ROUNDUP360

Trauma

Which patients die from pelvic ring fractures?

Since Young and Burgess reported their 'force vector analysis' classification it has been widely accepted that mortality and rates of visceral injury are associated with fracture pattern. We at *360* are amazed at how little literature there is on the impact of associated injuries in combination with a pelvic fracture; perhaps because of the rarity of each injury pattern. Although there are a number of well validated injury severity scores such as ISS, and predictors of mortality such as POSSUM, very little research has dealt with mortality in those patients with a pelvic ring fracture who are of most interest to the orthopaedic traumatologist. Researchers from **Hamburg (Germany)** identified this gap in the scientific literature and designed a study using the German Pelvic Trauma Registry with the aim of identifying the causes and timing of deaths in pelvic fractures, the patient demographics and the pattern of injuries in those patients who did not survive. They designed a Level III evidence, prognostic study utilising prospectively collated data from a retrospective database. The study only included data from the database, and survivors were compared with non-survivors. Their study included all 5340 patients included in the German Pelvic Trauma Registry, and follow-up was to a median of 13 days. In their study, 4% (283/5341) of patients were non-survivors, with deaths occurring at a median of two days after injury. The leading cause of death was haemorrhage (34%) of which 62% was massive bleeding. The authors noted a preponderance of males (56% non-survivors *versus* 43% of survivors); complex pelvic injuries (32% non-survivors *versus* 8% of survivors); fewer isolated ring fractures (13% non-survivors *versus* 49% of survivors); lower initial blood haemoglobin concentration (6.7 *versus* 9.8 g/dL) and systolic arterial blood pressure (77 *versus* 106 mmHg). In addition, the authors calculated a higher injury severity score (ISS) (35 *versus* 15) in the non-surviving group.[1] Here at *360* we're more surprised by these results than you might think. While they reflect precisely the expected pattern of severe, multiply injured, bleeding patients failing to survive, we are saddened and disappointed to learn in a modern study that haemorrhage is still the leading cause of death at two days. At *360* we hope that the next major investigation into pelvic trauma will both include a multivariant risk model, and more importantly demonstrate a fall in fatal haemorrhage reflecting improved trauma blood resuscitation protocols developed by allied forces in Afghanistan.

Monolateral distraction osteogenesis is a viable procedure

Distraction osteogenesis is a powerful technique for addressing bone defects, and although this may be achieved by a monolateral external fixator the majority of the recent literature concerns use of circular frames or intramedullary nails to achieve the new bone formation. A research group in **Tamil Nadu (India)** sought to redress this balance by describing their results with the monolateral technique. The authors describe a Level IV evidence study reporting their own results of their series of patients managed with a unilateral rail external fixator. All of their patients had post-traumatic bone defects. The researchers posed the research question: can we achieve distraction osteogenesis as effectively as with an Ilizarov frame but without the disadvantages of complex surgery and poor patient tolerance? The reported series included 22 patients, of whom 17 had long-standing infection. All were managed in the same centre with a monolateral rail external fixator. The authors treated patients with critical-sized bone defects who would not have healed without transport, and achieved union in 21 patients with an average of 12 months' treatment. They were able to address bone defects with an average 56-mm distraction gap. The authors noted a high rate of failure of docking, and reported a slightly worrying "less than an inch (24 mm) of residual shortening" in 18 patients. However, their external fixator was well tolerated and Paley's criteria showed 6/22 excellent results and 16/22 good or excellent results.[2] Here at *360* we have noticed that the market for deformity and nonunion surgery has been rather cornered by Ilizarov surgeons of late. While the results of the Ilizarov and spatial frames are irrefutable there are other methods for addressing such bone defects such as the monolateral rail and Masquelet technique. The results reported here are perhaps not as successful as many other published series, and residual shortening of potentially 25% of the initial defect does leave us some cause for concern. This paper has certainly started the old grey cells ticking here at *360* – nonunion work is complex, and with bone defects even more so, but perhaps the Ilizarov is not quite the panacea it was previously thought to be.

