

symptoms, progressive degenerative changes, general surgical comorbidities, and death from fat embolism.

REFERENCES

1. Nakamae T, Fujimoto Y, Yamada K, et al. Transforaminal percutaneous endoscopic discectomy for lumbar disc herniation in athletes under the local anesthesia. *J Orthop Sci.* 2019;24(6):1015-1019.
2. Nori S, Aoyama R, Ninomiya K, Suzuki S, Anazawa U, Shiraishi T. K-line (-) in the neck-flexed position affects surgical outcomes in patients with ossification of the posterior longitudinal ligament after muscle-preserving selective laminectomy. *J Orthop Sci.* 2019;S0949-2658(19)30322-7;Epub ahead of print.
3. Haffner M, Saiz AM Jr, Nathe R, et al. Preoperative multimodal analgesia decreases 24-hour postoperative narcotic consumption in elective spinal fusion patients. *Spine J.* 2019;19(11):1753-1763.
4. Jang HD, Lee JC, Choi SW, Shin BJ. Risk factors for postsurgical foot complaints one year following degenerative lumbar spinal surgery. *Spine (Phila Pa 1976).* 2019;Epub ahead of print.
5. Helenius IJ, Bauer JM, Verhofste B, et al. Os Odontoideum in children: treatment outcomes and neurological risk factors. *J Bone Joint Surg Am.* 2019;101(19):1750-1760.
6. Yelamrthy PKK, Chhabra HS, Vaccaro A, et al. Management and prognosis of acute traumatic cervical central cord syndrome: systematic review and Spinal Cord Society-Spine Trauma Study Group position statement. *Eur Spine J.* 2019;28(10):2390-2407.
7. Bernstein DN, Prong M, Kuruca E, et al. National trends and complications in the surgical management of ossification of the posterior longitudinal ligament (OPLL). *Spine (Phila Pa 1976).* 2019;44(22):1550-1557.
8. Okada E, Daimon K, Fujiwara H, et al. Ten-year longitudinal follow-up MRI study of age-related changes in thoracic intervertebral discs in asymptomatic patients. *Spine (Phila Pa 1976).* 2019;44(22):E1317-E1324.
9. Rudy HL, Yang D, Nam AD, Cho W. Review of sickle cell disease and spinal pathology. *Global Spine J.* 2019;9(7):761-766.
10. Ver MLP, Dimar JR II, Carreon LY. Traumatic lumbar spondylolisthesis: a systematic review and case series. *Global Spine J.* 2019;9(7):767-782.

Trauma

X-ref For other Roundups in this issue that cross-reference with Trauma see: **Hip & Pelvis Roundup 3; Wrist & Hand Roundup 4; Shoulder & Elbow Roundups 3, 4 & 5; Spine Roundup 6.**

Pubic ramus fractures are bad news in the over 70s

Frailty injuries that perhaps have never shared the limelight are coming to the attention of clinicians, healthcare funders, and providers. As always, the research community directs its focus to where the interest lies and you can be sure to see more papers concerning frailty-related fractures including hip, pelvic, humeral, and rib. Although there is a fair bit of research surrounding hip fractures, there is little in the general literature to support management decisions in other frailty fractures. We were delighted to see this paper from [Jyväskylä \(Finland\)](#), which brings into focus the often neglected pubic ramus fractures in older patients.¹ The authors designed a retrospective cohort study with the aim of establishing what the outcome of pubic ramus and other non-operatively managed frailty fractures of the pelvis was. The study was undertaken in the emergency department setting and patients presenting over a six-year window were matched to two control groups, one with neck of femur fractures, and one without injury. The authors were able to recruit 219 patients. The point estimate of mortality in the non-operative pelvis and acetabular fracture group was 7.3% at 30 days and 11.4% at 90 days, respectively.

When the authors made a comparison with their 'normal' age-matched controls, there was an 8.5-increased rate of mortality (95% confidence interval (CI), 5.2 to 13.9) in females and 11-fold (95% CI, 5.4 to 22.3) in males. There was no observable difference when compared to their matched population of femoral neck fractures. In terms of healthcare burden, at the 30 days, 28 (12.8%) pelvic fracture patients were readmitted for in-patient care in hospital. This paper nicely highlights the high morbidity and mortality burden in this group of patients. While there has been much focus on the potential to improve outcomes in hip fracture patients, some attention should surely be paid to similar populations of fragility fracture patients.

Does the C-clamp still have a role in unstable pelvic fractures?

