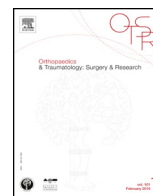




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Original article

Dual mobility cup in revision total hip arthroplasty: Dislocation rate and survival after 5 years



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ABSTRACT

Background: Dislocation is a common complication of total hip arthroplasty (THA), particularly when performed as revision surgery. Dual mobility cups (DMCs) minimize the risk of instability when implanted during primary THA. However, their usefulness and survival in revision THA remain unclear. We therefore conducted a retrospective study to assess DMC stability and survival at a minimal follow-up period of 5 years after revision THA.

Hypothesis: The dislocation rate associated with DMCs for revision THA is similar to that seen after primary THA.

Materials and methods: Cup exchange with implantation of a DMC was performed in 71 patients (74 hips) between 2000 and 2007, for the following reasons: recurrent dislocation ($n=22$), aseptic loosening ($n=38$), and infection ($n=14$). The DMCs were cemented in 47 cases and cementless in 27 cases. The clinical variables (Merle d'Aubigné-Postel score and Harris Hip Score) and radiological findings were collected retrospectively from the medical records and compared with those obtained at the last follow-up visit.

Results: Of the 74 cases, 2 were lost to follow-up. At last follow-up, the mean Merle d'Aubigné-Postel score was 15.2 (11–18) and the mean Harris Hip Score was 80.4 (51–98). Of the 8 failures, 2 (2/72, 2.7%) were related to mechanical factors (1 case each of aseptic loosening and dislocation) and 6 were changed because of infection (recurrent infection, $n=4$). Mechanical failure was not linked to a specific reason for revision THA. A radiolucent line was visible in 4 cases but this finding was not associated with clinical manifestations. When failure was defined as cup revision for any non-infectious complication, 5-year implant survival was 99% (95% confidence interval, 93–100%).

Discussion: Use of a DMC in revision THA was associated with a slightly higher dislocation rate (1/72, 1.4%) than in primary THA, whereas 5-year survival was comparable. Cemented DMCs were not associated with a greater risk of loosening.

Conclusion: DMCs are useful to decrease the risk of dislocation in revision THA performed for any reason. The low rate of loosening indicates that DMCs do not result in high stresses at the bone-implant interface.

Level of evidence: IV, retrospective study.

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1. Introduction

The dual mobility cups (DMC) designed by Gilles Bousquet are used in an expanding range of indications. This implant has been demonstrated to improve hip stability in primary total hip arthroplasty (THA) [1–7] and recurrent hip dislocation after THA [8–12].

Less is known about DMC outcomes in revision THAs performed for reasons other than recurrent dislocation [13–17], although these procedures carry a high risk of postoperative hip instability [18,19]. Other implant designs, such as the retentive cup and the large-diameter femoral head, decrease the risk of hip instability but are often associated with high rates of wear and loosening [20,21].

We therefore conducted a retrospective study to determine whether:

- DMCs used for revision surgery were associated with similar dislocation rates to those seen with DMCs for primary THA;
- DMC survival after revision surgery.

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We hypothesised that dislocation rates with DMCs were similar after primary and revision THA.

2. Materials and methods

2.1. Patients

The inclusion criteria were implantation of a DMC during cup exchange surgery and a follow-up of at least 5 years. Starting in the 2000s, growing interest in DMCs prompted us to use this cup design for revision THA. Between 2000 and 2007, 74 DMCs were implanted for cup exchange in 71 patients. During the same period, cup exchange was performed with other cup designs in 114 patients. The reasons for choosing a DMC were older age and risk factors for hip instability (i.e., multiple revisions or revision for hip instability or infection). The reasons for cup exchange were recurrent dislocation ($n=22$), aseptic dislocation ($n=38$), and infection ($n=14$, with one-stage procedure in 11 cases and two-stage procedure in 3 cases).

The 44 females and 27 males had a mean age of 67.9 ± 9.3 years (range, 38–90) at revision surgery. In 2 females, aseptic loosening required bilateral cup exchange. Another female underwent bilateral cup exchange, for recurrent dislocation on the right side and aseptic loosening on the left side.

2.2. Methods

Three DMC designs were used: DMSTM (cobalt-chromium, cemented; SEM, Paris, France) in 47 cases, EvoraTM (cobalt-chromium coated with hydroxyapatite coating, cementless; SEM) in 23 cases, and revision MobilitéTM (coated with hydroxyapatite, cementless; Tornier, Saint-Ismier, France) in 4 cases. In patients with good-quality bone after reaming and without bony defects, a cementless implant was used ($n=27$). Poor bone quality required a cemented implant in 47 cases, including 23 in which the presence of a bony defect prompted the use of a GanzTM Reinforcement Ring (Zimmer, Warsaw, IN, USA) and defect filling with allogeneic bone. The postero-lateral approach was used in all 74 cases.

