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An Assessment of Pelvic Binder Placement at a UK Major Trauma Centre

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Introduction:
Pelvic binders are used to reduce the haemorrhage associated with pelvic ring injuries. Application at the level of the greater trochanters is required. We assessed the frequency of their use in patients with pelvic ring injuries and their positioning in patients presenting to a single Major Trauma Centre (MTC).

Materials and Methods:
A retrospective review of our trauma database was performed to randomly select 1000 patients for study from April 2012 to December 2016. Patients with a pelvic binder or a pelvic ring injury defined by the Young and Burgess classification were included. CT trauma scanograms were used to identify and measure pelvic binder placement.

Results:
140 patients were identified. 110/140 had a binder placed of which 54 (49.1%) and 56 (50.9%) patient had satisfactory and unsatisfactory placement, respectively. 30/67 (44.8%) patients with a pelvic ring injury had no binder applied of which 6 (20%) had an unstable injury. 9/67 patients died.

Discussion:
This is the first study assessing pelvic binder placement in patients at a UK MTC. Unsatisfactory positioning of the pelvic binder is a common problem and it was not used in a large proportion of patients with pelvic ring injuries. This may be placing patients at risk of further preventable harm.
Clinical Complexity And Its Role In Trauma Care: Validation Of AO Principles Of Care.

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Introduction:

Complexity theory is based around the interaction of agents and factors to predict and quantify predictable and unpredictable events. Other features of complexity include non-linearity, feedback and scalability. This is contra-distinct to deterministic models focussing on 1 factor, reliance on average values and normal distributions. Interestingly, Orthopaedic Trauma practice has historically centred around the consideration of multiple factors, but this has been under-represented in peer-reviewed literature.

A key component of complexity involves the role of fractals, which have transformed the understanding of a range of natural science subjects, including cardiac, neural-network and cancer studies.

Method and patients:

Over the past 8 years we have undertaken a number of clinical projects centred on clinical complexity and the interaction between 2 principle factors namely local and systemic, generating a 4 part classification of clinical complexity.

This equates to “injury factors and patient factors” of traditional AO/ASIF (Association for the Study of Internal Fixation) teaching. We further refined these by setting criteria for these factors being straightforward or complex, thereby creating a 2x2 matrix of clinical complexity, with C0 as the most straightforward type of case and C3 the most complex.

<table>
<thead>
<tr>
<th>Presenting problem eg injury:</th>
<th>Simple</th>
<th>Complex</th>
</tr>
</thead>
<tbody>
<tr>
<td>General patient status:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Generally well ASA 1-2</td>
<td>C0</td>
<td>C1</td>
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Complex comorbidities; >3 Charlson majors, ASA 3+

**Results:**

Our orthopaedic trauma research has thus far focussed on hip fracture patients and we have validated results over 2 centres, involving analysis of 717 patients with AO/OTA A31 and B31 fractures. We found statistically significant differences between the most complex groups and straightforward patients in a variety of parameters such as mortality rates at 30 days and 1 year (p<0.001).

**Conclusions:**

Stratification into the 4 clinical complexity groups seems to have almost universal applicability. It tends to validate the AO principles of injury, that injury and patient factors are key to patient outcomes.

We should look more closely at the principles of complexity science, as this may provide an alternative methodology, with greater efficacy at modelling healthcare delivery and outcomes and would demonstrate which additional data would need to be collected.
Biomechanical Comparison of Cemented versus Non-Cemented Screw Fixation in Type II Odontoid Fractures in Elderly—A Cadaveric Study

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Summary:

Odontoid peg fractures are the most common injuries of the cervical spine in the elderly. Anterior screw stabilisation of type 2 odontoid peg fractures improves survival and function in these patients but may be complicated by failure of fixation.

Aims:

To determine whether cement augmentation of a standard anterior screw provides biomechanically superior fixation of type II odontoid fractures in comparison to an uncemented standard screw.

Materials and Methods:

Twenty human cadaveric C2 vertebrae from elderly donors (mean age 83 years) were prepared. Anderson and D’Alonzo type IIa odontoid fracture was created by transverse osteotomy and fluoroscopy guided anterior screw fixation was performed. The specimens were divided into two matched groups. The cemented group (n=10) had radiopaque high viscosity polymethylmethacrylate cement injected via Jamshidi needle into the base of the odontoid peg. The other group was not augmented. A V-shaped punch was used for loading the odontoid in an antero-posterior direction until failure. The failure state was defined as screw cut-out or 5% force decrease. Mean failure load and bending stiffness were calculated.

Results:

The mean failure load for the cemented group was 352.1 ± 163.8 N compared to 198.2 ± 81.9 N for the uncemented group (P=0.02). The mean bending stiffness of the uncemented group was 153.2 ± 71.9 N/mm compared with 195.3 ± 76.5 N/mm for the cemented group (P=0.159).

Conclusion:

Cement augmentation of an anterior standard screw fixation of Type II odontoid peg fractures in elderly patients significantly increased load to failure under anterior posterior load in comparison to non-augmented fixation. This may be a valuable technique to reduce failure of fixation.
Identification of the medial femoral safe zone for drilling during dynamic hip screw side plate fixation: A CT Angiogram tracing of the profunda femoris artery

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Introduction:
Sliding hip screw and side plate construct is the most commonly used fixation method for extracapsular neck of femur fractures. Vascular injury to the Profunda Femoris Artery (PFA) associated with drilling at time of fixation is increasingly reported. The aim of our study is to map the safe zones for drilling to avoid this serious complication.

