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CLINICAL EVALUATION OF CEMENTLESS BIPOLAR HIP ARTHROPLASTY AND CEMENTLESS TOTAL HIP ARTHROPLASTY FOR AVASCULAR NECROSIS OF THE FEMORAL HEAD

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Twenty-one hips in thirteen patients with avascular necrosis of the femoral head (AVN) were treated with surgical implantation of cementless bipolar arthroplasty (BHA) or cementless total hip arthroplasty (THA). In all cases, the same femoral component (Harris-Galante type) was used. The average age of the patients at the time of surgery was 41 years. The minimum follow-up period was 72 months while the average follow-up period took 112 months. Patients were rated using the Merle d'Aubigné hip score, as well as serial radiographs. The average hip score at follow-up examination was 16.1 in the THA group and 15.6 in the BHA group. Radiolucent lines in the BHA group were more likely to extend distally than the THA group. Although the results of this study support the use of both BHA and THA at almost equally preferable levels, the extension of radiolucent lines in the BHA group remains a serious concern.

Key words: avascular necrosis, total hip arthroplasty, femur

INTRODUCTION

The aim of treatment for avascular necrosis (AVN) of the femoral head is to preserve the femoral head without pain. If the necrotic area is limited in extent and separated from the weight-bearing area, the procedure that preserves the natural joint should be taken into consideration. Once the femoral head has collapsed, BHA or THA emerge as the best options. Young patients with AVN of the femoral head which has been attributed to bilateral involvement might be considered cementless prostheses as an attractive alternative to cemented prostheses in the advanced stage of the disease. Takaoka et al. (1) reported that BHA were preferred for the treatment of advanced AVN, provided that stable initial fixation could be achieved. On the other hand, some reports documented the limited success of BHA with the results being less favorable than those reported for THA (2,3).

The purpose of this study was to evaluate the results of cementless BHA and THA, which were performed with the same femoral prostheses in the patients with AVN.

PATIENTS AND METHODS

Thirteen consecutive patients (8 men and 5 women treated in the Department of Orthopaedics, Shimane Medical University Hospital) with an average age of 41 (34-46) were included in this study from 1987 to 1993. The most common risk factors in these patients were a history of intake of steroids (Table 1). All patients with stages III or IV of the disease according to Ficat and Arlet classification (4) entered a retrospective study to evaluate BHA or THA. Fifteen hips were classified as stage III and six were classified as stage IV. THA using the Harris-Galante porous-coated acetabular component with screw fixation and the Harris-Galante femoral stem without cement was performed in 2 hips with stage III and 6 hips with stage IV. BHA using the Harris-Galante femoral stem without cement was performed in 13 hips with stage III. All patients underwent THA or BHA using the posterior approach. No acetabular reaming was performed in the BHA group. Full weight bearing started at 3 months postoperatively.

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Table 1. Causal factors of patients with avascular necrosis of the femoral head

Diagnosis	No. of patients (No. of joints)
Steroid- associated	6 (10)
Alcoholic	5 (9)
Idiopathic	1 (1)
Caisson	1 (1)

Clinical evaluation was done preoperatively and at the latest follow-up using the Merle d'Aubigné hip scoring scale (functional grading of the hip including the factors of pain, mobility, and ability to walk) (5). Radiological evaluation was performed on radiolucencies in AP radiographs. Radiolucent lines around the acetabular component were recorded in the DeLee and Charnley acetabular zones (6) and the Gruen femoral zones (7). Using the measurements described by Callaghan (8), a 5-mm or greater change in the femoral component position was recorded as femoral component subsidence and a change in the acetabular component position greater than 2 mm was recorded as acetabular migration.

The Mann-Whitney U-test and t-test were used for statistical analysis.

RESULTS

Complete follow-up was available for all patients at an average of 9 years 4 months (range: 7 years - 13 years 9 months). One patient died of systemic disease (liver cirrhosis) at 8 years after arthroplasty. The average preoperative Merle d'Aubigne hip score was 11.1±3.2 points and the average score at follow-up was 15.8±2.1 points ($p<0.01$) (Fig. 1). Statistically, significant improvement was obtained in both BHA and THA groups ($p<0.01$) (Fig. 1), and satisfactory results were also obtained in both stage III and stage IV (Fig. 2). Significant improvement was recorded in the scores of pain and ability to walk ($p<0.01$) in both BHA and THA groups (Tables 2 and 3).

No femoral component migration was observed in the THA group, but slight subsidence (3 mm) occurred in 2 hips in the BHA group. Although there were no loosened components in both groups, femoral radiolucent lines usually occurred around the stem tip (zone 4) or in the lateral proximal of the stem (zone 1) (Fig. 3). Acetabular migration did not occur in the THA group, but slight upward migration of the outer head (within 2 mm) was observed in 2 hips (15.4%) in the BHA group. Acetabular radiolucent lines occurred in zone 1 (1 hip, 12.5%) and zone 2 (1 hip, 12.5%), but there were no obvious signs of loosening.

In one patient the prosthesis had to be removed due to deep infection at 12 years 8 months after THA and revision surgery was performed.

