sup> The authors enrolled 168 patients who were quasi-randomized into two groups and received an activity tracker with or without the data screen obscured. Postoperatively, patients were divided into a feedback group (who could see the data on their device) or a no-feedback group (who could not see their data). The feedback group were assigned a daily step goal. After two weeks, both groups were allowed to see their step count, but the no-feedback group continued to not receive goals. Patients who could see their step count showed up to a 43% higher step count than those who could not. Furthermore, this group were 1.7 times more likely to hit 7000 steps per day than the other six weeks postoperatively. Patient step count was higher in both groups at six months, and no difference in the patient-reported outcomes was found. The authors conclude that commercial step activity trackers with a daily step goal showed significantly more activity than those without following total joint arthroplasty. Given the pervasive nature of activity trackers, this may be a useful route to increasing postoperative recovery and

engagement with rehabilitation. While we would not expect the eventual outcome to be affected in terms of patient-reported outcome measures, the opportunity to incentivize rehabilitation with a relatively simple intervention is an attractive one.

### Perioperative tranexamic acid: a population-based cohort study from national Danish databases X-ref

■ Over the last five years, much has been written about the use of tranexamic acid in large joint arthroplasty. Some of this work has revolved around the potential for tranexamic acid to increase the risk of perioperative cardiovascular events. This study from **Odense (Denmark)** sought to define, at a population level, whether the perioperative use of tranexamic acid was associated with death or cardiovascular events within 30 days of total hip arthroplasty.<sup>7</sup> The authors of this study included 45 290 patients who underwent total hip arthroplasty, 38 586 of whom received tranexamic acid as part of their care. Venous thrombosis was the primary outcome, with secondary outcomes being deep vein thrombosis (DVT), pulmonary embolism, myocardial infarction, stroke, and all-cause mortality. Multivariable modelling and propensity score analysis was used to analyze the data. Tranexamic acid was not found to significantly increase the risk of venous thromboembolism or any of the secondary outcomes in the propensity score analysis or the multivariable model. As a result, the authors are confident in concluding that tranexamic acid is safe to use when modifying bleeding risk in arthroplasty.

### 'Having the other joint done'

■ Patients often ask about the likelihood of requiring surgery for their contralateral joint after undergoing unilateral total joint arthroplasty. There is very little known about how to answer this simple question. This study from **St. Louis, Missouri (USA)** of over 85 000 patients who underwent a primary arthroplasty demonstrated that arthroplasty in the contralateral joint is high (23.6%) for the hip, knee, and shoulder.<sup>8</sup> However, only 3.7% underwent a joint arthroplasty in a different joint five to eight years after the index surgery. This information is valuable for counselling patients appropriately, and for allowing them to understand potential future surgeries after performing their index procedure.

### Leptin, the intervertebral disc and lower back X-ref

■ Obesity is associated with lower back pain, and the relationship between the two is complex. Increased body weight puts a greater strain on

joints and makes physical activity harder, which is associated with muscular deconditioning and can be a mechanical cause of back pain. Leptins are cytokines produced by adipose tissue that play a role in inflammatory and degradative processes, and hence a study from **Oxford (UK)** has investigated the role of leptin on the intervertebral disc.<sup>9</sup> Their study used a bovine intervertebral disc, which was cultured with leptin, alone and with proinflammatory cytokines such as tumour necrosis factor (TNF)- $\alpha$ , interleukin (IL)-1 $\beta$ , or IL-6. The outcome response was by measuring markers of cellular metabolism such as nitric oxide, lactate, glycosaminoglycans, and expression of anabolic and catabolic genes. The study authors found that leptin induced greater production of proteases and nitric oxide. This effect was magnified in an inflammatory environment with increased production of pro-inflammatory cytokines. The study demonstrates that leptin, which is associated with obesity, can lead in this bovine direct application model to

intervertebral disc degeneration. The effect is even greater in a pre-existing inflammatory or degenerative environment. We would inject a slight note of caution, as the study is *ex vivo* and does not involve a normal physical or physiological environment. That said, the results in themselves are interesting.

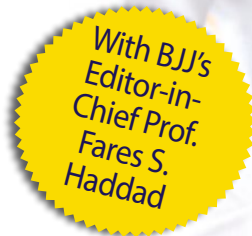
#### REFERENCES

1. **McArthur BA, Scully R, Ross FP, Bostrom MPG, Falghren A.** Mechanically induced periprosthetic osteolysis: a systematic review. *HSS J* 2018. (Epub ahead of print).
2. **Yoshihara H, Paulino CB.** Radiation exposure to the surgeons and patients in fluoroscopic-guided segmental pedicle screw placement for pediatric scoliosis. *Spine (Phila Pa 1976)* 2018;43:E1398-E1402.
3. **Eisele A, Dereskewitz C, Kus S, et al.** Factors affecting time off work in patients with traumatic hand injuries—a bio-psycho-social perspective. *Injury* 2018;49:1822-1829.
4. **De Vecchi E, Romanò CL, De Grandi R, et al.** Alpha defensin, leukocyte esterase, C-reactive protein, and leukocyte count in synovial fluid for pre-operative diagnosis of periprosthetic infection. *Int J Immunopathol Pharmacol* 2018. (Epub ahead of print) PMID: 30376742.
5. **Hickernell TR, Lakra A, Berg A, et al.** Should cannabinoids be added to multimodal pain regimens after total hip and knee arthroplasty? *J Arthroplasty* 2018;33:3637-3641.
6. **Van der Walt N, Salmon LJ, Gooden B, et al.** Feedback from activity trackers improves daily step count after knee and hip arthroplasty: a randomized controlled trial. *J Arthroplasty* 2018;33:3422-3428.
7. **Dastrup A, Pottgård A, Hallas J, Overgaard S.** Perioperative tranexamic acid treatment and risk of cardiovascular events or death after total hip arthroplasty: a population-based cohort study from national Danish databases. *J Bone Joint Surg [Am]* 2018;100-A:1742-1749.
8. **Lamplot JD, Bansal A, Nguyen JT, Brophy RH.** Risk of subsequent joint arthroplasty in contralateral or different joint after index shoulder, hip, or knee arthroplasty: association with index joint, demographics, and patient-specific factors. *J Bone Joint Surg [Am]* 2018;100-A:1750-1756.
9. **Segar AH, Fairbank JCT, Urban J.** Leptin and the intervertebral disc: a biochemical link exists between obesity, intervertebral disc degeneration and low back pain—an in vitro study in a bovine model. *Eur Spine J* 2018. (Epub ahead of print) PMID: 30324498.


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