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Revision Arthroplasty

Revision Total Hip Arthroplasty Using a Cementless Cup Supporter and Iliac Autograft: A Minimum of 15-Year Follow-Up

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ABSTRACT

Background: Bone deficiency in revision total hip arthroplasty is a surgical challenge. The Murata-Chiba cup supporter (MC support ring) is an acetabular component supporter for a cementless porous-coated cup. The purpose of this study is to examine the clinical and radiographic outcomes of reconstruction of acetabular bone deficiency using iliac autografts supported by an MC support ring in a revision setting with minimum 15-year follow-up.

Methods: Fifty-nine consecutive revision total hip arthroplasties (57 patients) using the MC support ring were followed for a minimum of 15 years. Nine hips had American Academy of Orthopaedic Surgeons type II deficiency and 24 had type III defects of the acetabulum. Clinical outcomes were evaluated using the Harris hip score. Radiographic evaluation included assessment for loosening and bone graft incorporation. Kaplan-Meier survival analysis was performed.

Results: At a minimum 15-year follow-up (mean, 17.6 years), 32 patients (33 hips) were alive, 17 patients (18 hips) were deceased, and 8 patients (8 hips) were lost to follow-up. The mean Harris hip score improved from 44.3 to 77.2 at final follow-up. Four hips required reoperation due to deep infection (2 hips) and liner dissociation (2 hips), but no acetabular components were revised for aseptic loosening. Incorporation of the bone graft occurred in all cases. One unrevised patient had radiographic failure. Survivorship at 15 years with re-revision or radiographic failure as the end point was 90.6% (95% confidence interval, 83.0%-98.8%).

Conclusion: The reconstruction of acetabular bone deficiency using autografts supported by an MC support ring provided satisfactory clinical and radiological results at 17.6 years postoperatively.

In revision total hip arthroplasty (THA), bone loss due to loosening and migration of the acetabular component makes fixation of a new implant difficult, and restoration of acetabular bone stock is one of the most important factors affecting the outcome. Many techniques have been described to reconstruct extensive acetabular defects, including use of a cemented polyethylene component with impaction allografting [1,2], structural allograft with a reconstruction cage [3], jumbo components [4], tantalum augmentation with a cementless cup [5,6], an acetabular reinforcement ring with or without a bone graft [7–9], and the cup-cage construct [10,11].

Early experience with cemented acetabular revision in the 1980s was disappointing [12–15], and this led to the development of the Murata-Chiba cup supporter (MC support ring; Zimmer, Warsaw, IN) in 1992. The MC support ring is a metal smooth supporting ring (Fig. 1) for use with a cementless porous-coated cup (Harris-Galante I, II and Trilogy Cup; Zimmer). We have used this ring with autograft in revision THA since 1993. The ring has no potential for bone ingrowth, but protects grafted bone through screw fixation to the pelvis, thereby partially protecting the grafted

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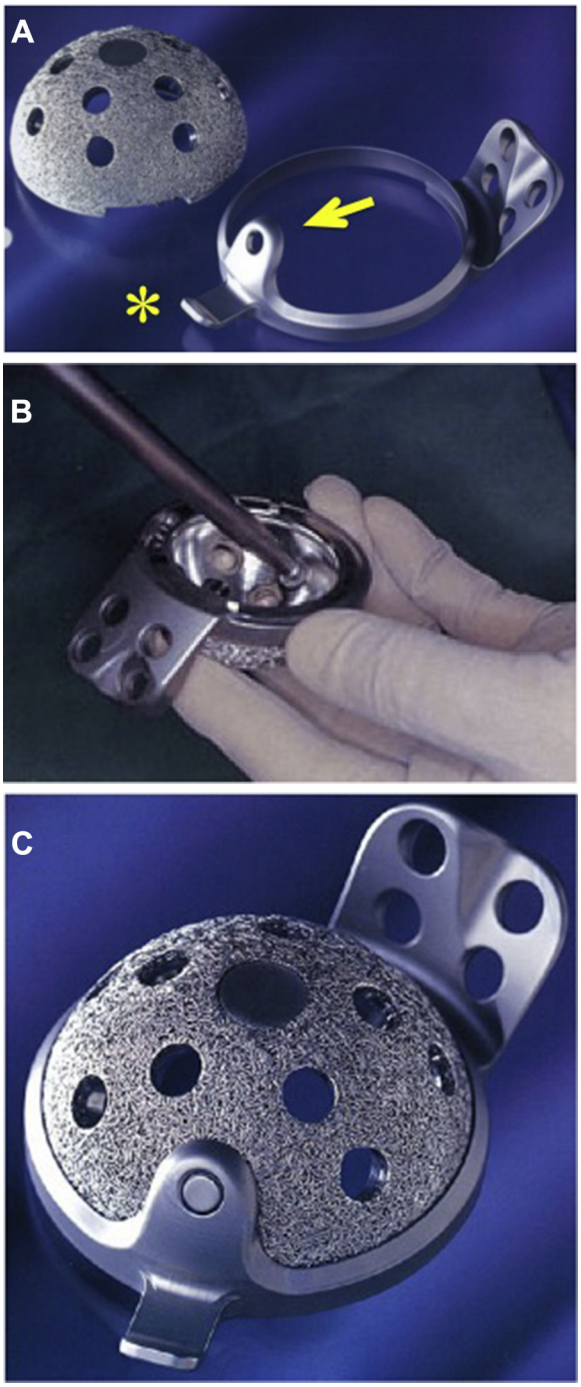

