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ORIGINAL ARTICLE

Acetabular revision of total hip arthroplasty using a press-fit dual mobility cup

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KEYWORDS
Acetabular revision;
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Summary
Introduction: Dual mobility cups are especially indicated in total hip replacement revision, the risk of recurrent instability being greater than in primary surgery. In revision, however, primary cup fixation is uncertain without routine anchoring screws.
Hypothesis: The stability of dual mobility cups impacted without cement, supplementary screw(s) or anchoring pegs fixation is satisfactory in total hip arthroplasty acetabular component revision, and prevents instability accidents.
Patients and methods: Twenty three patients were operated on by the same surgeon between January 1999 and December 2006 and prospectively followed up to a mean 4½ years (range, 2—10 yrs). A Collégia™ cup (Wright Medical France, Créteil, France) was impacted in 23 total hip arthroplasty acetabular component revisions, including 17 cases of SOFCOT grade-1 bone-stock loss and six of grade 2.
Results: There were six clinically poor results on the Merle D'Aubigné scale. One case of early migration occurred, in a multioperated acetabulum. There was one isolated dislocation and one recurrent dislocation associated with loose greater trochanter nonunion, but tolerated as it was infrequent.
Discussion: This option simplifies revision surgery and limits the risk of dislocation if the abductor muscles unit is continuous. It is indicated when local bone-site compromise encompass a wall-contained cavitary defect at most. A medial wall defect, if moderate, does not in our view preclude using a primary cup, impacted with a certain degree of protrusion. Longer-term follow-up will be needed to confirm these medium-term findings.
Level of evidence: Level IV. Prospective non comparative therapeutic study.

Introduction

Dual mobility cups are especially indicated in total hip replacement revision, the risk of recurrence of instability being greater than in primary surgery [1—6]. Their useful-

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ness in reducing postoperative dislocation rates has been fully demonstrated in primary surgery [7—9], and Langlais et al. [10] have extended this indication to revision. In their series, the dual mobility cups were cemented into Kerboull cross-plates: this assembly is necessary in order to combine bone reconstruction with lasting fixation in case of severe loss of acetabular substance [10].

Cementless fixation of large cups, following the recommended procedure for standard implants (simple impaction), is hard to extend to revision surgery. Primary fixation is uncertain, and is usually reinforced by secondary screws, although their precise role is debatable [11]. Moreover, this attitude is difficult to apply with a dual mobility cup, the inner surface of which has to be kept smooth, with no sharp edges such as screw-heads affecting the mobile polyethylene insert. There remain dedicated revision cups, with extra-acetabular fixation enabling support to be found in various areas around the acetabulum, but which are hard to fit in simple revision without reconstruction and the effectiveness of which, moreover, has yet to be demonstrated.

Primary cups, without secondary screws, thus seem to have limited role to play in revision surgery. There are, however, cases of revision in elderly subjects on moderate loss of substance where implanting a primary cup without reconstruction greatly simplifies surgery [12], especially when the time needed for femoral component revision is long.

We explored this option by implanting cementless primary dual mobility cups without reconstruction or secondary screwing in a series of 23 patients without history of sepsis, operated on by a single surgeon (PM) between January 1999 and December 2006, prospectively followed up for a mean 4½ years (range, 2—10 yrs). This series was just a small part (10%) of the aseptic revision surgery performed by the main author over the same period, the technique used in the other 90% being acetabular structural allograft reconstruction with (85%) or without (5%) cement. Patients were selected on peroperative criteria as observed after removal of the previous cup and cleaning of the fibrous membranes: integrity of the lower third of the medial wall (to provide a support at the ischiopubic notch), and absence of segmentary loss of anterior and posterior acetabular wall substance that would impair coverage of the new cup. The aims were: to define indications for this type of implantation in terms of observed acetabular bone damage, to report clinical results, notably in terms of hip stability, and to assess medium-term radiographic cup fixation.

Patients and methods

Patients

A primary Collégia™ cup (Wright Medical France, Créteil, France) was used in 23 total hip arthroplasty revisions involving acetabular component replacement. The stainless steel cup included hemispheric reinforcement with rough macrostructures. The hydroxyapatite-coated dome was in corundum, without surface porosity.

All 23 patients were operated on by the same surgeon. Mean age at revision was 68 years (range, 43—90 yrs); 16 female, seven male. Sixteen were assessed as Charnley class A, and seven as class C. Eighteen had been first operated on for hip osteoarthritis (four posttraumatic, one congenital dislocation), two for idiopathic necrosis, one for hip involvement in a spondylotic ankylosis, and two secondary to femoral neck fracture. Revision was for recurrent instability in six cases, aseptic loosening in 16 (including four with bipolar involvement), and analgesic-resistant psoas irritation (psoas/cup conflict) in one. Seven patients had had at least two previous implants.

Surgical procedure

Surgery used a posterolateral approach (with trochanterotomy in four cases, two involving former trochanteric nonunion). Bone damage was assessed peroperatively on the SOFCOT scale [13] after removal of the previous cup and cleaning of pseudomembranes: there were 16 grade-1 cases (general cavitary defect) and seven grade-2 (conserved anterior and posterior walls but with medial wall defect). After reaming down to live bone, a cup trial component of adequate dimensions was inserted anatomically, without impaction, blocked at the edge to provide an impaction chamber behind the dome. The Collégia™ cup was then impacted, without reconstruction, and complete coverage without anterior protrusion was checked. Mean cup diameter was 52 mm (range, 44—62 mm). In 16 cases, the femoral component revision was performed in the same step, using cemented primary implants except in three cases requiring long stems (two cemented and one cementless). Head diameter (chrome cobalt) was 22 mm in 17 cases and 28 mm in six. The two trochanteric nonunions were fixed using a tension band method.

Postoperatively, immediate weight-bearing was allowed except in the four cases of trochanterotomy, where three months' non-weight-bearing was prescribed.

Assessment

Follow-up was prospective; clinical (Merle D'Aubigné score [14]) and X-ray data were entered in a computer file at 45 days, 6 months, 1 year and then every 2 years. Cup center position was calculated on AP pelvis views using an orthonormal frame for each side: the *x*-axis was the horizontal tear-drop line and the *y*-axis was the vertical line through the tear drop. Comparison with the healthy side assessed cup center deviation from the anatomic reference position. Cup stability was assessed on an AP pelvis view with constant 110% magnification, measuring the vertical distance between cup center and the tear drop-line, following Massin et al. [15]. The bone/implant interface was examined for radiolucency at the cup-edge, not seen on the immediate postoperative image, in the three Charnley zones.

A reminder was sent out to patients at the time of the study; full follow-up (i.e., at least one FU consultation during the last 2 years of the study) was obtained in 19 cases, four patients having died.

A Wilcoxon test was used to compare preoperative and end-of-follow-up clinical scores.