



# Three Year Follow Up of Dual Mobility Cups in Revision Total Hip Arthroplasty



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## Abstract

**Aim:** The aim of the current study was to assess the rates of dislocation and aseptic loosening of dual mobility cups (DMCs) in revision total hip arthroplasty (THA).

**Methods:** Thirty four revision THAs done between 2012 and 2014, treated with dual mobility cups, were incorporated in this retrospective study. The indications for revision were recurrent dislocation (58.8%) and aseptic loosening (41.2%). The minimum follow-up was three years. The Harris Hip Score (HHS) was used in evaluation pre and post operatively.

**Results:** At final follow-up, the mean HHS improved from 42 preoperatively to 89 postoperatively. One patient encountered an attack of dislocation four months postoperative which necessitated open reduction and the use of hip abduction brace for twelve weeks. Two patients encountered type I heterotopic ossification six months postoperative. No cases of aseptic loosening were encountered during the three year follow up period.

**Conclusion:** Dual mobility cups give promising results in revision THA regarding dislocation and aseptic loosening.

**Keywords:** Dual mobility cups; Revision Total hip arthroplasty; Dislocation; Aseptic loosening

**Abbreviations:** THA: Total Hip Arthroplasty; HHS: Harris Hip Score; SD: Standard Deviation; OR: Odds Ratio; CI: Confidence Intervals

## Introduction

The increasing demand for revision hip arthroplasty is parallel to the increased rate of primary total hip arthroplasty [1,2]. Dislocation is a chief source of failure of primary THA and the main reason for revision in the United States, in advance of infection and aseptic loosening [1]. The dislocation rate is 0.2–9% in primary THA [3,4] while in revision THA, the rate is between 5 and 25% [3,5]. Varying solutions are proposed to decrease the dislocation rate in revisions such as large diameter heads [6], constrained liners [7] and dual mobility cups [8,9]. Recently, dual mobility cups have gained great popularity all over the world. It significantly decreases the risk of dislocation in primary THA [5]. Recent literature [10,11] showed a register of 3,473 THAs with a dislocation rate not exceeding 0.4% with no recurrence. Thereby, it seems logic to suggest the use of dual mobility cups in revision THAs, as revision surgeries carry a higher risk of dislocation [8]. The hypothesis assumes that dual mobility cups offer a reliable option in revision THA. This retrospective study was designed to assess the outcomes of usage of dual mobility cups in revision THA at a minimum three-year follow-up.

## Patients and Methods

In the period from September 2012 to October 2014, 34 sequential revision THAs were done in our university hospital. These records were taken out from data collected in the registry of orthopedic department. The study recruited 20 males and 14 female patients with a mean age of 63±6.4 years. The inclusion criteria were cases of revision THA in which dual mobility cups were used. Exclusion criteria were the use of cups other than dual mobility, cases which needed stem revision, or primary THA procedure [9-11].

## Surgical Technique

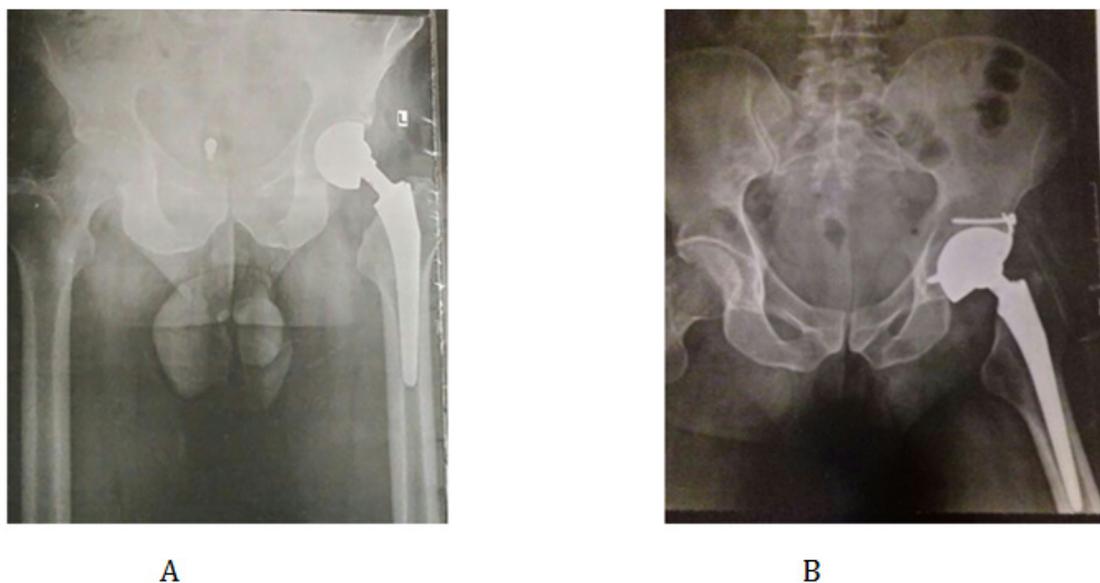
The lateral approach of the hip was the standard one used in all surgeries included in the study. The lateral position on operating table was also used in all cases. A combined spinal epidural anesthesia was used in all surgeries. The cup was removed and the acetabulum reamed. Bone grafting was carried out with either autologous iliac bone graft or a femoral head allograft if a large acetabular defect was present. The dual mobility implants were used from the NOVAE® product line