2.3. Outcome assessment methods

The clinical data (Postel-Merle d'Aubigné [PMA] [22] score and Harris Hip Score [23]) and radiological findings were collected retrospectively from the medical records and compared with those obtained at last follow-up visit. The set of radiographs consisted of an antero-posterior view of the pelvis and antero-posterior and lateral views of the operated hip. Granuloma-related osteolysis and radiolucent lines in the acetabulum were evaluated on serial radiographs in the DeLee and Charnley zones [24]. Loosening was defined as more than 3° of change in the cup inclination angle or more than 3 mm of cup migration [9].

2.4. Statistical methods

Kaplan–Meier survival curves were plotted with the 95% confidence intervals (95% CIs), using StatView 3.0 (Abacus Concepts, Berkeley, CA, USA) and R 2.10.1 (R Foundation for Statistical Computing, Vienna, Austria). The Kaplan–Meier method was applied to analyse survival, using two definitions of failure, i.e., surgical cup revision for any reason and surgical cup revision for non-infectious reasons. The survival analysis included computation of the 95% CIs, until the interval including at least 30 study cases.

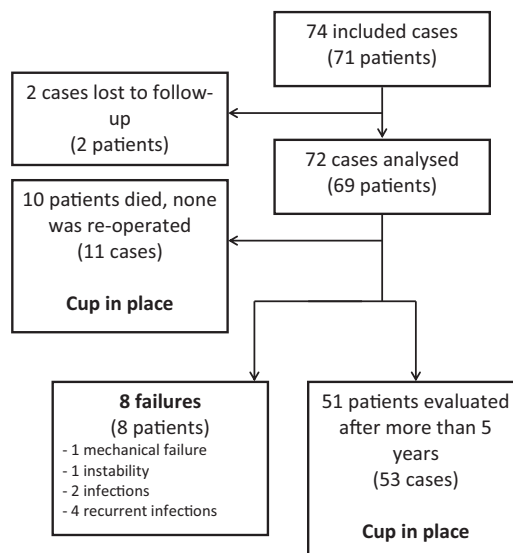


Fig. 1. Patient flow chart.

3. Results

Of the 71 patients (74 hips), 51 (53 hips) were re-evaluated. Mean follow-up in these 53 cases was 87.6 months (range, 60–137 months). Only 2 patients (2.7%) were lost to follow-up; both still had their DMC at last follow-up after 15 and 41.5 months, respectively. In addition, 10 patients (11 hips) died, at a mean of 38 months (range, 6–80 months) after revision surgery, without any instances of re-operation or dislocation.

Of the 72 assessable cases, 8 underwent removal of the DMC. In 6 (8.3%) cases, DMC removal was required because of infection (recurrent infection, $n=4$) after a mean follow-up of 15.7 months (1–55 months). In the 2 (2.7%) remaining cases, the reason for DMC removal was mechanical: aseptic loosening in 1 (1.4%) case, after 117 months; and dislocation of the large joint in 1 (1.4%) case, requiring reduction by external manoeuvres under general anaesthesia 10.5 months after cup exchange for hip instability. No links were obvious between these failures and any of the three cup designs used. No patients experienced intra-prosthetic dislocation.

Of the 51 patients (53 hips) with no cup exchange during a follow-up of at least 5 years, 8 (8 hips) were not re-evaluated clinically and had no follow-up radiographs after at least 5 years (Fig. 1). Thus, 43 patients (45 hips) were evaluated. The mean PMA score was 15.2 ± 2 (11–18) and the mean HHS was 80.4 ± 12.9 (51–98) (Table 1). Mean cup inclination in the coronal plane was 44.6° (38° – 54°). There were no radiolucent lines in 40 cases, including all 23 cases managed with a GanzTM Reinforcement Ring (which consistently produced strong fixation). A continuous 2-mm radiolucent line was visible in each of 4 asymptomatic patients. In 2 of these cases (MobilitéTM and DMSTM in 1 case each), the line remained stable over time and was associated with osteolysis in zones 1 and 3 or in zones 1, 2, and 3, respectively. Progression of the line was documented in the other 2 cases (DMSTM in both), which were associated with osteolysis in zones 1 and 2 or in zones 2 and 3, respectively. In a 60-year-old woman who was asymptomatic (PMA = 18; and HHS = 98), migration over more than 3 mm was noted 123 months after EvoraTM cup implantation, as well as polyethylene wear and acetabular osteolysis in zones 1, 2, and 3.

When failure was defined as revision surgery for any reason, the 5-year implant survival rate was 90% (95% CI, 84–95%) (Fig. 2). A major reason for failure was infection ($n=6$, 8.3%), a complication not directly related to the implant. When failure was defined as revision for non-infectious reasons, 5-year implant survival was

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