Resuscitation of the acutely bleeding pelvic fracture is still a moot point, with different practices between surgeons within the same institutions without looking at the major institutional, regional, and national differences in care. While the resuscitation side of things has been standardizing over the years, the standardization on the intervention side of treatment for pelvic fractures is still very much in its infancy. In general terms, the options for unstable bleeding patient are interventional radiology, pelvic packing, and mechanical stabilization either with external fixation, open reduction internal fixation (ORIF), or simple binder. The pelvic C-clamp (CC) is a

specific external fixation device that overcomes some of the difficulties associated with the acutely haemorrhaging pelvis when managing with external fixation. It is generally accepted that one major disadvantage of a pelvic external fixator (EF) is the lack of control at the back of the pelvis. Closure of the front tends to displace the SI joints. This is overcome with the CC, which is applied to the ilium at the level of the SI joints and functions to close the pelvis. There is little evidence, however, to support the use of the CC and it is definitely worth drawing the attention of 360 readers to this analysis from the German registry ([Germany](#)) which sets out to evaluate the effectiveness and complications associated with primary CC use in unstable pelvic fractures.² The authors based their analysis on all patients within the German Pelvic Trauma Registry and set out to study general complications, infections, and mortality after treatment of an unstable pelvic fracture primarily using either the CC or EF. Overall, the authors utilized the data for 5,499 patients treated for B or C type fractures (957 with external fixation vs 4,542 without) from the registry. As would be expected, patients treated by CC or EF for their pelvic fracture were younger, had more C-type fractures, higher ilio-sacral screw (ISS) fixation and displacement, and more complex fractures. Of course, the features that were more likely to warrant the use of external fixation were also those resulting in higher complication rates and were independent risk factors for complications. That said, when undertaking more complex analysis, the authors were

able to establish that mortality was reduced after CC/EF stabilization by 32% (95% CI, 0.49 to 0.95), the authors did establish that the risk for general complications was increased (odds ratio (OR) 1.25, 95% CI 1.02 to 1.53). For those patients who then underwent definitive secondary surgery, however, the use of the CC resulted in a dramatic increased risk in infection rate (OR 4.67, 95% CI 1.06 to 20.64), increasing from 3.2% to 20.8% in ISS fixation. However, there were no other clear morbidity burdens. It would seem that although falling somewhat out of vogue, there is a role for external fixation in general given the dramatically improved mortality. If possible, however, clearly the CC should be avoided.

Total hip arthroplasty or hemiarthroplasty for hip fracture **X-ref**

The HEALTH study is a hugely important study from [London, Ontario \(Canada\)](#), which aims to answer once and for all the question of what should be done following an intracapsular neck of femur fracture in the average patient – total hip replacement or hemiarthroplasty?³ The authors designed a well-conducted randomized controlled trial powered to establish the need for a second hip procedure within 24 months of surgery. The authors recruited 1,495 patients who were 50 years of age or older and had a displaced femoral neck fracture to undergo either total hip arthroplasty or hemiarthroplasty. The study was undertaken in 80 centres in ten countries and, as such, is generalizable to a wide range of healthcare settings. In addition to the primary outcome of any secondary hip procedure required, the authors also collected data surrounding the complications, death, and health-related quality of life and functional endpoints. In the total hip arthroplasty group, 57 out of 718 patients (7.9%) required further surgery for hip-related problems. This contrasted with 60 out of 723 patients (8.3%) who were randomly assigned to hemiarthroplasty (HR 0.95; 95% confidence interval 0.64 to 1.40), with no relevant differences in event rates between the two groups. In terms of secondary outcome measures, the authors used the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) score to assess function including the various subscales. Function, as measured with the total score, pain score, stiffness score, and function score, and

favoured total hip arthroplasty over hemiarthroplasty. However, the improvements in score were, on average, clinically unimportant. There were no differences in mortality rates, and serious adverse events as defined by this study were surprisingly common and reported at just over a third of patients in each group.

