Prevention of dislocation after hip replacement in elderly patients.

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Can it be avoided?
Dislocation after hip replacement is a serious complication (reoperation is often required).
Risk factors:

- elderly
- after femoral neck fx
- neuromuscular disorders (low muscle tone and motor coordination)
- noncompliant patients (low chair, leg crossing)
- obesity
- surgical errors; **aiming for correction of leg length discrepancy**, revision surgeries, improper cup or stem positioning
- women

Werner BC I wsp. Instability after total hip arthroplasty. WJO, 2012; 18(3): 122-130
Causes of hip instability in obese (BMI >30) THA patients

Soft tissue impingement during walking and sitting is relevant in morbidly obese

Biomechanics of failure modalities in total hip arthroplasty, Elkins JM, University of Iowa, 2013
Dislocation after hip replacement

- High risk group – it is right to maintain higher jump-distance

- Jump-distance depends on:
  - level of anteversion and inclination of the cup
  - cup and neck relation
  - head diameter and its cover
  - presence of antiluxation rim of the cup
Jump distance:

- is lowered by cup inclination
  \(0.25 \text{ mm per } 1^\circ \text{ with } 32 \text{ mm head diameter}\)

- is increased by cup anteversion
  \(0.05 \text{ mm per } 1^\circ\)

- is increased by head diameter
  \(0.4 \text{ mm per } 1 \text{ mm of head diameter when inclination is } 45^\circ\)
• ~ 50% of dislocations is associated with cup position


Murphy SB. Acetabular Cup Placement. CCJR, Winter 2015; Orlando: 75
Main cause of higher cup inclination – error during patient positioning (internal rotation and adduction)
• Increasing jump-distance:
  • dual mobility cup
  • anatomical head with large diameter (anatomical)

• Constrained acetabular component
Prevention of dislocation after THA

- Dual mobility cup provide highest jump distance, which is a result of **larger head diameter**

- Disadvantages:
  - Increased polyethylene wear *(wearing on the metal cup increases risk of aseptic loosening)*
  - Potential iliopsoas conflict
  - Inability to perform close reduction after dislocation


Prevention of dislocation after THA

- **Anatomical heads** with large diameter:
  - better mobility and jump-distance
  - thin both cup and PE insert
    (resistant to wear with ceramic or ceramic coated metal head)

- **Disadvantages:**
  - it is possible to deform the cup during implantation – faster wear
Prevention of disclocation after THA

- Constrained cups are reserved for patients:
  - with Alzheimer’s,
  - after revision procedures with damaged abductors
  - after revision procedures because of dislocation, especially with improper positioning of the implants
  - lowered muscle tone because of neurological illnesses or immobility

Large head?

Biomechanics of failure modalities in total hip arthroplasty, Elkins JM, University of Iowa, 2013

Table 12. Percentage of Femoral Head Sizes Implanted by Year (for most frequently reported* hip components 2010-2013) (N=26,119)

<table>
<thead>
<tr>
<th>Head Diameter</th>
<th>2010 (n=291)</th>
<th>2011 (n=999)</th>
<th>2012 (n=8,164)</th>
<th>2013 (n=15,797)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;28mm</td>
<td>1.0</td>
<td>3.6</td>
<td>3.6</td>
<td>3.4</td>
</tr>
<tr>
<td>28mm</td>
<td>6.5</td>
<td>8.4</td>
<td>9.2</td>
<td>15.0</td>
</tr>
<tr>
<td>32mm</td>
<td>27.5</td>
<td>35.2</td>
<td>29.8</td>
<td>26.4</td>
</tr>
<tr>
<td>36mm</td>
<td>40.2</td>
<td>36.4</td>
<td>45.8</td>
<td>41.3</td>
</tr>
<tr>
<td>40mm</td>
<td>19.6</td>
<td>8.8</td>
<td>7.3</td>
<td>5.2</td>
</tr>
<tr>
<td>&gt;40mm</td>
<td>5.1</td>
<td>7.5</td>
<td>4.3</td>
<td>8.7</td>
</tr>
</tbody>
</table>

* Does not include all hip replacement procedures, only frequently reported components
Revision algorithm

- **Type 1**: malposition of the acetabular component
  - cup revision and larger head
- **Type 2**: malposition of the femoral component
  - stem revision and larger head
- **Type 3**: abductor deficiency
  - dual mobility or constrained cup
- **Type 4**: impingement
  - removing the impingement and larger head
- **Type 5**: late wear
  - replacement and larger head
- **Type 6**: unclear etiology
  - dual mobility or constrained cup
- Patient **D.Z.**, born **1935**, **BMI 36**
- Primary **THA 2011**
- **Dislocation 2011**

**Case 1**
- Acetabular breaking after dislocation
- Infection treated by implant removal
• Surgery - **12-2012**: antiprotrusion cage GAP II, RESTORATION stem
• Dislocation at home
• Surgery – **02-2013**: PE insert removal, AVANTAGE cup
- Dislocation at home
- Surgery 03-2013: reimplantation of antiprotrusion cage GAP II 52 ⇒ 60 mm and antiluxation AVANTAGE cup 44 ⇒ 54 mm
Patient B. G., born 1947, BMI 44, primary THA 2013, traumatic dislocation 01-2016, and again 02-2016

Case 2
Class III obesity
Cup anteversion, not only head size...
Class III obesity
Constrained cup is not perfect...
Summary

- Larger head:
  - provides larger jump-distance,
  - increases joint mobility and helps to restore leg length
  - new type of cups with thinner cup and PE insert allow to implant large head (size close to anatomical)
  - theoretically increasing head $>36\text{mm}$ is not relevant, when inclination is steep
Most effective treatment of dislocation is prevention done by surgeon and patient.
Thank you for your attention