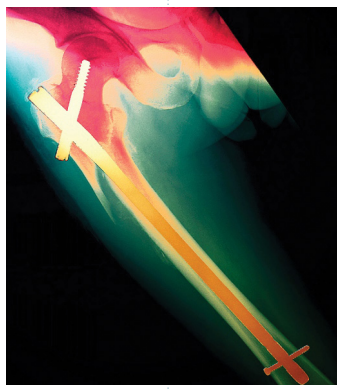
Surgical management of pelvic and perineal blast injuries

We all hope at *360* never to have personal experience of pelvic blast injury from the improvised explosive devices which characterise modern warfare. However, as with all warfare the recent conflicts in Afghanistan and Iraq have pushed forwards management of both civilian and military trauma victims. Evidence supporting management of blast injury to the pelvis and perineum, the most severe forms of open pelvic fracture, is thankfully scarce. We were, however, delighted to see the UK military surgeons sharing their experience of these difficult injuries which do rarely occur in civilian practice. Researchers from the Royal Centre for Defence Medicine, **Birmingham (UK)** designed a study to define the patterns of these difficult injuries and provide

a rationale for a resuscitation-debridement-diversion strategy with the aim of informing optimal care of these injuries. The researchers used the UK Joint Theatre Trauma Registry to conduct a Level III epidemiological study. Their study included data concerning patient demographics, mechanism of injury, Injury Severity Score (ISS), management, and outcomes. The researchers examined the records of 2204 UK military trauma patients of which 118 (5.4%) had suffered a recorded perineal injury. Of these, 56 (47%) were fatal. Pelvic fractures were associated with the peroneal blast injury in 63 (53%) of 118 patients, of which only 27% were survivors. Mortality rates were significantly higher in combined perineal and pelvic fractures (47%), compared with isolated pelvic fractures (41%) or perineal injuries (18%). The median ISS for all patients was 38 and for those with pelvic fractures was, as expected, significantly higher than for those with isolated perineal injuries (50 *versus* 30). As would be expected, the research team identified a high mortality and ISS associated with the blast pelvis and blast pelvis with perineal injuries. The authors' data support the current practice of bowel diversion in patients with open pelvic fractures and perineal injuries.[3] Although sometimes harrowing reading, we welcome at *360* the valuable lessons our military colleagues can teach us when dealing with the few, similarly injured patients we see in civilian trauma practice.

Weekend warriors at risk of going absent without leave

As health concerns are raised in other areas of medicine, more and more of the unfit, overweight population are trying to turn their lives, cardiovascular risk factors, and diabetes risks around. While much has been made of 'pre-hab' or pre-conditioning to avoid injuries in the elite and semi-elite athletes, perhaps a group more deserving of education are the unprofessional weekend warriors. These are 'regular people' with dubious physical abilities who are undertaking physical activities such as roof and tree maintenance. Researchers in **Massachusetts (USA)** wished to identify the common injury patterns, outcomes and potential for injury prevention in so-called weekend warriors. They identified a population of non-professionals undertaking home maintenance and tree pruning which resulted in injury. The researchers identified the patients in a retrospective manner using their trauma registry to report a retrospective epidemiological case series (Level III evidence). They identified 129 weekend warrior-related injuries sustained while falling from a height or being struck by a tree over a seven-year period. The patient cohort consisted of 90 (69.8%) falls from a height and 39 tree strikes. The patients were mostly male (96.1%) with a mean age of 45 years. They presented with a median Injury Severity Score of 12.7 (9.3).The majority presented with head injury (48.8%), fractures (pelvic 15.6%; upper limb 27.3%; lower limb 14.7%; spine 28.1%; ribs 27.3%) or intrathoracic injuries (22.5%), with facial fractures or abdominal injuries in the minority. The patients required a mean of 5.3 days hospitalisation, and in two cases the injuries were fatal. Surprisingly, only 64.2% of patients were discharged without the input of support services.[4] The researchers were surprised by the frequency and severity of the injuries, and here at *360* we are also surprised, particularly at the number of citizens who were struck by their own felled trees (39 in seven years!). However, on this side of the pond we would stop short of the appeal for the health and safety regulation called for by these authors. They were, after all, only reporting 20 injuries a year in a large level 1 trauma centre.



