Journal of Orthopaedics 15 (2018) 420–423

Contents lists available at ScienceDirect

Journal of Orthopaedics

journal homepage: www.elsevier.com/locate/jor

Safely transitioning to the direct anterior from posterior approach for total hip arthroplasty

Takahito Yuasa[a,*], Katsuhiko Maezawa[a], Hironobu Sato[a], Yuichiro Maruyama[a], Kazuo Kaneko[b]

[a] Department of Orthopaedic Surgery, Juntendo University Urayasu Hospital, Japan
[b] Department of Orthopaedic Surgery, Juntendo University, Japan

ARTICLE INFO

Keywords:
Direct anterior approach
Posterior approach
Total hip arthroplasty
Learning curve
Complication

ABSTRACT

Purpose: We compare the complication rate in transition to direct anterior (DAA) from posterior approach (PA) for total hip arthroplasty (THA).
Methods: This is a retrospective cohort single-surgeon study of consecutive primary THAs over a transition period from PA to DAA.
Results: There were no significant differences in dislocation rate, femoral fracture, lateral femoral cutaneous nerve injury or success rate in cup inclination and anteversion angle between two groups.
Conclusion: We conclude that this single-surgeon study demonstrates the safely transitioning to DAA from PA in THA with no significant increase in complications in a selected patients.

1. Introduction

Total hip arthroplasty (THA) has long been considered one of the most successful surgical procedures due to the consistent ability to relieve pain and restore function, and quality of life. The surgical approaches commonly used in THA include the posterior, direct lateral, anterolateral and anterior. Recent nationwide data show that the most common surgical approaches in use in hip arthroplasty are posterior and lateral.[1]

The direct anterior approach (DAA) has become an increasingly popular THA technique due in large part to the perceived improvements in early functional recovery, decreased visual analogue scale pain scores, decreased length of stay, increased rate of discharge to home, and decreased use of assistive devices.[2,3] Another potential advantage of the DAA is the ease with which intraoperative fluoroscopy can be used, which may help with component positioning.

Comparative studies have demonstrated reduced pain and quicker functional recovery with the anterior approach than a Hardinge (lateral) approach, and reduced markers of muscle damage when compared to the posterior approach (PA).[4–6] However, other reports have noted an increased complication rate during a surgeon's early experience with this new technique. Woolson et al. reported that 9% of major complications in their early experiences using the DAA following primary THAs performed by the senior surgeons who had performed standard PA since their residency.[7] Hallert et al. also reported that 8.5% of major complications in their first 200 DAA THAs.[8] Spaans et al.,[9] reported that the early complication rate was higher in DAA group and no learning effect was observed in this group regarding operating time or blood loss. A recent meta-analysis showed a risk of intra-operative fractures and lateral femoral cutaneous nerve impairment.[10]

We changed the main approach for primary THA from PA to the DAA in 2011. The author (TY) who had previously used the standard PA changed main approach to the DAA. As an increasing number of surgeons are adopting the DAA, questions should arise if this transition from traditional approaches to the DAA is safe for the patients and if this approach reliably reproduces implant positioning.

In the previous work of Homma et al., they reported the safety in early experience with a DAA using fluoroscopy guidance with manual leg control for primary THA.[11] The aim of this study was to analyze the learning curve of transition to DAA from PA in THA performed by the single surgeon.

2. Material and methods

Institutional review board approval was obtained before review of any records. We performed a retrospective analysis of prospectively collected data following primary THA unless there is a posterior acetabular defect that requires bone graft and plate fixation, and femoral deformity. All THAs were performed by a single surgeon (TY) using the direct anterior and posterior approaches, at a single center from February 2012 to July 2015. A total of 88 consecutive THAs were retrospectively reviewed. Exclusion criteria for DAA were: 1) previous

* Corresponding author at: Department of Orthopaedic Surgery, Juntendo University Urayasu Hospital, 2-1-1 Tomioka, Urayasu-city, Chiba, 279-0021, Japan.
E-mail address: tyuasa@juntendo.ac.jp (T. Yuasa).

https://doi.org/10.1016/j.jor.2018.03.013
Received 21 December 2017; Accepted 16 March 2018
Available online 23 March 2018

history of any osteotomy surgery; 2) CROWE grade III or IV DDH; 3) short neck due to Perthes deformity; and 4) severe hip contracture with < 30° of hip mobility in the sagittal plane. The single surgeon is a trained joint surgeon who used the posterior approach exclusively previously in his practice before the transition. Before the transition to the DAA, the surgeon consulted other surgeon with experience in the DAA and completed at least five cases.

2.1. Surgical technique

Modern uncemented cups and proximal coated stems were used: the Trident–Accolade system (Stryker Orthopaedics, Mahwah, NJ, USA) was implanted in all cases.

In the DAA-THA, the operation was performed using the distal part of the Smith-Petersen approach with the patient in the supine position on a standard surgical table, and only the affected leg was sterilized. A capsulotomy and femoral neck osteotomy was performed in the supine position by inter-muscular penetration of the tensor fasciae latae and Sartorius muscle. Sequential reaming and acetabular component implantation was conducted and verified under fluoroscopic guidance. The cup was set up, aiming for an inclination angle of 40° and an anteversion angle of 20°. Femoral preparation was undertaken with the leg extended, externally rotated, and adducted. A superior capsulotomy was performed to aid in femoral exposure. Femoral broaching and trials were performed with fluoroscopy assistance.

