Modular Dual Mobility

Acetabular Components: An Important Extension of a Proven Approach to Hip Instability

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Disclosure

- In accordance with ACCME guidelines the author acknowledges there is a financial relationship with Industry
  - Royalties: Aesculap
  - Consulting Fees: Aesculap, Innomed, Omni Science, Stryker

- FDA status:
  - all devices cleared
Purpose

- Define Dual Mobility Concept (Tri-Polar)
- Present the clinical issue that Dual Mobility Cup seeks to resolve
- Review relevant available Data
  - Laboratory
  - Clinical
- Describe indications for this recent innovation of an existing concept
Introduction

• Dual mobility cup - prevents instability
  – Primary & revision total hip arthroplasty

• Current designs make secure fixation difficult
  – No adjunct screw option

• New modular version of the dual mobility cup available
  – Conventional porous shell
  – Holes to allow augmented screw fixation
  – Highly polished modular metal liner
  – Bipolar femoral head
History
Dual Mobility = Tripolar

- Large, fixed (press-fit) Acetabular cup and a bipolar femoral component

![Diagram showing dual mobility components](image-url)
Instability in THA

Patient Related Factors for Dislocation in THA

- Age ≥ 75
- Females ≥ 70
- Prior hip surgery
  - Revision
- Underlying Dx
- Neuromuscular disease
- Cognitive dysfunction
- ASA score ≥ 3
Instability in Revision THA
Functional Potential of a Dual Mobility System

"Jump Distance"  Range of Motion

JUMP HEIGHT AT 45 DEGREES OF INCLINATION

<table>
<thead>
<tr>
<th></th>
<th>mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trident Poly 40mm Head</td>
<td>7.3</td>
</tr>
<tr>
<td>Trident Poly 44mm Head</td>
<td>7.9</td>
</tr>
<tr>
<td>Restoration ADM 48mm Insert/Effective Head</td>
<td>9.8</td>
</tr>
<tr>
<td>Trident Constrained Liner 42mm Head</td>
<td>13.6</td>
</tr>
</tbody>
</table>

Note: 54mm cup was utilized in testing.

A/P SWEEP ROM

<table>
<thead>
<tr>
<th></th>
<th>Degrees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trident Poly 40mm Head</td>
<td>134</td>
</tr>
<tr>
<td>Trident Poly 44mm Head</td>
<td>138</td>
</tr>
<tr>
<td>Restoration ADM 48mm Insert/Effective Head</td>
<td>145</td>
</tr>
</tbody>
</table>

Note: 54mm cup was utilized in testing.
## Dual Mobility Results in Primary THA

<table>
<thead>
<tr>
<th>Study</th>
<th>Number of THAS</th>
<th>Dislocation Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Philippot (SOFCOT 2004)</td>
<td>106</td>
<td>0</td>
</tr>
<tr>
<td>Aubriot (1993)</td>
<td>110</td>
<td>1</td>
</tr>
<tr>
<td>Vanel (SOFCOT 2003)</td>
<td>127</td>
<td>1</td>
</tr>
<tr>
<td>Bejui-Hugues (SOFCOT 2006)</td>
<td>167</td>
<td>0</td>
</tr>
<tr>
<td>Philippot (SOFCOT 2006)</td>
<td>70</td>
<td>0</td>
</tr>
</tbody>
</table>

**Dislocation Rate: <0.4%**
Dual Mobility Results in Revision THA

- Aubriot (1995) 13 Revisions 0 Dislocations For Instability
- Beguin (2002) 42 Revisions 0 Dislocations For Instability
- SFHG (2006) 403 Revisions 8 Dislocations
- Guyen (2009) 54 Revisions 3 Dislocations

Dislocation Rate 2.1%
# Dual Mobility Survival Rates

- **Aubriot (1993)** 100 THA 97% @ 5Y
- **Farizon (1998)** 135 THA 95.4% @ 10Y
- **Leclerc (1999)** 153 THA 95.9% @ 10Y 94.0% @ 15Y
- **Philippot (2004)** 106 THA 94.6% @ 10Y
- **Philippot (2006)** 100 THA 95% @ 10Y
Impact of Dual Mobility Design and Cross Linked Polyethylene Wear