Improved accuracy with the TightRope for syndesmosis reduction **X-ref**

There are two sides to the argument as to the benefits or otherwise of the TightRope device. There are a number of advocates of the flexible fixation, but there are also rare complications described associated with the FibreWire suture, which has the potential to cause granuloma formation in the foot and ankle. While there has been a moderate amount of published literature on the area over the past few years, we were pleased here at 360 to read the report of the recent Canadian orthopaedic association trial from [London, Ontario \(Canada\)](#).^{4,5} This prospective parallel group randomized crossover trial reported the outcomes of 103 patients treated with AO 44-C ankle fractures, all of whom demonstrated syndesmosis diastasis or instability after malleolar bony fixation. Patients were enrolled prior to surgery and syndesmosis fixation was randomized to either TightRope (one knotless TightRope) or screw fixation (two 3.5 mm cortical positional screws placed across three cortices). The authors report that surgical techniques and rehabilitation were standardized and follow-up was performed at two and six weeks, then at three, six, and 12 months.⁶ For the purposes of the study, syndesmosis reduction accuracy was assessed by CT scan performed at three months. Secondary outcome measures reported in this study included adverse events, reoperation, and functional outcome measures (EQ-5D, the Olerud-Molander Ankle Score, the Foot and Ankle Disability Index, and the Work Productivity Activity Impairment Questionnaire). Syndesmosis reduction accuracy was significantly better in the TightRope group. The rate of malreduction using screw fixation was 39% compared to 15% using TightRope fixation. Functional outcome measures demonstrated significant improvements over time, but there were no differences between the two fixation groups. The reoperation rate was higher in the screw group (30%) compared to the TightRope group (4%) with the difference

due to the rate of implant removal. There are no associated health economic analyses with this paper, but it does represent the highest quality evidence that has currently been produced comparing flexible syndesmosis fixation with the simple two screw construct. Given the reported advantage here, what should naturally follow is a health economic analysis to establish what if any is the health economic benefits of the more accurate reduction and lower removal rates.

Three-column classification for acetabular fractures

The Judet-Letournel fracture classification has been the most popular and widely used classification system for acetabular fractures. Limitations of this classification within contemporary practice are that it was developed based solely on plain radiographs of just 173 cases. With modern axial imaging and a greater understanding of acetabular fractures than before, it is apparent that certain fracture variants do not neatly fall within any of the ten fracture types, and the complexity of the classification system has limited its reproducibility, especially among less experienced surgeons. These authors from [Shijiazhuang \(China\)](#) developed a novel three-column classification system for acetabular fractures and evaluated its reliability and reproducibility in 1,028 cases.⁷ In their classification system, the branch of the ilium was defined as the roof, the branch of the pubis was defined as the anterior column, and the branch of the ischium was defined as the posterior column. They found that while 20.3% of cases (n = 209) could not be accurately classified by the Judet-Letournel classification, only 0.3 % of cases (n = 3) could not be classified using their three-column classification system. The interobserver reliability for the Judet-Letournel classification showed only moderate agreement (mean K value 0.591; 0.508 to 0.681), while there was substantial agreement using the three-column classification system (mean K value 0.735; 0.594 to 0.930). Intra-observer reliability was also greater for the three-column classification system (mean K value 0.909 versus 0.751). This novel classification system may be used as a supplement to the traditional Judet-Letournel classification system. However, the reason the Letournel system has stood the test of time, despite its limitations, is the value it has in assisting with acetabular

fracture diagnosis and directing the choice of surgical approach and fixation.

A few years down the road – did DRAFFT make any difference? [X-ref](#)

The DRAFFT trial was published back in 2014 in the *British Medical Journal* and is still causing a stir. It is a large parallel group randomized controlled trial which looks at the outcomes of patients presenting with closed reducible distal radius fractures in the metaphyseal block of the distal radius. The outcome is well known to most – it turns out (intuitively) – that if the fracture can be reduced closed, it makes little difference to the clinical outcomes if it is held reduced with either Kirschner-wires (K-wires) or a volar plate. The authors went on to provide a further analysis of the health economics (which were essentially driven by the cost difference between the plates and K-wires), along with a further analysis of routine healthcare billing data demonstrating that during the period of the trial the UK appears to have switched from plates towards K-wire fixation, a change that was found to be sustained in 2016 when the authors published their analysis. The current study from [Galway \(Republic of Ireland\)](#) asks the question, “Did the DRAFFT study change clinical practice in the Republic of Ireland?”⁸⁻⁹ The Irish orthopaedic community has strong links to the UK orthopaedic community and one might expect any change in practice as the result of this trial to be reflected in Ireland, as well as the rest of the British Isles. In this simple study, the authors extracted surgical information from across Ireland and grouped their analyses into annual intervals from 2008 to 2017. The study spanned a period from before the arrival of DRAFFT to well after final publication. Somewhat surprisingly, the authors established that while there was a trend in usage patterns, it is not exactly what one might expect. At the beginning of the series in 2008, K-wire fixation accounted for just short of 60% of operative procedures for fractures of the distal radius, with around 1:5 receiving plate fixation. By the end of the study period in 2017, the rate of K-wire fixation had fallen to 30%, and the proportion of patients who underwent plate fixation had risen to 62%. Clearly in Ireland at least, the trends in patterns of operative intervention are not entirely driven by the evidence in the literature.