(Serf, Décines, France) in 31 cases and (LIMA dual mobility cups, Italy) were used in 3 cases. Various configurations of dual mobility cups were used including press-fit impacted cementless cup (SUNFIT TH®), cement less cup impacted with two additional anchoring pegs and one fixation screw (NOVAE E®), or cemented cup (NOVAE Stick®). A six-week non-weight bearing period was advised when a (NOVAE E®) cup was used.

In other cases, immediate weight bearing with crutches was allowed Figures 1-3. The AAOS classification system was used to assess the degree of the acetabular defect preoperatively [12]. Clinical and radiological assessment was achieved at the last follow-up using the HHS and anteroposterior x-ray view of the pelvis and both hips.



**Figure 1:** A. Pre-operative x-ray of a 56 years old male patient with recurrent dislocation of total hip prosthesis. B. Post-operative x-ray showing revision with cementless dual mobility cup and head (Lima comp) and the use of metal mesh and cancellous bone auto graft to reconstruct the floor of acetabulum.

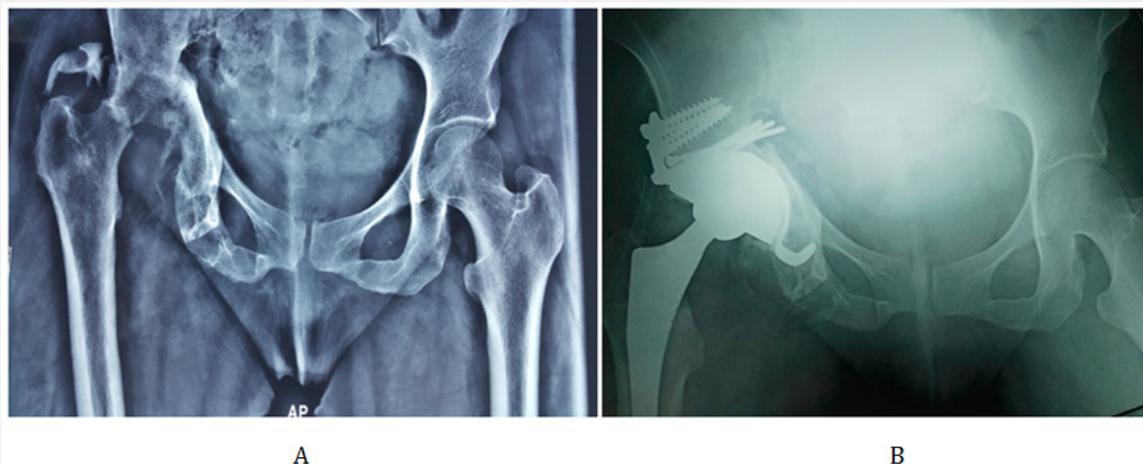


**Figure 2:** pre-operative x-ray of a 61 years old male patient with recurrent dislocation of bipolar prosthesis. B. post-operative x-ray of revision using cementless dual mobility cup with two pegs and screw (Serf comp).

### Statistical analysis

The SPSS computer program version 20 was used in statistical analysis of data. The mean and standard deviation

(SD) were considered for descriptive variables. The odds ratio (OR) was calculated with 95% confidence intervals (CI). The significance threshold was set at 5%.



**Figure 3:** A. pre-operative x-ray of a 37 years old female patient with post traumatic disruption of the acetabulum and head of femur. B. post-operative x-ray showing the use of metal acetabular ring over a femoral head allograft to reconstruct the acetabulum and then application of cemented dual mobility hip prosthesis (Serf comp).

