**Acetabular anterior column combined with posterior hemi transverse fracture fixation: validation of a finite element analysis**

**Motivation & Objectives**
Acetabular fractures can result in complex patterns, which may make fracture fixation surgery difficult. The current gold standard in acetabular fracture fixation is mostly open reduction and internal fixation (ORIF), which is rather an invasive operation. This is why percutaneous fixation can be seen as an attractive alternative. But to consider such alternatives on complicated fractures it is important to assess the biomechanical stability and compare it with the more commonly used ORIF.

The aim of this study was to develop a finite element model of a pelvis with anterior column combined with posterior hemi transverse fracture (ACPHF) using the software ANSYS. This fractured pelvis was completed by modeling three different types of fixation: validation of a finite element analysis.

**Results**

<table>
<thead>
<tr>
<th>Max principal strain</th>
<th>Min principal strain</th>
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<tbody>
<tr>
<td>Pelvis 1</td>
<td>Pelvis 2</td>
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<tr>
<td>Pelvis 3</td>
<td>Pelvis 1</td>
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</tbody>
</table>

**Method**

3 fractured pelvises were modelled on ANSYS with 3 different fixation methods: Pelvis 1 (top one) was fixed using the most common method, that is a long plate on the superior-medial part of the ilium, 8 screws are used in this method. Pelvis 2 (middle one) was fixed using a smaller plate on the medial part of the pelvis with 5 screws. The last (bottom one), pelvis 3, was fixed using only two screws. The 3 models corresponded to previous mechanical experiments.

The boundary conditions an loads were setup to match with the mechanical experiments. The nodes of the top of the iliac crest were set as fixed, and a load of 750N was applied on the femoral head in the vertical direction. The principal strains on the position of the strain gages in the mechanical experiments were then extracted.

**Conclusion**

The predicted strains were compared with experimental values obtained from a previous experiment performed on the same pelvises. The FE models were able to predict strains accurately on certain parts of the pelvis but generally they either under/overestimated strains in other parts. This can be attributed to several factors but we believe that the main reason is different contact conditions in model and experiment, as a sensitivity analysis on changes in contact conditions revealed that strain values are very sensitive to these conditions. Therefore it is recommended that more contact sensitivity analysis to be performed.