Results After Total Hip Arthroplasty With a Large Head and Bipolar Arthroplasty in Patients With Displaced Femoral Neck Fractures

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Abstract: The authors studied the short-term outcomes of total hip arthroplasty (THA) performed using large diameter femoral heads or bipolar arthroplasty (BA) in physiologically active elderly patients with displaced intracapsular femoral neck fractures. The THA group included 14 males and 66 females with a mean age of 75.5 years, and the BA group included 16 males and 73 females with a mean age of 77.6 years. Surgical procedures were performed by one surgeon using a modified Hardinge approach. Mean operation times were significantly longer in the THA groups. Pain, mobility, and walking ability scores were significantly better in the THA group than in the BA group. Despite no range of motion limitation during the early postoperative period, no dislocation was encountered in either group. The present study suggests that for displaced femoral neck fractures, THA with a large diameter femoral head results in less pain and better function than BA.
Keywords: femoral neck fracture, bipolar arthroplasty (BA), total hip arthroplasty (THA), large diameter femoral head.

Femoral neck fractures are common orthopedic injuries. However, there is some controversy regarding the optimal surgical treatment of these injuries [1]. Prosthetic replacement of the femoral head is one treatment option for a displaced femoral neck fracture in elderly patients [2], and proponents of arthroplasty suggest that replacing the femoral head eliminates the complications of femoral head osteonecrosis and femoral neck nonunion [3]. However, there is some controversy regarding the choice of prosthesis for joint arthroplasty in patients with a femoral neck fracture. Specifically, bipolar arthroplasty (BA) has a higher incidence of groin pain secondary to acetabular erosion and a higher probability of revision arthroplasty than total hip arthroplasty (THA) [4]. Although THA provides better functional results and long-term survival than BA, it is associated with higher dislocation rates and also requires longer surgery times [5,6]. However, larger diameter femoral heads (≥36 mm) provide a greater range of motion (ROM) and are believed to be a valuable tool for preventing dislocation after THA [7-9]. Based on these findings, it was hypothesized that THA with a 36-mm femoral head would produce better results, without any serious complications, than BA. However, few clinical data are available on the performance of THA using a large ball in patients with a femoral neck fracture. Accordingly, the aim of this study was to evaluate the short-term clinical outcomes of THA and BA in physiologically active elderly patients with a displaced intracapsular femoral neck fracture.

Materials and Methods

The relevant ethics committee at each participating study center reviewed and approved the study protocol, and all patients provided written informed consent before undergoing the screening procedures. This nonconcurrent clinical trial (THA was performed initially and was followed by BA) included 190 patients with a displaced intracapsular femoral neck fracture, who had been treated with a prosthetic replacement from February 2004 to June 2007. Each of the concurrent trials was consecutive, meaning that there were no BAs performed during the THA trial for patients who fit the selection criteria and vice versa. The inclusion criteria were a normal cognitive function (a mini-mental score [10] of >6), an independent, ambulatory status before

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Table 1. Summary of Demographics for Both Study Groups

	THA Group	BA Group
Average age (y, range)	75.5 (66-85)	77.6 (66-85)
Sex	Male (14), female (66)	Male (16), female (73)
Body weight (kg)	52.3	53.8
Femoral stem	Cementless (38), cement (42)	Cementless (42), cement (47)
Leg length (±SD)	−3.6 mm (±2.4)	−4.0 mm (±2.6)
Abductor offset (±SD)	3.8 mm (±2.1)	4.0 mm (±2.0)
Cases (n)	80	89

