Clinical And Radiological Evaluation of Fully Hydroxyapatite Coated Uncemented Stems in Hip Arthroplasty

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Abstract: To assess the functional and radiological outcome of fully hydroxyapatite coated stems in hip arthroplasty. Prospective and retrospective study. Follow up 6wks, 3mths, 6mths, 1year & then yearly. Minimum follow up of 6 months. Total No. of cases in the study : 31 patients (32 hips). All cases were done using STANDERD CORAIL stem. Mean age – 60.31 years (19 years to 94 years). In our study all hips were operated through posterior approach. Clinical evaluation with Harris hip score (Modified) and radiological evaluation with plain x-ray pelvis with both hips and proximal femur - AP view and x-ray of the operated hip - AP view and Lateral view was done for all patients at regular intervals. The 32 hips were evaluated both clinically and radiologically. There were 3 cases with vertical subsidence. Mean Pre-operative HHS : 24.3333 (12 cases). Mean Post-operative HHS : 91.6563. There were 2 cases of limb lengthening. There was no significant changes in clinical outcomes with minimal varus/valgus stems in our study. HA coated stems give excellent results in short term follow-up. Following hip arthroplasty with HA coated stem there is no clinically significant anterior thigh pain. Long-term follow-up is required to assess the incidence of Heterotopic Ossification with this stem. Intra-operative fissures and post-operative fractures are not related to them stem design, but can be avoided with careful and less aggressive reaming of the femoral canal.

Keywords: Corail stem, Hydroxyapatite(HA), Harris hip score (Modified), Heterotopic Ossification

I. Introduction

Aim Of The Study
To assess the functional and radiological outcome of fully hydroxyapatite coated stems in hip arthroplasty.

II. Materials And Methods

• Prospective and retrospective study
• Follow up 6wks, 3mths, 6mths, 1year & then yearly
• Minimum follow up of 6 months
• Total No. of hip arthroplasties done between 2007 March and 2011 March – 44 cases (46 hips).
• Total No. of cases which met inclusion criteria – 42 cases (44 hips)
• 9 cases were lost to follow-up (Including one bilateral hip)
• 2 patients died during follow-up
• Total No. of cases in the study : 31 patients (32 hips)

3.1: Inclusion criteria
• All Total hip / Bipolar Arthroplasty with fully Hydroxyapatite coated stems

3.2: Exclusion criteria
• All cemented and partially hydroxyapatite coated stems
• Revision THR

3.3: Implant Design
• All cases were done using STANDERD CORAIL stem.
• Details:
  – Fully coated with 150Um layer of hydroxyapatite
  – Stem material - forged titanium
  – Straight stem with thin distal tip
  – Neck angle 135, 12/14 morse taper & progressive offset
  – Quadrangular cross section.
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3.4: pre-operative clinical assessment
- Preoperatively the patients were evaluated using the Harris hip score (Except in NOF #)
- The general condition of the patient including his physical and mental status, general medical condition and ability to withstand surgery is considered
- Trendelenberg test to access the abductor osseomuscular mechanism was noted

3.5: pre-operative investigations
- The complete blood count, ASO, CRP, RA Factor, throat swabs, urine analysis, chest x-ray and multi channel ECG were done as a routine.

3.6: Preoperative radiographic assessment
- X ray Pelvis with both hips AP view
- X ray of affected hip AP and Lat view
- Preoperative planning should include the use of plastic overlap templates supplied by the prosthesis manufacturers.

3.7: Surgical Approach
- In our study all hips were operated through posterior approach.

3.8: Surgical Technique
Neck Resection
- Proximal compaction before broaching
- No distal reaming = Cancellous bone is preserved
- Progressive broaching until complete stability is achieved
- Calcar milling
- Trial reduction with trial neck segment
- Definitive implant insertion
- Femoral head impaction
- Final reduction

3.9: Post-operative Evaluation
- Clinical evaluation with Harris hip score (Modified) and radiological evaluation with plain x-ray pelvis with both hips and proximal femur - AP view and x-ray of the operated hip - AP view and Lateral view was done for all patients at regular intervals.

3.10: Clinical Evaluation
- Harris Hip Score (Modified)
- Incidence of Anterior Thigh Pain was noted

IV: Results

4.1: Clinical Evaluation
There was NO clinically significant anterior thigh pain

4.2: Harris hip score [MODIFIED]

<table>
<thead>
<tr>
<th>Score</th>
<th>Cases</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>84.375%</td>
<td>27</td>
<td>Excellent</td>
</tr>
<tr>
<td>12.5%</td>
<td>4</td>
<td>Good</td>
</tr>
<tr>
<td>0%</td>
<td>0</td>
<td>Fair</td>
</tr>
<tr>
<td>3.125%</td>
<td>1</td>
<td>Poor</td>
</tr>
</tbody>
</table>

4.3: Radiological Evaluation
a) stem position:
- varus: 18.75%
- center: 12.5%
- valgus: 68.75%

b) Vertical subsidence:
- There were 3 cases with vertical subsidence

<table>
<thead>
<tr>
<th>Subsidence</th>
<th>Patient name</th>
</tr>
</thead>
<tbody>
<tr>
<td>3mm</td>
<td>Sar</td>
</tr>
<tr>
<td>2mm</td>
<td>Mal</td>
</tr>
<tr>
<td>5mm</td>
<td>Mee</td>
</tr>
</tbody>
</table>
### V: Discussion

#### 5.1: Harris hip score
- Mean Pre-operative HHS: 24.3333 (12 cases)
- Mean Post-operative HHS: 91.6563

#### 5.2: Limb length discrepancy
- There were 2 cases of limb lengthening
- Corrected using heel rise
- Harris hip score was good in both the cases

#### 5.3: Stem Position
- There was no significant changes in clinical outcomes with minimal varus/valgus stems in our study.

