ROUNDUP360

Trauma

Just a sprain?

Children, we are all taught at medical school, are not just little adults. There cannot be a truer sentiment when faced with a five-year-old and a difficult diagnosis to reach. Researchers in **Stuttgart (Germany)** have done for ankle fractures what their colleagues have done with the knee (see next article roundup) by asking the question: would the use of MRI in paediatric ankle sprains lead to more timely and accurate diagnosis? Having exhausted the published literature and still without an answer, the clinical team set out to find out. They designed a prospective cohort study to establish the diagnostic value of MRI in children with a soft-tissue ankle injury. They recruited 30 serial patients with acute ankle injuries and in addition to the standard of care (clinical history, conventional imaging and examination) all patients underwent an MRI scan of their ankles. Of the 30 patients, ten had soft-tissue swelling alone, 12 had swelling and difficulties walking, while eight were unable to bear weight. Patients were followed up with clinical examination to a mean of eight months (when they underwent an interval MRI) and the study team identified the utility of MRI compared with clinical examination. The researchers identified that 22 (77%) patients had sustained a ligament injury and that three had sustained a physeal fracture. In patients who were able to bear weight, there were no additional ligament injuries revealed by MRI, however, in those with difficulties weight-bearing and those unable to bear weight MRI revealed high rates of bone bruising and ligament injury that did not correlate to the clinical findings. The authors found that those patients who had no additional ligament injuries identified by MRI did not have poorer eventual clinical results. No patients underwent surgery in light of their MRI results and the eventual clinical outcome correlated most closely with clinical examination. The authors argue that given that the only diagnosis seen on MRI which provided additional clinical information was bone bruising, which was of little prognostic value, then MRI is not indicated for this group of patients.[1] We found this to be a fascinating paper, here at *360*. While the world is moving more and more towards higher rates of diagnostic investigations, these very sensible authors conclude that MRI offers no additional treatment or prognostic information and therefore should not become a standard of care. Here at *360* we raise a glass to those plucky Germans swimming against the current tide of over-investigation.

Paediatric knee haemarthroses

We have often, here at *360*, enjoyed the occasional diagnostic conundrum. However, none are quite as elusive as the acute knee haemarthrosis. Difficult examination, combined with a tense haemarthrosis, particularly in the young child, can make the conundrum more of a Gordian Knot. A clinical investigation team in **Cincinnati (USA)** aimed to shed some light on the probable causes of the almost daily fracture clinic mystery. They hypothesised that the use of MRI would allow accurate diagnosis in these cases and report a diagnostic cohort series (Level III evidence). The study included a prospective contiguous series of adolescent patients presenting with an acute traumatic haemathrosis over a two-year period. A total of 131 patients with acute knee haemarthrosis were evaluated following their initial presentation with MRI and the eventual diagnosis was reached using a combination of MRI, case records and available surgical records. The authors divided their cohorts into two subgroups; young (ten to 14 years old, n = 59) and older (15 to 18 years old, n = 72). All patients had open physes, a history of trauma and an acute effusion confirmed on MRI. The investigators identified strikingly different injury patterns in both groups. Overall, between 75% and 80% of patients had identifiable pathology on MRI. In the younger age group patellar dislocations (36%) dominated with a small number of ACL tears (22%) and meniscal injuries (13%), while in the older age group there was a preponderance of ACL injuries (40%) with a lesser incidence of patellar dislocations (28%) and isolated meniscal tears (13%). The authors report that just over 40% of patients required surgery for their injuries. There was a tendency towards ACL injuries in patients with closed growth plates and patellar dislocations.[2] Perhaps the most interesting finding here is not really emphasised by the authors. They have identified that upwards of 75% of adolescent and teenage patients can be given a definitive diagnosis following MRI. This has certainly caused us a little pause for thought. Standard practice in many units throughout the world for children with haemarthrosis is an interval clinical examination followed by a scan if necessary. In light of this particular finding we will be changing our practice, and obtaining an MRI scan in all patients with primary haemarthrosis almost as soon as they wander through the door.

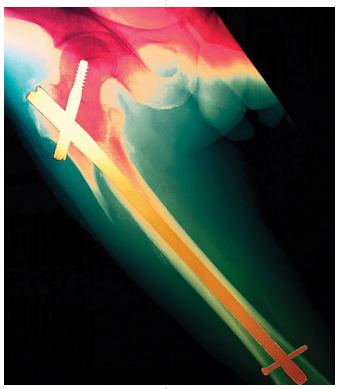
Evidence to support a belief

The majority of trauma surgeons believe that minimising surgical delay in the management of patients with a neck of femur fracture (NOF) is of vital importance. Indeed, in some healthcare systems this belief is so strongly entrenched that payment to the hospital for these patients in part depends on the time they take to get their operations. However, the evidence has always been a little sketchy to support this practice. Probably due to the confounders of the 'unfit' waiting longer for optimisation, there has not been a large study to demonstrate the benefit of early surgery. Researchers from **Copenhagen (Denmark)** have set out to answer the simple question: does surgical delay influence outcome in NOF? They used the Danish National Indicator Project and designed a retrospective study to examine the

