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Cementless cup supporter for protrusio acetabuli in patients with rheumatoid arthritis

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Abstract The MC cup supporter is an acetabular reinforcement ring for the Harris-Galante (HG) cementless porous-coated socket. This supporting ring has been used with autogenous bone graft since 1991 in the management of protrusio acetabuli in patients with rheumatoid arthritis (RA). We have reviewed 15 hips in 13 patients at an average of 53.6 months (range 24–84 months) after operation. The clinical results of total hip arthroplasty (THA) in protrusio acetabuli using this ring were satisfactory. All grafts appeared to have united radiologically with no radiolucent lines between graft and acetabulum.

Résumé L'armature MC a été mis au point pour le traitement de patients souffrant d'une arthrite rhumatoïde (AR) qui se présente avec une protrusion acétabulaire, en tant que bague de renforcement métallique acétabulaire d'une cavité articulaire à revêtement poreux sans ciment Harris-Galante (HG). Depuis 1991, cette nouvelle bague de support avec greffon osseux autogène à paroi médiale a été utilisé pour traiter la protrusion acétabulaire de patients ayant une AR. Nous avons réexaminé 15 hanches de 13 patients AR sur une moyenne de 53,6 mois, s'étalant sur une plage de 24 à 84 mois après l'opération. Les résultats cliniques de l'arthroplastie totale de la hanche utilisant cette bague de support furent satisfaisants pour tous les cas. Aucun cas ne montra de radiotransparence entre le greffon osseux et la paroi acétabulaire. Tous les greffons osseux se présentaient comme étant tomodensitométriquement réunis, et la protrusion n'a pas progressé.

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Introduction

36% of patients with RA have clinical or radiological evidence of hip disease and 5% will have protrusio acetabuli [10]. Crowninshield et al. [4] have reported that stresses on the medial wall of the acetabulum are increased if the socket is placed medially, and that the stresses can be reduced if the component is placed in a more anatomical position. There are many reports of loosening of the socket, and fracture of the medial wall may occur [10, 15, 18, 23]. Vail and McCollum [25] concluded that the use of medial wall bone graft behind the socket is the best technique for acetabular reconstruction in protrusio acetabuli.

Most of the previously described cup supporting rings involved the use of bone cement [5, 6, 24]. The MC cup supporter (Orthopedics, Chiba Rehabilitation Hospital) is a metal supporting ring (Fig. 1) for use with a Harris-Galante (HG) cementless porous-coated socket. We have used this ring with medial wall autogenous bone graft in the treatment of protrusio acetabuli in patients with RA since 1991.

Patients and methods

The study group consisted of 15 THA's performed in 13 patients with RA and protrusio acetabuli. All patients fulfilled the criteria for RA as described by the American Rheumatism Association [1]. The average length of follow-up was 53.6 months (range 24–84 months). The age of the patients at time of surgery was 61.9 years (range 48 to 79 years). There were 9 females and 4 males. The average duration of the disease was 20.6 years (range 16 to 32 years). All patients had received regular steroid therapy for at least 5 years prior to surgery. The clinical assessment of pain, range of movement and hip function was made using the Japanese Orthopedic Association hip score. Radiographs were evaluated for the degree of pre- and postoperative protrusion and graft incorporation. The degree of protrusio was measured using the method described by Ranawat [18]. We also looked for radiolucent lines between the graft and the acetabular wall. Comparative tests were done by using the Mann-Whitney U test and the statistical difference was set at $P < 0.05$.

Fig. 1 Gross appearance of the MC cup supporter. A large flange is hung on an acetabular labrum, and it is fixed at the posterior rim of the acetabulum with screws. The small flange is applied to the anterior-inferior rim of acetabulum. On the small flange side, there are screw holes to fix a cementless cup and an MC cup supporter is unified

Fig. 2 Postoperative scheme of the MC cup supporter. The slices of autogenous bone graft placed into the deficient medial wall and the morselized bone graft also pressed against the medial wall of the acetabulum. The small flange is applied to the anterior-inferior rim of acetabulum. A large flange and plate bone graft is fixed at the posterior rim of the acetabulum with screws

Fig. 3 Postoperative clinical evaluation (JOA score). All cases showed improvement in the total JOA score. Among the items clinically evaluated, pain showed marked improvement

MC cup supporter

The MC cup supporter (Fig. 1) has a large flange which is fixed to the posterior acetabular rim and a small flange which is directly applied to the antero-inferior rim. The cup sizes range from 46 mm to 56 mm

Surgical technique

Full thickness bone graft is harvested from the ipsilateral iliac crest, and is divided into two; one half for medial acetabular graft and the other half to augment fixation of the large flange (Fig. 2). The femoral head is also used as bone graft. A posterior approach is used. The posterior rim of the acetabulum is shaved with an air drill until microbleeding is observed. The prepared bone graft is placed against the medial wall and reverse-reamed. The cup is introduced at an abduction angle of 40° and an anteversion angle of 10°. Partial weight bearing is continued for eight weeks postoperatively

Fig. 4 Postoperative radiographical evaluation. Medial and superior migrations of the center of hip was corrected immediately after the operation. Migrations have not been observed in follow-up examinations

Fig. 5A–C Grade II protrusio in a 63-year-old woman with RA. She was unable to walk before surgery. **A** Preop., **B** 6 months postop., **C** 6 years post op. No progression of protrusio. She is able to walk without any crutch

Results

The average operation time was 246 min (range 195–330 min) and the average operative blood loss was 1649 ml (range 1380–3210 ml). The postoperative clinical assessment was satisfactory with an improvement in the average JOA hip scores from 20.6 preoperatively to 70.4 postoperatively (Fig. 3). One patient had a transient sciatic nerve palsy; there were no other significant postoperative complications. Radiological examination revealed that the centre of rotation of the hips was improved to within 4 mm of normal. This was statistically significant at $P < 0.01$. There were no cases of failure of the bone graft (Fig. 4 and 5), with no radiolucent lines around the socket and satisfactory union of the graft

Discussion

When performing THA for patients with protrusio acetabuli the bone stresses on the medial wall of the acetabulum are increased if the socket is placed medially [4, 10]. Several surgical techniques have been described to treat acetabular deficiency associated with protrusio. Garza and Charnley [22] reported the use of cement to fill bone defects, and they reported similar results when using cement as when using bone graft, and concluded that there was no indication for the use of a reinforcement ring even in severe cases. However, there were other reports of unsatisfactory results when cement alone was used [2, 3, 17, 20]. Harris et al. reported poor results with cement fixation augmented by mesh, although this technique was satisfactory in patients with mild protrusio [8–10, 13]. Several authors have recommended the use of medial graft [11, 12, 14, 15, 19, 25]; and use of this technique enables the socket to be placed in a more anatomical position, thereby preventing further progression of the protrusio. The technique may be augmented by the use of a support ring, or cement. Some studies have reported the failure of a cementless socket without a support ring [7, 21]. Rawanat et al. reported that where the degree of protrusion is more than 5 mm and the medial wall is intact, only graft is required; however, when the

medial wall is grossly deficient, additional fixation is required to restore the centre of rotation of the hip joint. Harris et al. reported that an uncemented socket without graft is sufficient [16]; and we have previously reported satisfactory results with an uncemented socket alone in mild protrusio [26] and we only used the MC support ring in patients with severe protrusio. The operation is a larger surgical undertaking than a routine procedure, with a longer operating time and an increased peri-operative blood loss; but good medium term results are obtained.

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