#### 5.4: Heterotopic Ossification
- Although the use of a “bone friendly” material like Hydroxyapatite theoretically increases the incidence of heterotopic ossification, there were no cases with heterotopic ossification in our study.
- Incidence of HO with HA coated stem was lower when compared to other types of uncemented stems, but long term follow-up is required to assess the true incidence.

#### 5.5: Dislocation
- Patient compliance was an issue
- Dementia / activity restricted to indoors
- Reviewed 3 months post-operatively with a dislocated hip
- X-ray: High riding femoral component
- Intra-operatively femoral stem was stable with good osteointegration
- Osteotomy was done to remove the femoral stem
- Excision arthroplasty was done

#### 5.6: Intra-operative fissure
- All 4 cases of intra-operative fissure was managed with cerclage wiring
- Weight bearing was delayed to 6 weeks
- Intra-operative fissure can be avoided with less aggressive reaming

### VI: Tables

**Table 1:** showing harris hip scores in percentage

<table>
<thead>
<tr>
<th>Subsidence</th>
<th>No. of cases</th>
<th>Harris hip scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>3mm</td>
<td>27 cases</td>
<td>84.375%</td>
</tr>
<tr>
<td>2mm</td>
<td>4 cases</td>
<td>12.5%</td>
</tr>
<tr>
<td>5mm</td>
<td>1 case</td>
<td>0%</td>
</tr>
</tbody>
</table>

**Table 2:** showing the vertical incidence in 3 cases

<table>
<thead>
<tr>
<th>No. of cases</th>
<th>BONE REACTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Endosteal bone apposition</td>
</tr>
<tr>
<td>2</td>
<td>Bone – reactive lines</td>
</tr>
<tr>
<td>nil</td>
<td>Periosteal bone reaction</td>
</tr>
<tr>
<td>nil</td>
<td>Pedestial formation</td>
</tr>
<tr>
<td>nil</td>
<td>Calcar resorption</td>
</tr>
<tr>
<td>nil</td>
<td>Polyethylene wear</td>
</tr>
<tr>
<td>nil</td>
<td>osteoporosis</td>
</tr>
<tr>
<td>nil</td>
<td>Heterotopic bone formation</td>
</tr>
</tbody>
</table>

**Table 3:** showing bone reaction
OUR STUDY                      JEAN PIERRE VIDALALIN    HARRIS HIP SCORE
84.3%                          0%                           EXCELLENT
12.5%                          80%                          GOOD
0%                             15%                          FAIR
3.1%                          5%                           POOR
91.6%                         85.1%                         MEAN

**Table 4:** showing various harris hip scores

<table>
<thead>
<tr>
<th>LENGTHENING</th>
<th>PATIENT DETAILS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5cm</td>
<td>Ram 73yrs/m #NOF Rt THR</td>
</tr>
<tr>
<td>1cm</td>
<td>Dan 58yrs/F AVN hip Lt THR</td>
</tr>
</tbody>
</table>

**Table 5:** showing limb length discrepancy

**VII: FIGURES**

**Case 1 - Excellent Result**

- Pt name: Muth
- Age/sex: 24yrs/ Male
- Diagnosis: B/L AVN hip
- Procedure: B/L THR
- Pre & post op HHS:
  - Right hip: 23/96
  - Left hip: 23/95
- Follow-up: 22 months

**X-rays**

Before Operation

Post Operation Right Hip

Post Operation L/L Hip

6 months post-op

12 months post-op
Clinical Photos

X-rays

Case 2 – Excellent Hip
- Pt name: Kes
- Age/sex: 58yrs/M
- Diagnosis: Chronic arthritis Lt hip
- Procedure: THR Lt
- Pre & post op HHS: 31 / 94
- Follow-up: 52 months
Clinical Photos

Case 3 – Excellent Result

- Pt name: BaK
- Age/sex: 62years/Male
- Diagnosis: AVN Left hip
- Procedure: Left THR
- Pre & post op HHS: 22/94
- Follow-up: 32 months

X-rays
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X-rays

Clinical Photos

Case 5 – Good Result

- Pt name: Bab
- Age/sex: 79 years/Male
- Diagnosis: # Neck of Femur Left hip
- Procedure: Left Bipolar
- Pre & post op HHS: NA/87
- Follow-up: 52 months
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X-rays

Pre-op # NOF Lt hip
Post-op Immediate Lt Bipolar

X-rays

52 mths post op AP & LAT Lt hip

Clinical Photos

POST OP
dHs: 87

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Case 5 – Poor Result

- Pt name: Shan
- Age/sex: 60 years/ Male
- Diagnosis: Fracture NOF
- Procedure: THR
- Pre & post op HHS: NA/49
- Complication: Dislocation

X-rays

On 20th POD patient tried to lie prone and dislocated his prosthetic hip joint.

Closed reduction attempted but not successful hence open reduction done.

Abduction splinting post open reduction.
VIII: Conclusion

HA coated stems give excellent results in short term follow-up.

- Following hip arthroplasty with HA coated stem there is no clinically significant anterior thigh pain.
- Long-term follow-up is required to assess the incidence of Heterotopic Ossification with this stem.
- Intra-operative fissures and post-operative fractures are not related to them stem design, but can be avoided with careful and less aggressive reaming of the femoral canal.