effect on mortality that surgical delay, weekend, holiday or night time admission, and ASA grade, might have on the outcomes of NOF. They used a multiple regression model to estimate the odds ratios for 38 020 patients admitted over a seven-year period and established that the risk of in-hospital death increased with surgical delay (OR = 1.3 per 24h) and ASA score (OR = 2.3 per point). Increasing mortality was seen with male gender (OR = 2.2) and older patients (OR = 1.4 per five years). They did not find that patients admitted out of hours had an increased mortality generally, simply that the additional delay associated with admission at these times may result in increased mortality.[3] Here at *360* we were delighted to read a study that confirms what we and many surgeons believe but what several reviews through two decades were unable to prove: minimising surgical delay is of vital importance in these elderly patients with numerous risk factors. The difference between a surgery delay of between 24 and 48 hours could be fatal for many patients.

'Moonboot' saves the day!

The rise in popularity of Aircast type walking boots, driven by the ability for the patients to remove them themselves, thereby avoiding a further consultation, has been phenomenal over the past few years. Even David Beckham has been seen sporting one after injury. Researchers in **Yeovil (UK)** designed a study to establish the efficacy of such treatment for metatarsal fractures. They designed a prospective comparative cohort study (Level II evidence) to compare treatment with an Aircast boot with immobilisation in plaster. The outcome measures assessed were pain, functional outcome and time taken from work during recovery from a base of the fifth metatarsal fracture. Patients were assigned to treatment methodology according to the preference of the treating consultant. A total of 39 patients were enrolled in the study. Of these, 23 were treated with a walking short leg cast and 16 with a walking boot. Outcomes were assessed at regular intervals to a final 12-week follow-up visit. Patients were assessed using the VAS foot and ankle questionnaire (VAS FA), a comprehensive score covering a range of disability and functional domains throughout the foot and ankle. The researchers established that use of the walking boot reduced the recovery period significantly by three weeks (from 12 to nine weeks). Patients allocated to the boot also reported less pain between three and 12 weeks with significantly better function at three, six and nine weeks.



Additionally, patients took five fewer days off work and returned to driving significantly earlier.[4] While the use of comparative cohorts does not allow for the elimination of confounders and bias in the same way a randomised controlled trial does, and the results of this study should be interpreted in that light, it is fairly clear to us here at *360* that Aircast boots are the way forward for fifth metatarsal fractures. What concerned us slightly was the extremely long return to function levels, and particularly the 30 days patients were taking off from paid employment, for an injury that in some centres would be treated with crutches and Tubigrip.

Pamphlets and outcomes

Patient information is a tricky thing; how much is too much and how much is required? It is well established that patients do not necessarily remember everything they are told in the clinic room and that use of 'enhanced' information with either a separate consultation with a specialist nurse or information leaflets may be helpful in improving patients' perception of their understanding. There is little evidence, however, to support this practice in trauma, and no studies looking at pamphlets and outcomes. Investigators in **Toronto (Canada)** sought to establish the effect that directed patient information interventions (pamphlets) had in the post-operative management of ankle fractures. In order to answer the question they designed a randomised controlled trial (Level I evidence) where patients were randomised to either receiving, or not, the AAOS ankle fracture information sheet. This includes not only an explanation of the surgery, but also describes the post-operative routine. In addition, these patients also received a handout depicting common physiotherapy exercises. Patients were followed up for three months radiologically, with the Molander score and satisfaction questionnaires. The primary outcome measure was a Likert scale satisfaction measure. The study had a relatively low recruitment rate with only 40 patients recruited in two years, all of whom underwent operative treatment for their ankle fracture. Those patients who received the information sheet were more satisfied at three months than those who did not. In addition, they had significant improvement in work and activity levels at six weeks, although this advantage disappeared by three months. There were no differences in post-operative complication rates between the two groups.[5] The findings of satisfaction levels in this study mirror those in other areas of medicine and orthopaedics. Patients like an information sheet, it gives them access for further information, and resolves recall problems. The slightly unexpected finding of this study must be the improved outcomes at six weeks. We wonder here at *360* HQ if this had little to do with the AAOS information sheet and more to do with illustration of physiotherapy exercises.