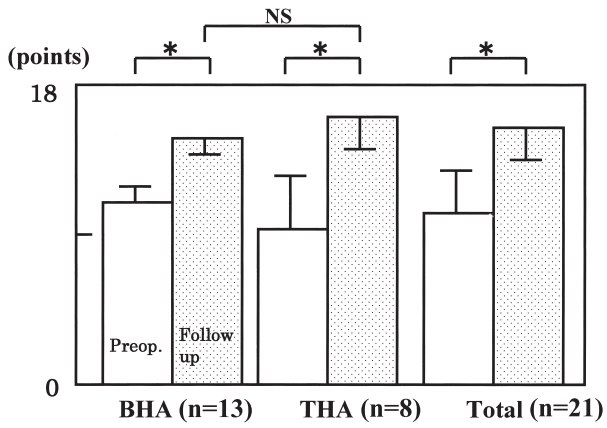

Fig. 1. Merle d'Aubigné hip score according to the treatment. Significant improvement was obtained after total hip arthroplasty (THA) and bipolar hip arthroplasty (BHA) (Mean±SD values are shown. * $p<0.01$, NS: not significant). Eighteen points represent full marks.

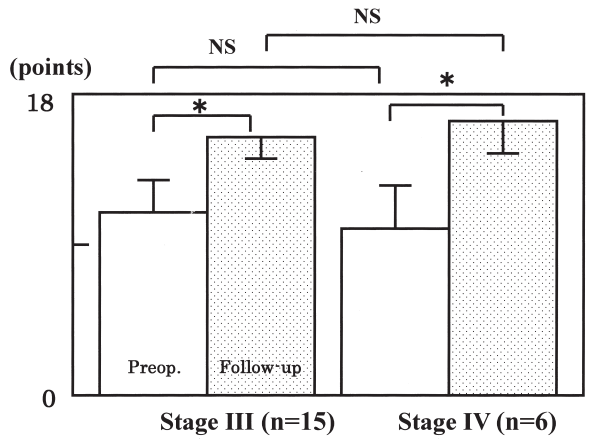

Fig. 2. Merle d'Aubigné hip score according to the Ficat stage classification. Significant improvement was obtained in both stage III and IV (Mean±SD values are shown. * $p<0.01$, NS: not significant).

Table 2. Clinical evaluation of BHA

	Preop.	Follow-up	p value
Pain	3.5±1.2	5.6±0.5	p<0.01
Mobility	5.6±0.5	5.7±0.5	p=0.18
Ability to walk	2.9±0.9	4.3±1.3	p<0.01
Total	12.0±1.5	15.6±1.7	p<0.01

Mean±SD values are shown (n=13).

Table 3. Clinical evaluation of THA

	Preop.	Follow-up	p value
Pain	2.6±1.7	5.5±0.9	p<0.01
Mobility	5.0±1.4	5.8±0.5	p=0.18
Ability to walk	2.3±1.7	5.0±1.3	p<0.01
Total	9.9±4.5	16.1±2.6	p<0.01

Mean±SD values are shown (n=8).

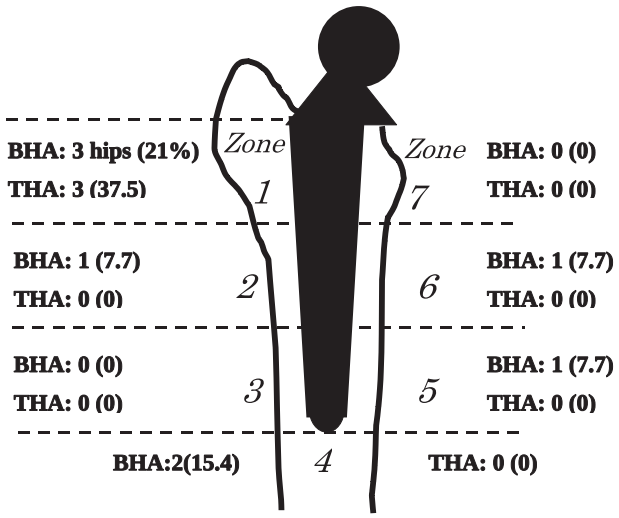

Fig. 3. Zonal distribution of radiolucent lines around the femoral component. The number of the hips with radiolucent lines and their percentage (parenthesized) are shown.

DISCUSSION

Our results demonstrated that favorable results were obtained in both THA and BHA, but the radiolucent lines around the femoral stem tended to extend distally in the BHA group compared with the THA group. These clear lines are caused by wear debris of polyethylene of the acetabular component (8) and is related to the long-term results of a hip arthroplasty.

Uncemented THA in patients with AVN appear to be as good or better than the results reported for cemented arthroplasty in AVN (5,9,10) and BHA (2). The number of complications and revisions was greater in the bipolar arthroplasty. This was attributable to degeneration of the cartilage, which was already present in the acetabular cartilage of a high percentage of hips with AVN, even when radiographs of the acetabulum showed no abnormalities (11). If BHA is chosen as the type of arthroplasty for patients with stage III AVN, the surgery should be done before degeneration of the acetabular cartilage develops.

No femoral component loosened in either the BHA or THA groups. Further, no acetabular component loosened in the THA group in our series. Clohisy and Harris (12) reported excellent fixation and clinical results of the acetabular component for most patients with an average follow-up period of 10 years. We used the screw fixation for acetabular components in all patients because most patients had poor bone stock due to underlying metabolic bone disease and the use of steroids. Screw fixation might take advantage of favorable bone ingrowth onto the acetabular component resulting in better clinical results for the THA group. We hve no cases of outer head migration in the BHA group, which might be attributed to preservation of the subchondral bone of the acetabulum without reaming.

Although this study is limited in size, these relatively long-term results suggest that the clinical results of the BHA group with stage III of the disease at an average follow-up period of 9 years are compatible with those of the THA group. However, meticulous observation is required for these patients because radiolucent lines around the femoral stem tended to distally extend more frequently in the BHA group.

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