The Journal of Arthroplasty 30 (2015) 403–406

Contents lists available at ScienceDirect

The Journal of Arthroplasty

journal homepage: www.arthroplastyjournal.org

Total Hip Arthroplasty After Rotational Acetabular Osteotomy

Hideya Ito, MD [a,b], Yoshio Takatori, MD, PhD [c], Toru Moro, MD, PhD [d], Hirofumi Oshima, MD [d], Hiroyuki Oka, MD [e], Sakae Tanaka, MD, PhD [b]

[a] Bone and Joint Orthopaedic Surgery, Japanese Red Cross Medical Center, Shibuya-ku, Tokyo, Japan
[b] Sensory and Motor System Medicine, Faculty of Medicine, The University of Tokyo, Bunkyo-ku, Tokyo, Japan
[c] Japan Community Health Care Organization Yugawara Hospital, Ashigara-gun, Kanagawa, Japan
[d] Division of Science for Joint Reconstruction, Graduate School of Medicine, The University of Tokyo, Bunkyo-ku, Tokyo, Japan
[e] Department of Joint Disease Research, 22nd Century medical and Research Center, Graduate, School of Medicine, The University of Tokyo, Bunkyo-ku, Tokyo, Japan

ARTICLE INFO

Article history:
Received 21 August 2014
Accepted 1 October 2014

Keywords:
rotational acetabular osteotomy
periacetabular osteotomy
acetabular dysplasia
total hip arthroplasty
acetabular cups

ABSTRACT

In this study, we aimed to determine whether the outcomes of total hip arthroplasty (THA) after rotational acetabular osteotomy (RAO) are equal to those of primary THA, and to elucidate the characteristics of THA after RAO. The clinical and radiographic findings of THA after RAO (44 hips), with minimum 24 months of follow-up, were compared with a matched control group of 58 hips without prior RAO. We found that the outcomes in terms of functional scores and complication rates did not differ between THA after RAO and THA without previous pelvic osteotomy, indicating that the results of THA after RAO are equivalent to those of primary THA. Although THA after RAO requires technical considerations, similar clinical outcomes to primary THA can be expected.

Rotational acetabular osteotomy (RAO) is a type of periacetabular osteotomy used to treat symptomatic dysplasia of the acetabulum [1]. This procedure involves restoration of the femoral head coverage, resulting in pain relief and delays or prevention of the onset of arthritis. In Japan, there are reportedly a higher proportion of patients with dysplastic hips than in other countries [2], and many of these patients have undergone RAO. While some studies have reported good results of RAO [3–6], some patients require subsequent total hip arthroplasty (THA) because of pain secondary to progression of arthritis.

Several reports are available on THA after periacetabular osteotomy [7–11]. Most authors reported that THA after periacetabular osteotomy requires technical consideration and careful radiographic evaluation because the acetabulum may undergo morphologic changes. In terms of clinical results, one study reported that Bernese periacetabular osteotomy does not compromise the outcome of THA [11], whereas another study reported that the outcomes of THA after triple innominate osteotomy were not equivalent to those of primary THA [8]. However, it should be noted that these studies all had small sample sizes or were not comparative studies. To date, only one published case report of THA after RAO is available [12], and the effects of a previous RAO on subsequent THA are still unknown.

In this study, we aimed to determine whether the outcomes of THA after RAO are equal to those of primary THA, and to elucidate the characteristics of THA after RAO by comparing the clinical and radiographic findings of patients who underwent THA after RAO with matched controls who underwent THA without prior RAO.

Materials and Methods

This investigation was a retrospective chart and radiographic review comparing two groups of patients. We obtained institutional ethics board approval for the study, which was performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki. All patients provided informed consent to participate in the study. Between 1999 and 2011, we performed THA on 45 hips in 43 patients who had previously undergone RAO. One patient was lost to follow-up, resulting in the study group comprising of 44 hips in 42 patients. For comparative purposes, 58 age- and gender-matched hips in 58 patients who had undergone THA for osteoarthritis secondary to hip dysplasia during same period were identified and included as the control group. None of the patients in the control group had undergone any prior pelvic osteotomy.