### Results

At final follow-up, the mean HHS improved from  $42 \pm 3.2$  preoperatively to  $89 \pm 4.3$  postoperatively. One patient encountered an attack of dislocation four months postoperative which necessitated open reduction and the use of hip abduction brace for twelve weeks. One patient encountered superficial wound infection one week postoperative which responded well to wound debridement and intravenous antibiotics according to culture and sensitivity. No patient experienced intra-prosthetic dislocation. Only 2 patients (5.9%) were lost to follow-up. One patient died. Mean cup inclination in the antero-posterior x-ray was  $46^\circ$  ( $38^\circ$ - $54^\circ$ ) in last follow up. A constant 2-mm radiolucent line was observable in two patients. The line remained unchanged over time and went together with osteolysis in zones 1 and 3 or in zones 1, 2, and 3, respectively. Two cases of revision for aseptic loosening were encountered, but neither recurrent dislocation nor persistent infection were encountered in the current study. Having undergone previous surgeries before the revision procedure was significantly related to a higher dislocation risk (OR = 19, 95% CI,  $p < 0.005$ ).

Aseptic loosening of the dual mobility construct occurred in 5.9% of cases. Cementless cups had an aseptic loosening rate of 0%, while cemented cups (2 out of 7 cases) had a 28.6% rate (OR = 14,  $p = 0.0001$ ). Other than, these two cases of surgical revision, there were no anomalous fixation-related findings on the x-rays for the SUNFIT TH® and NOVAE E® cups. On the other hand, using a cemented cup in a reinforcement ring together with bone graft was related with unusual x-ray findings (fracture of hook or screw) in 2 cases. These oddities were not clinically symptomatic during three years of follow-up and did not necessitate any surgical revision.

### Discussion

The indication of dual mobility prosthesis is based on its intrinsic stability. The current study confirmed this perception

in patients at high-risk: revision THA. The risk of dislocation at three years was 0% when all factors for revision were pooled which was consistent with published dislocation rates of 0–10.4% [13-16], whereas the literature reports rates between 5 and 20% for single mobility bearings [3]. Comparisons between studies are challenging because patients and indications differ clearly from one study to another. Schneider et al. [15] stated a 10.4% dislocation rate when using a cemented cup inside a reinforcement ring in 88 cases (62 stage III, 26 stage IV). Stedman et al. [17] described another risk factor for dislocation which was the high rate of unipolar revision (73%), but this high percentage was not found in the current study. After revision hip arthroplasty, the first attack of dislocation always happened within six months. When using a dual-mobility cup in primary THAs, the risk of dislocation is restricted to the first postoperative three months with no recurrence [11]. In revision, about two-thirds of patients with an attack of dislocation will experience recurrence. Because of this, it is wise to let all patients who experienced an attack of dislocation wear a hip abduction brace for three months. Dual mobility cups are the most operational anti-dislocation method and look superior to constrained liners [7].

Reconstruction of tensor fascia lata [18], which stabilizes hips in over 50% of complicated cases, looks practical as a last effort to manage instability. The jumping distance [19] signifies the prosthetic stability of any system. The risk of dislocation is inversely related to this distance [19]. The jumping distance in the dual mobility system is much more than that of any traditional acetabular cup construct. Unthinkingly, the dual mobility system is the most stable construct. Nevertheless, the surgeon must follow firm rules during insertion and orientation of a dual mobility cup. Wegrzyn et al. [20] reported incorrect cup orientation in 50% of dislocation cases ( $n = 5/10$ ) out of the 994 revision THAs at a seven-year follow-up (1.5% dislocation rate). In the current study, the overall recurrent dislocation rate was

0% at three years. Management of recurrent dislocation using dual mobility cups has been previously reported. Leclercq et al. [17] emphasized the significance of dual mobility with only one attack of dislocation out of 13 revisions done for recurrent dislocation. The efficiency of dual mobility was reported in many papers [16,18,20-24], with recurrent dislocation rates ranging from 0 to 4.8%. Wegrzyn et al. [25] reported good results with a dual mobility cup cemented in a Kerboull cross. It is obvious that using a cementless cup in the most complicated cases would increase the revision rate.

Nevertheless, this conclusion did not push me to meticulously use a reinforcement ring since acceptable primary stability can be accomplished using a cementless cup of the same size. It is established that when more than 70% of the cup is covered with living bone was adequate to gain secondary fixation; the remaining 30% of the cup could be covered with bone graft. The bilayer titanium-hydroxyapatite coating [26] of the cup in revision hips, made it likely to gain the same secondary fixation that in primary THA [27]. The main limitation of the current study was that the sample size was not large enough to detect significant differences between subgroups (cemented and cementless) [28-37]. This study revealed that dual mobility cups are applicable, whatever the indication for revision THA. The isolated dislocation rate was 2.9% and the recurrent dislocation rate was 0% in patients with higher risk of dislocation.

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