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Original Article

Patient-reported outcomes in patients who undergo total hip arthroplasty after periacetabular osteotomy

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ABSTRACT

Background: There has been constant discussion about whether the clinical outcome of THA after periacetabular osteotomy (PAO) is equivalent to that after primary total hip arthroplasty (THA). However, there have been few reports about patient-reported outcomes (PRO) for those who undergo THA after PAO. We compared the pre- and postoperative PRO of patients who underwent THA after PAO and those who underwent primary THA alone.

Methods: We performed a case–control study. Twenty-seven patients (29 hips) underwent THA after PAO (osteotomy group); their mean age at surgery was 57.2 years, and they underwent postoperative follow-up for a mean period of 3.0 years. For the control group, after matching age, sex, and Crowe classification, we included 54 patients (58 joints) who underwent primary THA for hip dysplasia. Assessment performed preoperatively and at the last follow-up included the Harris hip score, the Short Form 36 (SF-36) for the Physical Component Summary (PCS), Mental Component Summary (MCS), and Role/Social Component Summary (RCS) domains, Japanese Orthopaedic Association Hip-Disease Evaluation Questionnaire (JHEQ) for pain, movement, and mental health, and the visual analog scale (VAS) score of hip pain and satisfaction.

Results: The two groups demonstrated no significant difference in the preoperative Harris hip score, each domain of the SF-36, JHEQ, and the VAS score of hip pain and satisfaction. The osteotomy group demonstrated significantly poor Harris hip scores for gait and activity, and JHEQ for movement at the last follow-up. There was no significant difference in each domain of the SF-36 and the VAS score of hip pain and satisfaction at the last follow-up.

Conclusion: Previous PAO affects the quality of physical function in patients who undergo subsequent THA.

1. Introduction

Various types of periacetabular osteotomy (PAO) are considered suitable to treat acetabular dysplasia in young adults in order to prevent the progression of osteoarthritis [1–4]. However, some patients who undergo PAO demonstrate long-term progression of osteoarthritis, thereby needing conversion to total hip arthroplasty (THA) [5–11]. Many studies have reported that the clinical outcomes of THA after PAO are equivalent to those after primary THA [7–9]. On the other hand, several reports suggested that the therapeutic outcomes of THA after PAO are poorer than those obtained after primary THA [10,11]. There has been constant discussion about whether the clinical outcome of THA after PAO is equivalent to that after primary THA. In past reports, clinical outcomes were evaluated only by medical investigator-initiated outcomes such as the Harris Hip Score (HSS). Recently, patient-reported measures of quality of life (QOL) have been found to be essential tools to assess the postoperative clinical outcomes of THA [12,13]. However, few studies on THA after PAO have evaluated patient-reported outcome (PRO). In the present study, therefore, we compared PRO of THA after PAO with those of primary THA.

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2. Materials and methods

2.1. Patients and procedures

This study was a retrospective chart review and was approved by an institutional review board. All patients provided written informed consent to participate. The study included 35 patients (37 hips) who consecutively underwent THA between April 2011 and March 2016 because of the progression of osteoarthritis after PAO. Seven patients (seven hips) who underwent concomitant intertrochanteric valgus osteotomy and one patient (one hip) who died during the follow-up period because of causes not related to surgery were excluded from the study. Thus, the final osteotomy group comprised of 27 patients (29 hips). The types of PAO included eccentric rotational acetabular osteotomy (ERAO) [14], performed for 23 hips at our institution; and rotational acetabular osteotomy (RAO) [15], performed for 6 hips at other hospitals. The patients included two men (two hips) and 25 women (27 hips), with a mean age of 57.2 years (range, 40–77 years) at the time of THA. Patients were followed-up for a mean duration of 3.0 years (range, 1–5 years). The mean age at the time of PAO was 41.1 years (range, 12–57 years). The mean interval between PAO and THA was 13.7 years (range, 3–23 years).

We also selected hospital records to identify patients who underwent primary THA for osteoarthritis during the same period. We designed a case control study in which patients were matched by age (±5 years), sex, and Crowe classification. We identified 54 patients (58 hips) with no history of osteotomy who underwent primary THA for hip osteoarthritis. All THA procedures were performed by a single senior surgeon or by junior surgeons under the guidance of a senior surgeon. THA in all patients was performed using a standard posterior approach, with the patient in the lateral decubitus position.