The preoperative data analyzed included age at THA, gender, interval from RAO to THA (years), body mass index (BMI), the Crowe classification [13] of hip joints, pre-THA contralateral hip joint status, and previous femoral osteotomy. Post-operative data comprised the follow-up duration after THA.

Conflict of interest statement: One of the co-author receives finance as a consultant for Msd K. K., Asahi Kasei Pharma Corporation, Teijin Pharma Limited, Daiichi Sankyo Company, Limited, and has also received finance for presentations at Eisai Co., Ltd., Ono Pharmaceutical Co., Ltd., Taisho Toyama Pharmaceutical Co., Ltd., Chugai Pharmaceutical Co., Ltd., Eli Lilly Japan K. K., Pfizer Japan Inc., Msd K. K., Asahi Kasei Pharma Corporation, Teijin Pharma Limited, Daiichi Sankyo Company, Limited.

The Conflict of Interest statement associated with this article can be found at http://dx.doi.org/10.1016/j.arth.2014.10.002.

Reprint requests: Hideya Ito, MD, Bone and Joint Orthopaedic Surgery, Japanese Red Cross medical Center, 4-1-22 Hiroo Shibuya-ku, Tokyo 150-8935, Japan.

http://dx.doi.org/10.1016/j.arth.2014.10.002
0883-5403/

Surgical Procedure

All THAs were performed in the lateral decubitus position and through a posterior approach. The incision used differed from that used in the preceding RAO, which had been performed through a combined anterior and posterior approach with a single incision, as described by Ninomiya et al [1]. We used the combined approach described by Lusskin et al [14] for 35/44 hips in the study group and 42/58 hips in the control group. We did not perform trochanteric osteotomy in any joints. We attempted to place the acetabular cup with an abduction angle of between 30° and 50° [15]. After the acetabular preparation, the center of reaming was decided, and a gouge was used to remove the subchondral bone to measure the distance to the medial wall. Initial medialization of the acetabular reaming was performed using the smallest reamer, after which the diameter of the reamer was gradually increased. When there was uniform contact between the reamer and acetabular bone, a cup of that size was selected. All patients received a cementless acetabular component with 4 fins and additional screw fixation if required. After the final femoral reaming and rasping, trial reduction was performed. If a bony impingement occurred, any osteophytes of the acetabulum were removed using a chisel or bone rongeur forceps luer. Upon resolving the bony impingement, the final implantation of the femoral component was performed. All femoral components used were also cementless devices. The Mallory-Head acetabular and Bimetric stem systems (Biomet, Warsaw, IN, USA) were used on 32 hips in the study group and 38 hips in the control group, whereas the Q5LP acetabular and K-MAX stem systems (Kyocera Medical Corp, Osaka, Japan) were used in 12 and 20 hips in the study and control groups, respectively.

Computed tomography (CT) scans were obtained in all patients in the study group in order to determine the three-dimensional shape of the acetabulums.

Operative Data and Clinical Evaluation

Operative data, including the operative time, intraoperative estimated blood loss, removal of osteophytes, and the size of acetabular cups used, were obtained using clinical records.

Hip joint function was evaluated according to the Merle d'Aubigné-Postel score [16] preoperatively and at the final follow-up. Reoperation and complications, including infection, venous thromboembolism, dislocation, nerve palsy, and wound healing problems, were recorded.

Radiographic Evaluation

Radiographic evaluations were performed using anteroposterior radiographs taken before and immediately after THA, and at the final follow-up. The acetabular cup position was evaluated on the radiographs obtained immediately post-surgery. We measured the abduction angle of the acetabular cup and the hip joint center position. The hip joint center position was defined as the vertical and horizontal distances from the teardrop, as described by Fukui et al [17] (Fig. 1). The magnification of each radiograph was calibrated from the known and measured diameters of the prosthetic femoral head. Loosening of the acetabular cup and heterotopic bone formation were evaluated on the radiographs obtained immediately post-THA and at the final follow-up. The acetabular cup was considered to be loosening if there was more than 3 mm of migration or a change of at least 4° in the abduction angle [18]. We used the classification system developed by Brooker et al [19] to qualitatively evaluate heterotopic bone formation.

