

Total Hip Replacement in the Dysplastic Hip: The Use of Cementless Acetabular Components

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ABSTRACT

Objectives: The aim of this study was to examine the early results of patients with acetabular dysplasia treated with the use of uncemented acetabular components and without complex bony augmentation. **Materials and Methods:** Eleven patients (13 hips) were included in this study. The median acetabular component size was 44mm (range, 44-56mm). The mean follow up period was 24 months (range, 15-59 months). All patients were pain free at follow up. **Results:** The mean Merle d'Aubigné Postel score increased from 3 to 17. Our early results suggest that acetabular reconstruction using a small cementless cup, may be an alternative to previously described methods of total hip arthroplasty in the presence of superolateral bone loss.

Key Words:

Total Hip Arthroplasty, Dysplasia, Uncemented, Hydroxyapatite Coated, Cancellous Screw Fixation

INTRODUCTION

A dysplastic acetabulum was initially considered a relative contraindication to total hip arthroplasty^{1,2}. Linde and Janssen analysed 123 Charnley hip replacements to determine factors predictive for aseptic loosening. The most important factor was lack of lateral bony support, followed by the degree of proximal migration of the femoral head and the height of the cup relative to the true acetabulum³. Techniques employed to address this problem include medial acetabular wall osteotomy^{4,5}, the use of reinforcement rings^{6,7}, acetabular augmentation with femoral head autografts⁸, or allografts⁹. In this study, we present a series of patients with deficient acetabular bone stock who were successfully treated with an uncemented cup without the use of any specialised techniques or implants.

MATERIALS AND METHODS

Study Subjects

Eleven patients (13 hips; 7 women and 4 men; average age 70y (range: 44-82y)) with hip dysplasia underwent uncemented total hip arthroplasty and were followed prospectively (Table I). Three patients had been diagnosed

with hip conditions in childhood including Perthes disease, slipped capital femoral epiphysis and developmental dysplasia. Each of these three patients had undergone a previous femoral osteotomy. None of the included patient had previous acetabular surgery. The mean follow-up period was 36 months (range: 27 – 71 months), and there were no patients lost to follow up. According to the Crowe classification system, 11 hips were type I, 3 hips were type II. The mean acetabular angle, as measured by the method of Sharp¹⁰, was 46° (range 40° to 56°).

Surgical technique

The anterolateral approach was used in all patients. In all hips a Furlong hydroxyapatite-ceramic (HAC) cancellous screw fit (CSF) cup was used (JRI Limited, Sheffield, UK.) The Furlong HAC CSF is a press-fit HAC coated cup, secured with cancellous screws. Sequential reaming of the acetabulum was performed, and the smallest cup necessary to give 70% intact host bone coverage was used. No attempt was made to place the cup in an excessive medial position. The median acetabular component size was 44mm (7@44mm, 1@46mm, 1@48mm, 1@52mm, 2@54mm, 1@56mm). The cup was sited at the level of the teardrop in all cases. Press fit fixation was supplemented with cancellous screws. We used a plastic model to illustrate the procedure (Figures 1-3). In cases where bony coverage of the acetabular component was incomplete (Figure 1), the sclerotic defect was drilled with a 3.5 mm drill bit to encourage bone healing (Figure 2); residual defects were packed with morselised cancellous bone graft obtained during acetabular reaming (Figure 3). Initial press fit fixation was routinely supplemented with the use of three cancellous screws.

Table I: Patient demographics

Particulars	No.
No. of patients	11
No. of hips	13
Gender	
Male	7
Female	4
Age (years)	70 (44 – 82)
Previous surgery on ipsilateral side	
None	8
Femoral osteotomy	3



Fig. 1: Showing the acetabular defect drilled in several places.



Fig. 2: Showing the cup well inserted with the defect uncovered.



Fig. 3: Definitive cup with particulate bone graft.



Fig. 4: Anteroposterior radiograph of the left hip showing the bony ingrowth above the acetabular component in a patient who underwent total hip replacement for degenerative dysplastic hip.

Postoperative Care

Postoperatively all patients received mechanical and chemical thromboprophylaxis in accordance with guidelines issued by the National Institute of Clinical Excellence.[15] Patients at low risk for venous thromboembolism (VTE) received Fragmin (dalteparin) 5000 IU subcutaneously until discharge. Patients with one or more risk factors for VTE continued to receive pharmaceutical prophylaxis for four weeks following surgery. Cefuroxime 750mg was administered intravenously three times daily for the first 24 hours. All patients were mobile and fully weight bearing within the first 48 hours.

RESULTS

All patients were pleased with the results of their surgery. There was no measurable limb length inequality in 80% of patients postoperatively. In 20% there was a discrepancy of less than 3cm. All patients were pain free and able to flex the operated hip $\geq 90^\circ$. The mean Merle d'Aubigné Postel¹¹ score increased from 5 preoperatively (range: 1-7) to 17 postoperatively (range: 14-19). One patient underwent

revision of the acetabular component due to recurrent dislocation. The screws failed to hold the cup in its position, and the cup eventually moved in to an open position predisposing to dislocation of the prosthesis. Review of postoperative radiographs demonstrated that where a persisting acetabular defect had been filled with particulate bone debris, the defect became consolidated within four months (Figure 4).

DISCUSSION

Many different techniques have been employed to address the challenges posed by the dysplastic acetabulum. Many authors perform cemented arthroplasty of the dysplastic hip without formal acetabular augmentation^{12,13,14,15}. Revision rates in these patient groups ranges from 7% to 37% for 10 and 20 years postoperatively. Although bulk femoral head

autograft has been used in an attempt to increase bony coverage of the cup and thus improve survival in cemented arthroplasty, the positive short-term results of this technique have not resulted in longer term survival of the prosthesis. Gerber and Harris documented that despite promising early results, 21% of 47 cemented acetabular components failed at seven years follow up⁵. In their series the percentage of the acetabular component covered by the graft averaged 42%. Better results were obtained by Rodriguez *et al* who reviewed twenty-nine hips treated in a similar manner¹⁶. They found that, although 38% of the hips were loose at a mean of 11 years, all grafts united and 90% of the hips were asymptomatic. Rodriguez *et al* postulated that the differences between these results and those of Harris were due to the fact that in their series, on average only 24% of the cup surface was covered by graft.

Anderson M and Harris W reported the early results of 20 dysplastic hips treated with the use of an uncemented porous coated acetabular cup, without femoral head autograft augmentation¹⁷. At a mean 6.9 years, none of the sockets showed radiographic signs of loosening and none had been revised.

Our early results with the Furlong CSF cup support the hypothesis that, in the dysplastic hip where 70% or more coverage of the cup can be achieved, femoral head augmentation is unnecessary. By utilising the smallest possible cup size, 44mm diameter in the majority of cases 44mm, coverage by host bone was maximised. Excessive medialisation is avoided, thus preserving bone stock and allowing the cup to be positioned at the true centre of hip rotation. This preserves leg length and restores normal hip biomechanics. We observed that when the residual acetabular defect is filled with particulate bone graft, the defect rapidly becomes occupied by new bone. This maximises the available bone stock for any revision surgery that may be required. We hope that longer term follow-up of patients treated in this manner will demonstrate that this technique results in sustained improvement in pain and mobility.

The limitations of our study are the small number of patients with a short duration of follow-up. This reflects the scarcity of such cases in a short period of time for one general orthopaedic surgeon at a district hospital. The main strength of our study is our observation of bone stock restoration in the early postoperative period. To our knowledge this has not been previously reported in the literature.

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