Methods:
Local radiology archiving software was used to identify normal lower limb Computerized Tomography Angiogram (CTA) studies. The length of the PFA was taken as the distance between a reference point (mid-point of the base of the lesser trochanter) and the termination of the PFA on the coronal sections. Using axial sections at 1 cm intervals, the position of the PFA in relation to the medial femoral cortex was identified. On each section 2 lines were drawn, Line A representing the femoral midcoronal plane (determined by the epicondylar axis). Line B, passing through the artery and meeting line A at the lateral femoral cortex. Angle between both lines was measured in degrees and labeled as positive for the anterior and negative for posterior. Distance between the medial femoral cortex and the lateral wall of the PFA was measured in centimeters along the Line B.

Results:
In 28 males and 16 females with mean age of 65.6 years (Range 19 – 96), the mean length of the PFA was 11.35 cm (Range 8.12 – 16.2, SD 2.1).

The part of the PFA between 5 – 9 cm distal to the reference point was close to the medial femoral cortex (10 – 16.5 mm) and lying near the coronal axis of the body (Arc of -17.2 to + 6.6 degrees).

The course of the artery started anteromedial, becoming gradually closer to the medial cortex as it descended distally before terminating in a posteromedial position.

Conclusion:
The danger zone of the PFA is located between 5 – 9 cm distal to the reference point. Direct lateral to medial drilling of the femur in this region can result in perforation of the PFA. Hence, excessive attention should be paid on application of screws in this region.
The prevalence of chronic pain between 6-12 months post tibial diaphyseal fracture.

Francois Prinsloo, Mathew Prime, Alex Wickham, Shehan Hettiaratchy

**Introduction:** Chronic pain (CP) affects up to 78% of patients at 1 year after tibial diaphyseal fracture (TF).^1^ CP can significantly affect an individual's quality of life and also impacts society through inability to work and increased healthcare use. Many nerves run in close proximity to the tibia and are thus prone to injury during TF. Nerve injury can cause acute neuropathic pain (ANP), which responds poorly to commonly prescribed analgesics. Under treated ANP predisposes patients to CP through central sensitisation and wind-up mechanisms. We aimed to identify levels of pain and risk factors for CP at 6-12 months following TF.

**Methods:** All patients admitted to the major trauma centre at Imperial College Healthcare NHS Trust between 01/01/2016 – 31/12/2016 were evaluated. Patients who had sustained isolated TF were identified using clinical coordination system eTrauma. Injuries were categorized using the AO classification. Pain and quality of life (QoL) were assessed using the EuroQol (EQ-5D-5L) questionnaire and the DN4 neuropathic pain questionnaire. All data was analysed using SPSS.

**Results:** Forty isolated TF were identified during the study period and 20 were followed up between 6-12 months after TF. Mean pain scores of 2.6/5 were identified using the EQ-5D. Pain was reported by 18 (90%) of patients and 10 (50%) reported moderate to severe pain. Pain scores were significantly greater following high-energy injuries however no significant links were seen with other patient, injury or management related factors and levels of pain at follow up. Using the DN4 criteria, 7 (35%) patients had neuropathic pain, however only 57% of these received appropriate anti-neuropathic pain medication.

**Conclusion:** CP is a common occurrence after TF and is largely under-reported. Neuropathic pain affects approximately one third of patients, half of whom do not receive appropriate treatment. Further prospective multi centre investigation is warranted to better identify those with ANP, and other risk factors for chronic pain development. This can then guide effective management and improve patient outcomes.
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**Early weight bearing after plate fixation of tibia plateau fractures does not lead to loss of reduction or articular collapse**

Aanchal Jain, Efthymios Iliopoulos, Wessam Ebied, Alex Trompeter

Plate fixation for tibial plateau fractures is a commonly used method of fracture stabilisation. Many orthopaedic surgeons traditionally do not allow their patients to weight bear for the first 6 weeks after surgery fearing loss of fracture reduction and articular collapse. The aim of this study is to investigate whether the post operative weight bearing status influences these outcomes.

Data was collected retrospectively for all patients with tibial plateau fractures who were treated surgically between January 2015 and June 2017. Inclusion criteria was fixation with a plate construct. Fractures treated non-operatively, with screws alone or external fixation were excluded. The immediate post operative weight bearing status of these patients was noted. Weight bearing status was divided into two groups – Group 1 (Non and touch weight bear – the non weight bearing group) and Group 2 (Weight bear as tolerated / Full weight bear – the weight bearing group). Radiological data about displacement or loss of fixation was collected at the six weeks and three months follow up after the operation, using a standardised measurement for displacement performed independently by two authors (EI, WE).

Of 120 fractures in 118 patients, a total of 90 fractures were included to the study. The mean age of the cohort was 45.1 ±16.5 years with the majority of the patients being male (66%). 51% of the patients had a Schatzker II fracture. Fifty-five patients were treated with one lateral proximal tibial periarticular plate (61%) and eighteen patients needed a supplementary medial or postero-medial plate. The weight bearing status did not correlate with the fracture type (p=0.82). None of the follow up radiographs revealed loss of fixation and only one patient from the weight bearing group had >1mm displacement at the two follow-ups. Fisher’s exact test revealed no statistically significant difference between the two study groups in both follow-up time points (p=0.36 and 0.37 respectively). The quality of reduction and articular reconstruction of tibia plateau fractures treated with plate fixation is not affected by the immediate post-operative weight bearing status Early weight bearing of these patients should be encouraged, as no adverse effects are noted.