CRASH-3: the one with the head injuries

The CRASH trials have evaluated the value of tranexamic acid as a clot stabilizer in patients with suspected post-traumatic bleeding. The CRASH-2 study changed practice globally and made the administration of tranexamic acid to patients with haemodynamic instability the standard of care the majority of developed trauma systems. The CRASH-3 study set the ambitious task of establishing if tranexamic acid had an effect on head injury-related death.¹⁰ The authors conducted a large multinational (29 countries) and multicentre (175 hospitals) study which, was a parallel group randomized trial comparing TXA administration to standard of care plus placebo. The study was powered to detect in hospital-related death and in the initial published protocol patients were accepted to the study if TXA could be administered within eight hours of injury. The trial protocol was adjusted in 2016 to limit administration to the first three hours of treatment based on accumulating evidence later TXA administration may be ineffective. The study team recruited 12,737 patients to receive tranexamic acid (n = 6,406), or placebo (n = 6,331). Of these, 9,202 (72.2%) received their intervention within three hours of injury. The authors prespecified a number of analyses including a sensitivity analysis to exclude the more severe head injuries (GCS = 3, or bilateral unreactive pupils at baseline). Overall, the head injury related death rate at 28 days was not significantly different between groups (18.5% TXA vs 19.8; risk ratio 0.94 (95% confidence interval (CI), 0.86 to 1.02)). In the prespecified subgroup, the authors established that with less catastrophic head injury the risk of head injury-related death was 12.5% in the tranexamic acid group versus 14.0% in the placebo group (485 versus 525 events; RR 0.89 (95% CI, 0.80 to 1.00)). This group is much smaller (for this analysis around 3,800 in each arm), and are in themselves uneven reflective of a lack of stratification, which is reflected in the decision to stratify severe head injury as GSC of 3 to 8, but undertake a specific analysis excluding those with a GCS of 3. The authors go on to undertake a useful meta-analysis of theirs and other trials, which does bring the estimate of survival benefit to favour TXA without a confidence interval overlapping 0 (RR 0.89 95% CI, 0.80 to 0.99).



Does timing matter in grade III open fractures?

The orthoplastics service in [Bristol \(UK\)](#) is renowned for its joined up approach and hands-on orthopaedic and plastic surgeons. A number of new approaches – some controversial, and some less so – have emerged from Southmead Hospital over the past few years.¹¹ It is always heartening to hear those espousing a perspective to then go ahead and read their results. The Bristol system revolves around strategically-placed combined orthoplastics lists with an initial debridement for grade III open fractures happening when the patient is admitted – and then the service offers combined orthopaedic and plastic surgical lists at regular points during the week. Whilst this approach ensures that each patient receives the most experienced surgical input providing the best possible care, it does mean the patients potentially suffer a delay to theatre. Here they present the results of their approach and specifically comment on their complication rates with particular attention to time to surgery. This retrospective study looks at the outcomes of their open tibial fractures treated over a two-year period, where the authors initially identified 148 patients with open fractures. Of these, just 45 were suitable for final analysis. On average, patients had an initial debridement at 19 hours following injury, and definitive reconstruction occurred at 65 hours. The authors comment that they use temporary internal fixation with plates, which is an unusual but recognized treatment. Overall, the success of their treatment regime is 89% at a mean follow-up of two years. The authors did not prospectively contact their patients to ensure they had had no further surgery or treatment for infection. Of

the 45 patients who were eligible for final analysis, the authors undertook multivariable analysis in this cohort, which they report did not yield time to secondary coverage as a significant predictor of problems. However, this analysis is almost certainly weak as with just five events in 45 patients and a range of times to coverage, the chances of identifying anything on a multivariable analysis are slim. There is also the over interpretation problem here – the authors include 11 covariables. These are, of course, all reasonable but while undertaking multiple logistic regression analysis, a good rule of thumb for sample size is ten participants per variable and, as such, 120 patients would be a minimum sample size for this analysis. The patients presented are tibial shaft fractures, although there does appear to be a surprising distribution of fracture patterns with nearly 50% of the patients reported here, representing the lowest energy 4.3A type. However, overall there is a useful message here – based on the limited data available, the approach proposed yields a treatment success rate of 89% in grade IIIB open fractures which is heartening, however does also underline the

severity of the injury. The authors should be commended for gathering together a representative series from their practice and reporting a relatively difficult to follow up group of patients.

