Is the initial construct stiffness of the acetabular cup affected by depending on the direction of the screw?

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Introduction

- Micromotion has been shown to affect bony ingrowth into cementless components
- Torsion of Acetabular cup introduce fixation failure
- Press fitting & number of screws → Cup stability
- Cup stability also depends on screw stability & number
- Which position and direction is the best option for the cup stability?

Purpose

1) To compare the Torsional Strength & Lever out Strength of acetabular component depending on types of acetabular cups

Methods

- In vitro study
- 20 sawbones of the male pelvis
- Right side : Group 1, Left side : Group 2
- Coronal lever out and axial torsion tests were performed with an Instron testing machine, measuring load versus displacement.
- Saw bone model

- Full pelvis for mechanical testing
- Short Fiber Filled Epoxy : simulated cortical bone
- Mimic the properties of human bones
- Alternative testing media to human cadaver bone

Results

<table>
<thead>
<tr>
<th></th>
<th>Group 1</th>
<th>Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hip</td>
<td>Right</td>
<td>Left</td>
</tr>
<tr>
<td>Type</td>
<td>Centered</td>
<td>Spread</td>
</tr>
<tr>
<td>Implant</td>
<td>Bencox Hybrid Cup</td>
<td>G7® Multihole Cup</td>
</tr>
<tr>
<td>N of Screws</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Size of Cup</td>
<td>58 mm</td>
<td>58 mm</td>
</tr>
</tbody>
</table>

- Procedure

- Mechanical test : Torsional strength

- Statistical analysis
  - Wilcoxon signed rank test is used to compare the peak lever out strength and torsion strength in two groups
  - SPSS (version 21.0; SPSS Inc., Chicago, IL, USA) p-value < 0.05 was considered significant.

Conclusion

- Acetabular component of Spread hole type stand more torsion strength & lever out strength.
- In the case of insufficient press-fit fixation, implant s of spread hole type would help maintain initial cup stability.
- Further study is required to see whether we can apply this result in bone defect model.

References