Generally cementless implants were chosen; however, in the case of poor bone quality on preoperative radiography findings and problems with fixation, cement implants were chosen instead. With regard to the type of implants used in the osteotomy group, Trident HA (Stryker Orthopedics, Mahwah, NJ) was used for 29 hips, Super Secur-Fit (Stryker Orthopedics, Mahwah, NJ) stems were used for 22 hips, Accolade II (Stryker Orthopedics, Mahwah, NJ) stems were used in three hips, and Exeter (Stryker Orthopedics, Mahwah, NJ) stems were used for four hips. For the control group, Trident HA (Stryker Orthopedics, Mahwah, NJ) was used for 58 hips, Super Secur-Fit (Stryker Orthopedics, Mahwah, NJ) stems were used for 51 hips, Accolade II (Stryker Orthopedics, Mahwah, NJ) stems were used in five hips, and Exeter (Stryker Orthopedics, Mahwah, NJ) stems were used for two hips. Regarding postoperative rehabilitation, generally, we allowed walking training and range of motion (ROM) training with full weight bearing in both groups.

There were no significant differences in age, sex, body mass index, the follow-up duration or implant type between the groups (Table 1).

Table 1
Patients demographics.

	Osteotomy group (n = 29)	Control group (n = 58)	p value
Number of patients	27	54	
Gender (male/female)	2/25	4/50	1
BMI	24.2 ± 3.6	23.6 ± 3.3	0.362
Age at THA (years)	57.2 ± 7.2	58.3 ± 7.7	0.563
Duration PAO to THA (years)	13.7 ± 6.2	–	–
Crowe classification			1
Group I	16	32	
Group II	11	22	
Group III	2	4	
Group IV	0	0	
Follow up (years)	3.0 ± 1.7	3.1 ± 1.6	0.828
Acetabular socket (cementless/cement)	29/0	58/0	1
Femoral Stem (cementless/cement)	25/4	56/2	0.092

BMI: Body mass index.
THA: Total hip arthroplasty.
PAO: Periacetabular osteotomy.

2.2. Clinical evaluation

We investigated the medical records of patients to determine the operative time, intraoperative blood loss, postoperative complications such as infection, dislocation, deep venous thrombosis, and nerve palsy. Hip function was evaluated using the HHS and ROM before surgery and at the last follow-up. Both HHS and ROM were assessed annually by a single senior surgeon. Leg-length discrepancy was measured using the difference in vertical distance from the inner teardrop line to the most prominent point of the lesser trochanter with postoperative anteroposterior images of the hip, according to a report by Dong et al. [16].

2.3. PRO evaluation

PRO was evaluated using the Japanese version of the Short Form-36 (SF-36) questionnaire for health status [17,18] and the Japanese Orthopaedic Association Hip-Disease Evaluation Questionnaire (JHEQ) [19]. We evaluated SF-36 scores for the Physical Component Summary (PCS), Mental Component Summary (MCS), and Role/Social Component Summary (RCS) domains. The JHEQ was created by the Japanese Orthopaedic Association to consider Asian lifestyle behaviors. The JHEQ consists of three components for pain, movement, and mental health. Each component is scored in a range from 0 (worst) to 28 (best). The total score ranges between 0 (worst) and 84 (best). Hip pain and patient satisfaction with their hip's condition is marked with the Visual Analog Scale (VAS): pain is rated between 0 mm (best) and 100 mm (worst), and satisfaction is rated between 0 mm (best) and 100 mm (worst). Questionnaires were administered to all patients preoperatively and at the last follow-up.

2.4. Statistical analysis

Statistical analyses of the osteotomy group and the control group was performed with SPSS version 21 (IBM Corp., Armonk, NY, USA). The analyses consisted of Student's t-test for continuous variables, Mann–Whitney's U test for non-continuous variables, and Fisher's exact test for categorical variables, with the level of significance set at 0.05. Data are expressed as a mean ± standard deviation or median (range).

3. Results

3.1. Clinical evaluation

There was no significant difference in the preoperative HHS between the osteotomy group and control group. However, the osteotomy group had a significantly lower HHS (84.1 ± 8.1) than the control group (90.6 ± 7.4) at the last follow-up ($p < 0.01$) (Table 2). The gait scores in the osteotomy group and the control group were 24.7 ± 6.2 and 30.1 ± 5.1, respectively ($p < 0.01$). The activity scores in the osteotomy group and the control group were 11.3 ± 2.2 and 12.4 ± 1.9, respectively ($p = 0.035$). There were no significant differences between the groups in preoperative ROM. However, at the last follow-up, flexion, abduction, external rotation and internal rotation were all significantly poorer in the osteotomy group than

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