REFERENCES

1. **Reito A, Kuoppala M, Pajulammi H, Hokkinen L, Kyrölä K, Paloneva J.** Mortality and comorbidity after non-operatively managed, low-energy pelvic fracture in patients over age 70: a comparison with an age-matched femoral neck fracture cohort and general population. *BMC Geriatr.* 2019;19(1):315.
2. **Schmal H, Larsen MS, Stuby F, Strohm PC, Reising K, Goodwin Burri K.** Effectiveness and complications of primary C-clamp stabilization or external fixation for unstable pelvic fractures. *Injury.* 2019;50(11):1959–1965.
3. **Bhandari M, Einhorn TA, Guyatt G, et al; HEALTH Investigators.** Total hip arthroplasty or hemiarthroplasty for hip fracture. *N Engl J Med.* 2019;381(23):2199–2208.
4. **Ollivere BJ, Bosman HA, Bearcroft PW, Robinson AH.** Foreign body granulomatous reaction associated with polyethylene 'Fiberwire' suture material used in Achilles tendon repair. *Foot Ankle Surg.* 2014;20(2):e27–e29.
5. **Willmott HJ, Singh B, David LA.** Outcome and complications of treatment of ankle diastasis with tightrope fixation. *Injury.* 2009;40(11):1204–1206.
6. **Sanders D, Schneider P, Taylor M, Tieszer C, Lawendy AR; Canadian Orthopaedic Trauma Society.** Improved reduction of the tibiofibular syndesmosis with TightRope compared with screw fixation: results of a randomized controlled study. *J Orthop Trauma.* 2019;33(11):531–537.
7. **Zhang R, Yin Y, Li A, et al.** Three-column classification for acetabular fractures: introduction and reproducibility assessment. *J Bone Joint Surg Am.* 2019;101(22):2015–2025.
8. **Costa ML, Jameson SS, Reed MR.** Do large pragmatic randomized trials change clinical practice?: assessing the impact of the Distal Radius Acute Fracture Fixation Trial (DRAFFT). *Bone Joint J.* 2016;98-B(3):410–413.
9. **McColgan R, Dalton DM, Cassar-Gheiti AJ, Fox CM, O'Sullivan ME.** Trends in the management of fractures of the distal radius in Ireland: did the Distal Radius Acute Fracture Fixation Trial (DRAFFT) change practice? *Bone Joint J.* 2019;101-B(12):1550–1556.
10. **CRASH-3 trial collaborators.** Effects of tranexamic acid on death, disability, vascular occlusive events and other morbidities in patients with acute traumatic brain injury (CRASH-3): a randomized, placebo-controlled trial. *Lancet.* 2019;394(10210):1713–1723.
11. **Al-Hourani K, Fowler T, Whitehouse MR, Khan U, Kelly M.** Two-stage combined orthoplastic management of type IIIB open diaphyseal tibial fractures requiring flap coverage: is the timing of debridement and coverage associated with outcomes? *J Orthop Trauma.* 2019;33(12):591–597.

Oncology

Non-metastatic radiation-induced sarcoma of bone

As the use of ionising medical imaging increases in medicine, we will inevitably see the consequences of radiation exposure emerging especially in those patients undergoing radiation treatment for cancer. Sadly, in some cases these take the form of further malignancy as patients survive for longer into adulthood. In this study from **Birmingham (UK)**, the authors have reported their own single-centre series of 25 patients with non-metastatic radiation-induced bone sarcoma who underwent definitive surgical treatment in order to assess the survival and prognostic factors influencing the outcome of this unique condition.¹ The 25 patients were treated depending on presentation with limb salvage surgery; amputation in 15 patients, and

histological diagnosis of either osteosarcoma or undifferentiated pleomorphic sarcoma in ten patients. Within this group, the reported five-year survival was 53%, and patients with wide or radical surgical margins showed better survival than those without. Local occurrence was more common in those patients undergoing limb salvage, though overall survival and event free survival at five years was the same in each treatment group. The authors of this study conclude that limb salvage, with wide or radical margins, are to be recommended in this select group, though with the necessary caveat of open discussion with a patient explaining the slightly higher risk of local recurrence. We will probably see more radiation induced sarcomas of bone as patients survive longer after treatment of other cancers. This paper shows that surgery is essential to optimize survival.

Local control and survival of localized pelvic Ewing's sarcoma? A retrospective analysis of data from the Euro-EWING99 trial **X-ref**

Ewing's sarcoma continues to challenge surgeons and oncologists alike as we seek the right combination of therapies to combat this difficult to treat tumour. In this paper from the **Euro-EWING99 Consortium (Germany)**, the authors have used the wide ranging data from the Euro-EWING99 trial to evaluate survival and recurrence in patients treated surgically for sacral and pelvic Ewing's sarcoma, and have gone on to assess the effect of local treatment in sacral lesions and the factors influencing survival in patients with bone tumours receiving surgical treatment.² This large cohort has in total 1,411 patients, of whom 180 presented with pelvic