For the PA-THA a standard approach was used with the patient adopting a lateral position on a standard surgical table. The cup setup was adjusted with a trial handle, aiming for an inclination angle of 40° and an anteversion angle of 20°. After inserting the stem, leg-length difference was checked, and optimal stem positioning was checked intra-operatively using an X-ray and any necessary adjustments were then made. After confirming that they were not impinging, the articular capsule and piriformis muscle were sutured back together.

2.2. Perioperative and postoperative protocol

Regardless of approach, all patients were subjected to the same preoperative, perioperative, anesthetic, rehabilitation, and pain protocols, except for the requirement for hip precautions in the posterior group which do not apply to the anterior group.

2.3. Clinical outcome

As a subjective measurement, surgeon reported outcome measurement (Harris Hip Score; HHS)[12] was used.

2.4. Radiological evaluation

We evaluated Lauenstein and AP imaging in a recumbent position in both the PA group and the DAA group eight weeks after surgery. The Trident acetabular cup and the Accolade stem were evaluated for each approach. For the radiographic assessments, a straight line was drawn to both teardrops using the Lewinneck method and the cup inclination angle measured.[13] The anteversion angle was measured using the Widmer method.[14] Successful cup positioning was defined as an inclination of 40° ± 10° and an anteversion of 20 ± 10°. Stem alignment was evaluated via the angle formed between the long axis of the prosthesis and the long axis of the femur.[15]As previously described by Abe et al. [16] the alignment of the stem in the coronal plane was defined as neutral, valgus (≥3° medial deviation), or varus (≥3° lateral deviation). Using an X-ray profile view, the stem alignment in the sagittal plane was defined as neutral, extension (≥3° anterior deviation), or flexion (≥3° posterior deviation). The measurement was performed in a blinded fashion by two surgeons (TY and KM).

We also recorded early post-operative complications including dislocation, deep vein thrombosis, deep infection, and re-operation for any reason, with an average follow-up of 34.1 months (range, 18–56 months).

Table 1
Characteristics of the patients.

	DAA (SD)	PA (SD)	p-value
No. of hips	45	43	
Gender F/M	39/3	36/5	
Diagnosis OA/ANF	41/4	36/7	
Age at operation	63.1(13.1)	60.9(11.7)	0.376
BMI (kg/m^2)	23.9(3.70)	23.5(3.55)	0.573
ASA	2.02(0.42)	2.06(0.34)	0.701

OA; osteoarthritis, ANF; aseptic necrosis of femoral haed.

2.5. Statistical analysis

Statistical analysis of differences between the two groups was performed using GraphPad Prism 5 version 5.0. Chi-square test was used for qualitative variables, and Student's *t*-test was used for quantitative variables. Levels of significance reaching 95% or more were accepted.

3. Results

A total of consecutive 88 patients (45 anterior, 43 posterior) underwent a primary THA performed by a single surgeon from February 2012 to July 2015. The DAA and PA groups had no significant differences in patient demographics (Table 1). There were no significant differences between the DAA and PA group in operation time (105.5vs 101.9, p = 0.416), estimated blood loss (303.5 vs 308.7, p = 0.776), length of stay (21.5 vs 23.5, p = 0.185) (Table 2). At the final follow-up, there was no siginificant difference between the two group in Harris Hip score (91.2 vs 90.8, p = 0.415) (Table 2).

Radiologically, the cup inclination angle was 2.8° higher in the DAA group (42.3 ± 4.8) than the PA group (45.1 ± 5.5) (p = 0.021). The anteversion angle was 5.9° higher in the DAA group (24.8 ± 6.5) than the PA group (18.9 ± 4.4) (p < 0.0001) (Table 3). There were 11 cases of anteversion > 30° in the DAA group, while there were 6 cases of inclination angle > 50° in the PA group. There was no significant difference of success rate in cup inclination angle and anteversion angle using the DAA (75.6%) versus the PA (86.0%) (p = 0.213). There was no difference in stem position on AP and lateral view between the DAA and the PA group, except for those stems implanted in valgus on AP view in the DAA group (Table 3).

Postoperative complications in the DAA and PA groups are listed in Table 4. There was one case of anterior dislocation in the DAA group and two cases of posterior dislocation in the PA group (p = 0.498). None of the patients with dislocation developed re-dislocation requiring revision surgery. Femoral chip fracture was observed in three cases in DAA group and one case in PA group (p = 0.153). In the DAA group, three cases of lateral femoral cutaneous nerve injury were observed (p = 0.108), but it was transient. Neither femoral shaft fracture nor stem subsidence were observed. At the final follow-up, no revision was necessary in both groups.

Table 2
Outcome by surgical approach.

	DAA (SD)	PA (SD)	p-value
Operation time (min)	105.5 (17.2)	101.9 (14.9)	0.416
Estimated blood loss (g)	303.5 (71.4)	308.7 (83.1)	0.776
Length of stay (days)	21.5 (4.15)	23.5 (5.76)	0.185
Harris Hip Score			
Pre-ope	47.1 (8.03)	49.8 (5.41)	0.238
Final follow-up	91.2 (6.02)	90.8 (4.83)	0.415