Early experience with the locking attachment plate

Here at *360* we have been eagerly awaiting the first reports of the locking attachment plate in clinical use. This ingenious little device attaches to the side of a femoral locking plate and has carefully placed outriggers which allow the surgeon to place bicortical screws around a femoral hip stem. Therefore, we were delighted to read the abstract of a German language paper from authors in **Halle (Germany)**. The authors report a series of 17 patients, all with periprosthetic fractures treated with open reduction and internal fixation augmented with the locking attachment plate. They followed their patients up for more than a year. Their series included patients with femoral, humeral and tibial fractures.[5] Although we were unable to access the whole paper in English we were delighted here at *360* to see promising results from this new implant which we believe will form a valuable addition to our armamentarium when treating the ever-increasing burden of periprosthetic fractures.

Fibula nailing – an alternate, and viable technique

Ankle fracture fixation has been a stalwart of AO courses for nearly half a century, and generations of orthopaedic surgeons (including us at *360*) learned a plate and screw technique on plastic bone that has remained much unchanged since the early days of operative fracture fixation. Thus, we were not surprised to see orthopaedic surgeons innovating, and trying a new technique. We were more surprised nobody had tried it first. Researchers in **Edinburgh (UK)** have been using an intramedullary locking nail technique to reduce soft-tissue complications in patients with acute ankle fractures. The researchers reviewed the results of 105 patients with unstable ankle fractures treated with intramedullary locking nail fixation. The patients had a mean age of 64.8 years and 76% (80 patients) had significant medical co-morbidities. The authors report seven patients with loss of fixation and five patients with wound infections. The initial locking construct achieved stability in 91% of ankles. A refined surgical technique (with a supplemental syndesmosis screw) resulted in the achievement of stable constructs in 100% of ankles. At six years of follow-up the authors reported mean scores of 46 points for the SF-36, 65 for the Molander score, 83 for the AOFAS scores, and there were no cases of nonunion.[6] At *360*, we were delighted to read this well-conducted study describing a new technique with long-term clinical and radiological follow-up. We may well even try intramedullary nailing on our next fibular fracture.

Robots are taking over after all

A recent issue of *360* looked at the possibility that robots might take over orthopaedic surgery one day, so a paper from **Hong Kong (China)** caught our eye. Image-guided navigation systems have been implemented successfully in orthopaedic trauma surgery because of their ability to help surgeons position and orientate hand-held drills at the best entry points. However, current systems cannot prevent drilling tools or instruments from slipping or deviating from the planned trajectory during the drilling process. A method is therefore needed to overcome such problems. A novel passive/active hybrid robot (the HybriDot) for

positioning and supporting surgical tools and instruments while drilling and/or cutting in orthopaedic trauma surgery is presented in this paper. This new robot, consisting of a circular prismatic joint and five passive/active back-drivable joints, is designed to fulfill clinical needs. In this paper, a system configuration and three operational modes are introduced and analysed. Workspace and layout in the operating theatre are also analysed in order to validate the structure design. Finally, experiments to evaluate the feasibility of the robot system are described. Analysis, simulation, and experimental results show that the novel structure of the robot can provide an appropriate workspace without risk of collision within operating theatre environments during operation. The back-drivable joint mechanism can provide surgeons with more safety and flexibility in operational modes. The mean square value of the positional accuracy of this robot is 0.811 mm and the orientation is accurate to within 2.186°. Trials on actual patients undergoing surgery for distal locking of intramedullary nails were successfully conducted in one pass using the robot.[7] So, we conclude at *360*, robots appear to be taking over after all. This particular design has the advantages of having an appropriate workspace, being well designed for human-robot co-operation, and having high accuracy, sufficient rigidity, and easy deployability within the operating theatre for use in common tasks such as screw fixation and assistance with drilling.

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