- 38% reduction in wear rate between Restoration ADM Duration and Trident N2/Vac
- 98% Reduction in wear rate between Restoration ADM X3 and Trident N2/Vac
- 97% Reduction in wear rate between Restoration ADM X3 and Restoration ADM Duration
Dual Mobility Cups with Cross Linked Poly have very little Increase in Wear Even at 65 Degrees Inclination

compared to metal-on-metal at 65° of inclination\(^\text{15}\)

![Graph showing wear rate comparison](image)
Implant Longevity = 98% Reduction in Wear Compared to a Fixed bearing Construct

VOLUMETRIC WEAR RATE

<table>
<thead>
<tr>
<th>Wear Rate (mm^3/mc)</th>
<th>Conventional Fixed Bearing Construct</th>
<th>Restoration ADM with X3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>32.90</td>
<td>0.59</td>
</tr>
</tbody>
</table>

Implant longevity study showing a significant reduction in wear compared to a fixed bearing construct.
Evolution of Hemispherical Dual Mobility Cup to Anatomic Dual Mobility
Evolution of Hemispherical Dual Mobility Cup to Anatomic Dual Mobility
Evolution of Hemispherical Dual Mobility Cup to Anatomic Dual Mobility
Recent Innovation to Original Dual mobility Concept

- Highly Cross Linked Polyethylene
- Anatomic Shell Shape
- **Modular Dual Mobility**
Our Methods

- MDM cup implanted in 15 patients in primary & 5 patients in revision THA
- Indications included:
  - septic and aseptic revision surgery
  - developmental hip dysplasia
  - avascular necrosis
  - recurrent dislocations
  - hemiarthroplasty conversion to THA
  - periprosthetic fracture
  - abductor insufficiency requiring augmented repair
  - hypermobility from auto-immune inflammatory disease
Applications of the MDM Cup

1  Dysplasia
2  OA with \( \downarrow \) offset
3  AVN with small cup
4  Failed MOM
5/6 Failed Bipolar
7  Infected Bipolar
8  Acute dislocation after Fem. Revision
9/10 Recurrent dislocation
  1  Early
  2  Late
The Modular Dual Mobility (MDM) Acetabular Component

- Conventional uncemented cup
  - Hemispherical
  - Elevated rim
  - Porous metal
- Polished modular metal or standard X-3 poly inserts
- Large X-3 Poly Head
- 22/28 mm CoCr or Ceramic head

INTRA-OPERATIVE VERSATILITY
Surgical Technique

- Standard acetabular preparation for press-fit component
  - possible screw augmentation
- Modular metal liner is manually inserted
  - lining up tines and impacted
- Confirm concentric positioning
- Standard femoral stem preparation
  - dual-mobility head with multiple neck length options is easily assembled and placed on the trunion
- The hip is then located and assessed for limb length, stability, and offset
Applications of the MDM Cup: Recurrent Dislocation with Wear
Applications of the MDM Cup
Applications of the MDM Cup
Applications of the MDM Cup: Recurrent Dislocation with Wear
Applications of the MDM Cup: AVN in Sickle Cell Disease
Applications of the MDM Cup: AVN in Sickle Cell Disease
Applications of the MDM Cup: Hip Dysplasia in a young, active Woman
Applications of the MDM Cup: Hip Dysplasia in a young, active Woman
Results

- Successful implantation in all primary and 4/5 revision THAs
  - Adjunct screw fixation was utilized in 8 patients
- No peri-operative complications related to the MDM
- In 2 revision cases, the MDM liner was used in previously well-fixed acetabular shell compatible with the MDM insert
- MDM abandoned in 1 revision case due to impingement and excessive lengthening
Summary

• The Modular Dual Mobility cup offers a safe, effective solution to hip instability
• Long term durability may be increased
• The concept has extensive laboratory & clinical support
• Screw fixation is possible
• Conventional, familiar Instrumentation
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INTRA-OPERATIVE VERSATILITY
THANK YOU