Poor gait after pilon fracture

The pilon fracture (axial burst fracture of the tibia) is one of the most devastating injuries in terms of long-term functional deficit. Patients sustaining these injuries, even when treated with gold standard management, are often left with long-term functional deficits and impairments in gait. A study team in **Wuerzburg (Germany)** aimed to investigate these changes in gait pattern more carefully. They recruited 36 patients who sustained a pilon fracture and included gait analysis and a range of functional outcome scores (AOFAS, VAS foot and ankle scale (VAS FA) and Phillips score) in their follow-up programme. Gait analysis was undertaken using a pedobarography technique with analysis of load, pressure and force-time graphs. Patients were followed up to a mean of 50 months (19 to 100). At final follow-up the cohort had achieved mean scores of 55 AOFAS, 65 VAS-FA and 55 Phillips score, representing around 60% of the available points on each score. The research team identified clear statistically significant links between the fracture classification according to the AO classification and functional outcomes (AOFAS k = -0.63, VAS-FA k = -0.56, Phillips k = -0.64) and additionally a highly statistically significant link between the onset of post-traumatic arthrosis and the AO classification. The gait analysis revealed a lateral shift of the force vector overloading the lateral midfoot on a background of decreased total load bearing. In particular, the normal heel-toe gait was affected with reduced loading of heel, first ray and toe. This pattern seems likely to be attributable to a stiff ankle.[6] Understanding of the abnormalities of gait

seen following a pilon fracture is critically important. While some patients will go on to undergo ankle fusions, many do not but still have significant symptoms. Based on this data, earlier use of orthosis to provide some medial posting may provide patients with some relief of symptoms. While it may seem obvious that increased AO grades result in higher rates of post-traumatic arthrosis, this has not been previously shown, and the picture is complex around the ankle. A high rate of asymptomatic arthrosis is seen following severe ankle and tibial injuries. The challenge for the future is picking out why some patients' arthrosis is symptomatic and others less so.

Lactate and surgical timing

If such a thing as fashion exists in the resuscitation room then the serum lactate is the Prada of resus. Lactate-controlled surgery, championed by some of the world's largest trauma centres, has given an objective measure to the use of damage control orthopaedics (DCO). Conventional wisdom suggests that performing multiple long bone fixation in patients with high venous lactate (above 2.5 mmol/L) should be undertaken with caution. However, there are no randomised studies, and in a complex intervention such as resuscitation the potential for confounders in interpreting the data that exists is massive. Surgeons in **Pietermaritzburg (South Africa)** have thrown their collective weight behind the lactate-controlled surgery and published a retrospective prognostic series (Level III evidence). They investigated the prognostic value of raised serum lactate in patients with normal vital signs but a lactate > 2.5 mmol/L. Using their centre's trauma database they identified 88 patients with an ISS > 16 and significant long bone or pelvic fractures who underwent operative intervention within 48 hours of injury. However, only 36 of these form the basis of the study, as the remainder had abnormal vital signs. Of these, 17 had normal lactate and formed the control group, and 19 had abnormal lactates. By day three post-operatively, those patients with high pre-operative lactates required higher levels of post-operative inotropic support and higher sequential organ failure scores than those who did not.[7] Although the authors conclude that the solution is to delay surgery in patients with raised lactates, which is supported by the study team, they have not been able to answer all our questions at 360 within their manuscript. In a highly selected cohort of patients we wonder if the raised lactate is in fact a sign of under-resuscitation. What happened to the serial lactates? And what was the peak lactate load intra-operatively? Lactate-controlled surgery is here to stay, but we only know a fraction of what there is to know about it.

Marginal results with marginal impaction

Marginal impaction is tricky to treat and seems to occur most commonly in some of the most difficult fractures to manage: acetabular fractures and pilon fractures. Elevation of the joint surface often leaves a void in the subchondral region, requiring bone grafting. Achieving adequate fixation with screws is often impossible. There is little in the way of published literature surrounding the long-term sequelae of marginal impaction or indeed the efficacy of operative treatments. The pelvic team in **Leeds (UK)** have yet again come to the rescue with their reporting of a series of patients with acetabular fractures and marginal impaction. Their prospective cohort series (Level III evidence) covers patients admitted with an acetabular fracture and marginal impaction at two tertiary referral centres. In addition to the usual Judet and LeTournel classification the study team quantified the extent of articular impaction dividing the acetabulum into thirds. Outcomes were assessed using functional (EQ-5D) and radiological (Matta's criteria) scores as well as complication rates. The team recruited 60 patients (57 men) with a mean age of 41 years (18 to 72) into this observational study. Patients were followed up for a minimum of 24 months. Post-surgical radiographs were assessed to establish the quality of reduction. Anatomical reduction was achieved in three quarters of the patients. In the patients where anatomical reduction was achieved, the reduction was lost in a quarter of them during the period of the study. The radiological outcomes were graded as excellent in 55%, good in 18%, fair in 2% and poor in 25%. During the follow-up period, 10% of patients required a THR and a further 8% required further surgery for other reasons.[8] The authors identified that inferior impaction leads to a poorer functional result, and conclude that, in their hands at least, elevation of the impaction leads to satisfactory medium-term results. These results are indeed excellent with less than 10% of patients requiring salvage arthroplasty following an acetabular fracture complicated by marginal impaction. It certainly seems that, in this study, the strategy of elevation gives an acceptable result for an awful injury.

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