injury, no preexisting hip disease, an age between 65 and 90, a femoral head of more than 44 mm in diameter, and a fitness for surgery. The 169 patients were reviewed, with 7 lost to follow-up, and 14 who already died. The mean follow-up period was 36 months (18-52 months). The THA group included 14 males and 66 females with a mean age of 75.5 years (range, 66-85 years). The BA group included 16 males and 73 females with a mean age of 77.6 years (range, 66-85 years) (Table 1). A cementless titanium shell with a porous coating (Trilogy; Zimmer Inc, Warsaw, Ind) and a highly cross-linked polyethylene liner with an inner diameter of 36 mm (Longevity; Zimmer Inc) were placed in all patients undergoing THA. Based on the surgeon's preference, 1 or 2 dome screws were also placed. A Versys femoral stem (Zimmer Inc) was used in patients who underwent cemented fixation (42 cases in group THA and 47 in group BA), and an FMT femoral stem (Zimmer Inc) was used in patients who underwent uncemented fixation (38 cases in group THA and 42 in group BA). Surgical procedures were performed by one surgeon (MRC) using a modified Hardinge approach with patients in the lateral position. All patients underwent capsular repair closure, and all were administered prophylactic antibiotics. Postoperative protocols were identical in all 169 patients. Patients were allowed to sit on the first postoperative day and stand with support, according to ability. Range of motion was not subject to limitation, and no abduction pillow was used. A single surgeon (HSL), but not the operating surgeon, performed all the measurements. The clinical outcomes of the 2 groups were analyzed using Harris hip scores [11] and using the Merle d'Aubigne and Postel method [12]. Harris hip scores were classified as excellent (91-100), good (81-90), fair (71-80), and poor (61-70). The Merle d'Aubigne and Postel classification was used to assess pain, mobility, and ability to walk using 6 level scales. The radiographic examinations included anteroposterior view of the pelvis centered over the pubis and a cross table lateral. Femoral uncemented components were radiographically assessed using the method by Engh et al [13] and cemented components using the method by Barrack et al [14]. Patients were observed at 6 weeks, 3 months, 6 months, and 1 year after index operation. Latest follow-up radiographs were assessed and compared with original postoperative radiographs to determine the presence of osteolysis and loosening. Each patient was asked about the incidences of dislocation and infection. Relationships between the 2 groups in operation time and intraoperative bleeding volume were assessed using the Mann-Whitney test.

Results

Mean postoperative leg length discrepancy in the THA group was 3.6 mm (SD, ±2.4), and the mean abductor offset difference was 3.8 mm (SD, ±2.1). Mean postoperative leg length discrepancy in the BA group was 4.0 mm (SD, ±2.6), and mean abductor offset difference was 4.0 mm (SD, ±2.0). Harris hip scores of the THA group at final follow-up were excellent in 56 cases (70%) and good in 17 cases (21%), and in the BA group, Harris hip scores were excellent in 51 cases (57.3%) and good in 30 cases (34%) (Table 2). However, this difference was not significant ($P = .11$). Harris hip pain scores in the THA group were none or ignorable (44 points) in 58 cases (72.5%), slight (40 points) in 17 cases (21.3%), and mild (30 points) in 5 cases (6.2%). Harris hip pain scores in the BA group were none or ignorable in 56 cases (62.9%), slight in 19 cases (21.3%), mild in 9 cases (10.1%), and moderate (20 points) in 5 cases (5.7%), and the difference between the 2 groups was not statistically significant ($P = .72$). According to the Merle d'Aubigne and Postel classification, pain levels were 4 in 4 cases (6%) in the THA group. Pain levels were 3 in 6 cases (7%) and 4 in 10 cases (11%) in the BA group. This difference was significant ($P = .04$). In the THA group, the mobility level was 6 in 72 cases (90%), and in the BA group, it was 6 in 63 cases (71%), which was significant ($P = .05$). In the THA group, walking level was 4 in 4 cases (5%), and in the BA group, walking level was 3 in 2 cases (3.4%) and 4 in 10 cases (11%) (Table 3), which was marginally significant ($P = .06$). Mean operation times were 72.5 and 61.5 minutes in the THA and BA groups, respectively, and this was significant ($P = .02$). However, mean intraoperative blood losses were 470 mL and 455 mL in the THA and BA groups, respectively, which was not significant ($P = .096$). There were no dislocations or infections in either group. Radiographic examinations performed at final follow-ups showed stable fixation in all patients with a noncemented femoral component, and Barrack type A or B in patients with a cemented femoral component. No cases of

Table 2. The Harris Hip Score on the THA and BA Groups

	THA Group	BA Group
Excellent	56 (70%)	51 (57.3%)
Good	17 (21.3%)	30 (33.7%)
Fair	7 (8.7%)	6 (6.7%)
Poor	0	2 (2.2%)