Fig. 1. (A) The Murata-Chiba support ring. On the small flange side, there is a screw hole (arrow) to fix a cementless cup. *Inferior hook. (B, C) The unified MC cup supporter.

bone from excessive loading during the incorporation and remodeling processes. Hence, this device permits bone ingrowth into the porous-coated cup and bone stock restoration, similarly to the cup-cage construct.

Matsuno et al [16] reported good midterm results using the MC support ring in the treatment of protrusio acetabuli in patients with rheumatoid arthritis. However, the long-term results of reconstruction of acetabular bone defects in revision THA with this ring have not been described. The purpose of this study was to evaluate the long-term clinical and radiological results of acetabular reconstruction using an MC support ring, autograft, and a cementless porous-coated acetabular cup in patients with a minimum follow-up of 15 years.

Materials and Methods

MC Support Ring

The MC support ring (Fig. 1) is a titanium ring with a large superior flange that is fixed to the iliac bone and a small inferior hook that is placed around the anteroinferior rim of the acetabulum. The ring is available in sizes ranging from 46 to 60 mm and is used with a Harris-Galante I, II and Trilogy multihole cup of the same size.

Patients and Follow-Up

The study was conducted as a retrospective medical record review of 59 consecutive revision THAs in 57 patients performed between February 1993 and June 2001, using cementless acetabular cups and autograft supported by an MC support ring. Eight patients (8 hips) were lost to follow-up at less than 15 years postoperatively. In these patients, complications or instabilities with mechanical failure of acetabular reconstruction were observed over a mean follow-up period of 6.0 years (range, 0.8-12.0 years). Seventeen patients (18 hips) died from causes unrelated to the index revision surgery within 15 years. The mean age at death was 80.1 years (range, 57-96 years). Two of the deceased patients had periprosthetic infections at 4 and 84 months after revision surgery, respectively. One died of pneumonia at age 88, twelve years after resection arthroplasty, and the other died of liver cirrhosis due to chronic hepatitis C infection at age 63, nine years after resection arthroplasty. These 26 hips were included in the analysis of survivorship and related complication. The remaining 32 patients (33 hips) were reviewed clinically and radiographically (Table 1). The mean follow-up was 17.6 years (range, 15.0-22.9 years). The study was approved by our hospital institutional review board.

In 91% of the hips, the original diagnosis was osteoarthritis secondary to acetabular dysplasia. The indication for revision was aseptic loosening in 25 hips (76%) and proximal migration of bipolar hemiarthroplasty in 8 hips (24%). There was no case of infection, dislocation, or acetabular fracture in the cohort. The Charnley classification [17] was used for the assessment of comorbidity: category A, ipsilateral joint arthroplasty; B1, ipsilateral joint arthroplasty with degenerative change in the contralateral hip; B2, both hips replaced; and C, multiple joint disease or other

Table 1
Details of the 33 Revision Total Hip Arthroplasties.

Total patients	32
Sex	Female 26, male 7
Total hips	33
Side	Right 20, left 13
Age at operation (y)	54.1 ± 11.2
Height (cm)	154.6 ± 7.7
Weight (kg)	55.1 ± 9.0
Original diagnosis	OA 30, FNF 2, AVN 1
Initial arthroplasty	THA 19, BHA 8, THARIES 6
Diagnosis for revision	Loosening 25, Mig. BHA 8
Number of previous surgeries	One 29, two 4
Charnley category	A 13, B1 12, B2 7, C 1
AAOS type	II 9, III 24
Paprosky type	IIA 8, IIB 8, IIC 2, IIIA 12, IIIB 3

OA, osteoarthritis; FNF, femoral neck fracture; AVN, avascular necrosis of femoral head; THA, total hip arthroplasty; BHA, bipolar hemiarthroplasty; THARIES, total hip articular replacement by internal eccentric shells; Mig. BHA, migration of BHA; AAOS, American Academy of Orthopaedic Surgeons.