



Clinical and radiological results of the stemmed Mc Minn cup in hip revision surgery

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Results with the stemmed McMinn acetabular cup in revision total hip arthroplasty with acetabular defects have been scarcely reported. We report our experience and radiological outcome with the stemmed cup in three Dutch orthopaedic departments.

Twenty four patients with a median age of 69 years were operated between 1999 and 2005. Immediate postoperative radiographs were evaluated and compared with those at follow-up.

The center of rotation was restored in 75% of the hips. Adequate alignment was seen in 71%. The mechanical failure rate was 38%. The cup was removed because of sepsis in three patients. Two patients had a dislocation (1 chronic). After 5 years, definite radiological loosening of the prosthesis was noted in 4 patients.

Keywords: McMinn cup ; stemmed cup ; acetabular reconstruction ; revision THA.

INTRODUCTION

Revision of a severely deficient acetabulum is a delicate task and is technically demanding (2,3,6,10,13,14). The treatment of uncontained defects is usually conducted with reinforcement devices, structural bone grafts and meshes (6,8,13,14). The configuration of the stemmed McMinn acetabular component is based on the presumption that the iliopubic bar of the pelvis remains intact, even in major acetabular defects. This device provides conditions for initial stability and fixation without

structural bone grafts and facilitates restoration of the original center of rotation. Literature is ambivalent on the results of this component (2,3,6,10).

The aim of this study is to evaluate the initial experience and radiological outcome with the stemmed cup in three Dutch orthopedic departments.

PATIENTS AND METHODS

The stemmed McMinn component is a Tilastin® alloy (Ti6, Al4, V) conical cup with a tapered fluted stem and a modular polyethylene insert (Link, Hamburg, Germany)

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Fig. 1. — Postoperative AP radiograph of a hip after cementless revision arthroplasty with a modular W link femoral stem and a McMinn stemmed cup.



Fig. 2. — Follow-up AP radiograph of a hip revised with a cementless Wagner stem and a McMinn stemmed cup, which is loose and has undergone marked proximal migration.

(fig 1). The cup outer surface is either macro porous or hydroxyapatite coated, the stem is not coated. External diameter (45/50/55 mm), insert (22/26/28/32 mm) and stem length (45/65/85) are variable. The design of the cup is based on the initial Ring cup that was implanted in the 1960s. The stemmed cup originates from the observation that the bone between ilium and ischium anterior to the greater sciatic notch is generally intact even in the severely deficient acetabulum. Pelvic discontinuity is therefore a contraindication for placement of this acetabular device. The stem of the uncemented component finds support in intact bone while the conical micro porous or HA-coated cup acts as a scaffold for the bone graft.

All acetabular revisions or total hip revisions with the stemmed Mc Minn cup performed in three Dutch hospitals between 1999 and 2005 were collected. Patient records and peri-operative radiographs were searched for demographic data, initial diagnosis, prior surgery and scored for preoperative acetabular defects.

Postoperative radiographs were evaluated and measurements were based on comparisons of the hip and pelvic radiographs carried out postoperatively and at follow-up. Good alignment was defined as anteversion measured on AP pelvis and AP hip, and inclination between 30 and 60° measured on AP pelvis. For an adequate restoration of the center of rotation the distal edge of the cup had to be less than 30 mm above the teardrop line. Loosening was defined as cranial migration of 5 mm, or rotation of 10° on the AP radiograph compared to the direct postoperative radiographs. Heterotopic periarticular ossifications were graded according to Brooker (7). Clinical and radiological assessment was conducted after 6 weeks, 3 and 6 months, one year and annually thereafter.

Patients were classified according to Charnley : A (unilateral hip problem, no additional impairment), B (bilateral hip problem, no additional impairment) and C (multiple joint problem, other problems that impair mobilisation). Based on preoperative radiographs and

intraoperative observation, the acetabular defects were rated according to the AAOS classification.

The surgical procedure involved a posterolateral approach and was performed by three experienced surgeons. After subperiosteal exposure of the greater sciatic notch, a guide wire was passed from the acetabular centre into the bar of bone between ilium and ischium using an aiming device. Cannulated reamers were used to prepare the trajectory of the cup. The stemmed cup was subsequently implanted and morcellized bone grafts were packed around the external conical part. Patients were subsequently mobilized with gradually increasing weight bearing for 3 months and fully thereafter. All patients received peri-operative antibiotic prophylaxis and 6-12 weeks thromboprophylaxis (either LMWH or acenocoumarol).

RESULTS

Twenty-four acetabular revisions using a stemmed cup were performed in 19 female and 5 male patients with a mean age of 69.5 years (39-86). Average follow-up was 4 years (range : 1-8).

Revision of the acetabular component was indicated for aseptic loosening (18 cases), periprosthetic femoral fracture with aseptic loosening of the acetabular component (2), acetabular fracture with primary reconstruction (1), loosening of a protrusion shell (2) and recurrent dislocation (1). The femoral component was also revised in 11 of the 24 procedures, in nine cases because of aseptic loosening and in two after a periprosthetic fracture.