Statistical Analysis

Statistical analysis of the differences between the study and control groups was conducted using JMP Pro 10.0 (SAS Institute, Cary, NC, USA). The independent-sample *t* test was used for continuous variables, whereas the chi-square test or Fisher's exact test was used for dichotomous values according to the validity conditions. All statistical tests were two-tailed, and a significance level of 0.05 was used.

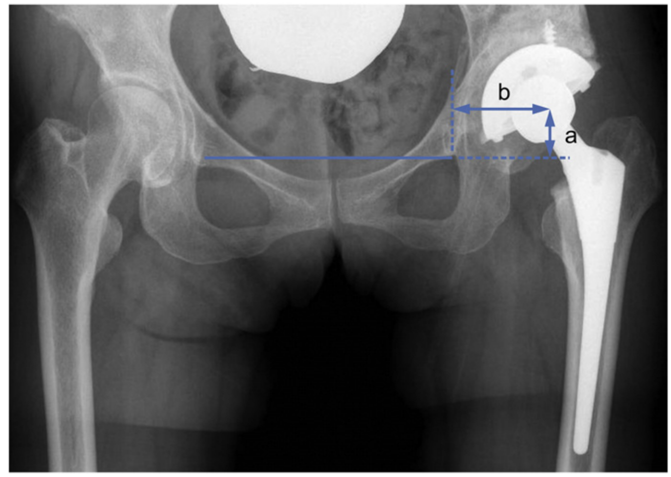

Fig. 1. Measurement of hip joint center position. The hip joint center position was defined as the vertical distance (a) and horizontal distance (b) from the teardrop.

Results

Demographics

The demographic and clinical baseline data of the patients are shown in Table 1. The mean age at the time of THA, gender, BMI, previous femoral osteotomy, and follow-up duration did not differ significantly between the two groups. Furthermore, the ratio of the Crowe classification of the preoperative hip joints and the contralateral hip joint status were also not significantly different between the groups. The average time interval between RAO and THA was 21 years (range, 7–37 years).

Operative Data and Clinical Evaluation

The operative and clinical data are shown in Table 2. The operative time in the study group was significantly longer than in the control

Table 1
Baseline Characteristics of the Study Patients (n = 100).

	Study Group	Control Group	*P*
Number of hips	44	58	
Number of patients	42	58	
Gender (M/F)	2/40	2/56	
Age at RAO (years)	34 ± 12.4 (11–53)	N/A	
Age at THA (years)	55.6 ± 7.8 (36–72)	56 2 ± 5.1 (46–67)	0.64
Interval from RAO to THA (years)	21 ± 7.3 (7–37)	N/A	
BMI (kg/m^2)	22.8 ± 3.4 (17.3–32.0)	22.3 ± 2.7 (17.5–27.6)	0.65
Crowe classification			0.87
I	29 (66.0%)	39 (67.3%)	
II	10 (22.7%)	14 (24.1%)	
III	3 (6.8%)	4 (6.9%)	
IV	2 (4.5%)	1 (1.7%)	
Contralateral joint			0.77
Normal	14 (31.8%)	21 (38.1%)	
OA	20 (45.5%)	27 (46.6%)	
THA	10 (22.7%)	10 (17.2%)	
Previous femoral osteotomy	2 (4.5%)	4 (6.9%)	1.00
Follow-up (months)	55.8 ± 36.2 (24–107)	62.9 ± 28.4 (24–95)	0.06

Data are presented as mean ± standard deviation (range) or number (%). Abbreviations: M, male; F, female; RAO, rotational acetabular osteotomy; THA, total hip arthroplasty; N/A, not applicable; BMI, body mass index; OA, osteoarthritis.