According to the Charnley classification 11 patients were class A, 3 class B and 10 class C. Acetabular defects were graded type 2 in 9 cases, type 3 in 14 cases and type 4 (pelvic discontinuity) in one case. No patients were lost to follow-up. Seven patients had died from unrelated causes and had been asymptomatic until their last follow-up.

Recent radiographs were compared to those made postoperatively. The immediate post-operative radiographs showed an adequate center of rotation in 18 hips (75%) ; in 6 cases the center of rotation could not be restored because of inadequate acetabular bone stock or perforation of the medial acetabular wall. Adequate alignment (inclination and anteversion) was seen in 17 cases (70%). In all the 6 cases in which the center of rotation could not

be restored, the optimal inclination and anteversion could not be restored either. In one patient with correct center of rotation the inclination was inadequate (table I).

At final follow-up, six patients had a radiologically loose acetabulum (fig. 2).

Intra-operative problems with drill guide positioning occurred in six patients, resulting in penetration of the iliac bone. Three of these patients did not have an adequate position of the cup on postoperative radiographs. There was no surgery related mortality.

Despite reasonable results on radiographs the clinical outcomes were slightly better than expected in terms of pain and function. Persistent infection in three patients necessitated removal of the prosthesis, resulting in a Girdlestone situation. Two patients dislocated, one immediately postoperatively and one after 9 months as a result of migration of the acetabular component. After closed reduction the course was uneventful in the first patient ; in the second patient chronic dislocation was accepted. In 4 cases definite loosening was noted with migration of the cup ranging between 2 to 10 cm. The overall mechanical failure rate was 38% (9 of 24, including the dislocations) within the study period.

DISCUSSION

Inadequate bone stock is a major problem in revision acetabular surgery, and many treatment options are available. Cemented acetabular revisions are fraught with high failure rates (3,12,13) ; they may remain appropriate for the cavity deficient acetabulum (2,3).

The combination of impacted morselized allograft and cement has reportedly produced diverging results, depending on the degree of containment of the defect (3,12,13,14). Cementless acetabular components give satisfactory results but are not suited for the severely deficient acetabulum. Contraindications for the use of cementless acetabular components include lack of intrinsic mechanical stability, less than 50% host bone contact, radiation necrosis or pelvic discontinuity (11). Reconstruction rings are an option but results depend on the status of the rim and medial wall (1).

Table I

Patient #	Center of rotation restored	Alignment	FU (years)	Migration	Perforation	Loosening
1	Yes	Good	6	No	No	No
2	Yes	Good	6	No	No	No
3	No	Not good	5	Yes	No	Yes
4	No	Not good	5	Yes	Yes	No
5	Yes	Good	3	No	No	No
6	No	Not good	8	Yes	No	Yes
7	Yes	Good	3	Yes	No	Yes + disloc
8	Yes	Good	1	No	No	Yes
9	Yes	Good	1	No	No	No
10	Yes	Good	7	No	No	Yes
11	No	Not good	2	Yes	Yes	No
12	Yes	Good	4	No	No	No
13	Yes	Good	1	No	No	No
14	Yes	Good	1	No	No	No
15	Yes	Good	4	No	No	No
16	No	Not good	3	No	Yes	No
17	Yes	Good	6	No	Yes	No
18	Yes	Good	2	No	No	No
19	Yes	Not good	5	Yes	No	Yes + disloc
20	Yes	Good	5	No	No	No
21	Yes	Good	4	No	Yes	No
22	No	Not good	1	Yes	No	Yes
23	Yes	Good	6	No	No	No
24	No	Not good	0	No	Yes	Yes

Eisler *et al* reported poor results with this stemmed acetabular component. They used the device in a limited number of type 4 defects (6). Badhe *et al* noted results that justified their continued use of the stemmed prosthesis (2,3).

The reason for our poor results may be the high percentage of second and third revisions (20%). Each revision becomes more difficult and the number of septic complications increases. Although the McMinn cup is not designed for type 4 defects, we implanted a stemmed cup in a patient with a type 4 defect, which resulted in migration of the stemmed component.

It is uncertain if perforation or partial perforation of the stem has influence on the outcome. In case of perforation it creates a problem with centralization of the acetabulum. We encountered intra operative problems with positioning of the guide wire in 6 cases, which was considered a learning curve

effect. The iliac bone was penetrated, which probably resulted in a lack of primary iliopubic fixation. Adequate primary fixation was only achieved in 50% of the cases.

Despite the poor radiological findings, the clinical results were acceptable considering the severity of the preoperative acetabular deficiency.

Despite the small size of this series of patients, failure of the McMinn cup can be predicted in situations of massive destruction of the acetabulum, a second or third revision, perforation of iliac bone by the guide wire and inadequate positioning of the cup. It appears that no implant, even a stemmed acetabular component can give satisfactory results in type 4 acetabular defects. Suggestions to improve the McMinn prosthesis could be coating of the stem for better fixation in the iliac bone and additional holes in the shell for additional screw fixation.

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