Influence of surgical approach on final outcome in total hip arthroplasty for osteoarthritis in patients older than 80 years

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ABSTRACT

Purpose: We compared the outcome of total hip arthroplasty (THA) in this age group using direct anterior or posterior approach.

Methods: We performed a retrospective analysis following consecutive primary THA in patients over 80 years. **Results:** The DAA group demonstrated significantly shorter length of stay, better functional improvement, no dislocation or revision while PA group required two revisions due to dislocation.

Conclusions: The use of DAA for THA in the elderly was associated with shorter hospitalization and superior functional outcomes in the early post-operative period, and had a lower rate of dislocation without increasing risk of early revision.

1. Introduction

The increasing size of the elderly population will raise the demand on healthcare system.¹ Many orthopaedic disorders including degenerative disorders often cause functional impairment and disturb daily life. One such specific disease is osteoarthritis (OA) of the hip joint. OA of the hip has a high prevalence in the population aged over 60 years^{2,3} and arthroplasty is considered to be successful and cost-effective for end-stage disease. With an increase in the average life expectancy, opportunities to perform total hip arthroplasty (THA) in aged patients have been increasing.⁴ There have been many authors who exclusively have studied patients having THA in their ninth decade of life.^{5–18} These authors indicate that this procedure provides durable results in this group of patients, but at the expense of a higher rate of post-operative medical and implant-related complications such as pneumonia, dislocation and periprosthetic fracture.

It has been suggested by some that the use of the posterolateral approach to THA leads to a higher rate of postoperative dislocation.⁵ It also has been suggested that postoperative delirium and the inability to comply with postoperative precautions could in fact predispose older patients to dislocate. In light of this, some surgeons advocate the use of an anterolateral or direct lateral approach to minimize this complication in this patient group. However, some authors did not find any difference in dislocation rate as a function of surgical approach.^{5,7} In

one study, the author reported 2.6% dislocation rate using anterior approach in this population.¹⁹

To our knowledge, there was no report that compare the influence of surgical approach in total hip arthroplasty in patients older than 80 years. Our hypothesis was that the complication rate would be low even in the elderly when using direct anterior approach.

The aim of this study was to assess the surgeon and patient reported outcome measures, postoperative complications, length of stay in a series of THA done through a direct anterior or posterior approach in elderly patients (older than 80 years).

2. Materials and methods

Institutional review board approval was obtained before review of any records. We performed a retrospective analysis of prospectively collected data following consecutive unilateral, primary cementless THA in patients older than 80 years who could be followed up for 1 year. All THAs were performed by two senior surgeons (TY, KM) using the direct anterior and posterior approaches, at a single center from July 2014 to July 2017. In DAA cases, we excluded first 50 cases in the learning period. A total of 17 THAs were retrospectively reviewed. The DAA and PA were performed by two senior surgeons (TY, KM). Autologous blood was donated and stored whenever possible.

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2.1. Surgical technique

The R3-SL-PLUS MIA (Smith&Nephew, London, UK) was used in all patients.

DAA-THA was performed in the supine position on a normal table with fluoroscopy and subsequent repair of the anterior capsule as previously described.¹⁸ PA-THA was performed in the lateral position with division and subsequent repair of the hip external rotators and capsule. In both group, the cup was set up, aiming for an inclination angle of 40° and an anteversion angle of 15°.

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. For the post-operative pain management, we used patient controlled epidural analgesia (PCEA). Full weight bearing was allowed one day after the operation. All patients were allowed to discharge from hospital after they were able to go up and down the stairs with cane, as we do not have rehabilitation facility outside the hospital.

2.3. Radiological evaluation

We evaluated Lauenstein and AP imaging in a recumbent position in both the DAA and the PA group six weeks after surgery. The acetabular cup and the femoral 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.²⁰ The anteversion angle was measured using the Widmer method.²¹ Stem alignment of varus or valgus positioning of less than 3° was considered neutral position on AP radiographs, and stem alignment of anterior or posterior positioning of less than 3° was defined as neutral position on lateral radiographs. Evaluation was performed by 2 independent senior orthopaedic surgeons.

2.4. Outcome measures

Follow-up was conducted by the same investigator. As a subjective measurement, surgeon reported outcome measurement (Harris Hip Score; HHS)²² was used. As an objective measurements, the self-administered Japanese Orthopaedic Association Hip Disease Evaluation Questionnaire (JHEQ),²³ which allocates 28 points for pain, 28 points for movement, 28 points for mental, with a maximum total score of 84 points, were used for assessment preoperatively and at the latest follow-up. The JHEQ takes into account facets of the Asian lifestyle, it may help improve the assessment of QOL for Asian patients. At the same time, the JHEQ can also be useful in Western populations for evaluating patients who frequently engage in deep flexion of the hip joint. The patients filled it out by themselves.

We also recorded post-operative complications including dislocation, deep vein thrombosis, intraoperative fracture, deep infection, and re-operation for any reason.

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 17 patients (8 anterior, 9 posterior) underwent a primary THA performed by two senior surgeons from January 2014 to July

Table 1

Characteristics of the patients.

	DAA (SD)	PA (SD)	p-value
Gender F/M	8/0	7/2	0.156
Age at operation	81.7 (2.36)	82.6 (3.42)	0.284
Crowe I/II	6/2	7/2	0.892
BMI (kg/m ²)	23.3 (2.31)	23.1 (2.19)	0.919
ASA	2.14 (0.38)	2.0	0.783
Follow-up (months)	27.1 (6.51)	24.8 (4.88)	0.368

Table 2

Preoperative complications.

	DAA	PA
Hypertension	4	3
Arrhythmia	1	1
Respiratory disease	1	1
Angina pectoris	0	1
Diabetes mellitus	1	1
Uterus myoma	1	1

Table 3

Operative data and implant alignment.

	DAA (SD)	PA (SD)	p-value
Operative time (min)	103.4 (14.4)	106.1 (21.1)	0.783
Estimated blood loss (ml)	359.3 (89.5)	358.7 (155.9)	0.991
Length of stay (days)	23.4 (2.0)	28.6 (6.45)	0.043
Cup angle (degree)			
Inclination	40.0 ± 4.16	41.8 ± 6.44	0.533
Anteversion	14.1 ± 5.63	12.8 ± 4.65	0.641
Cup positioning in the safe zone (hips)	8 (100%)	7 (77.8%)	0.255

Table 4

Outcome by surgical approach.

		DAA (SD)	PA (SD)	p-value
HHS	pre-op	42.9 (2.19)	38.6 (3.99)	0.525
	final follow-up	88.4 (6.0)	80.6 (3.99)	0.013
JHEQ	pre-op	19.2 (7.49)	17.2 (5.34)	0.472
	final follow-up	62.8 (8.85)	55.5 (6.29)	0.114

Table 5

Complications.

	DAA	PA	p-value
Dislocation	0	2 (2.22%)	0.155
Intraoperative fracture	0	0	
Infection	0	0	
Subsidence/thigh pain	0	0	
Venous thrombosis	0	0	
Revision	0	2 (2.22%)	0.155

2017. The DAA and PA groups had no significant differences in patient demographics (Table 1). The past diseases are shown in Table 2. The number of patients requiring allogenic blood transfusion was 3 (37.5%) in the PA group and 0 in the DAA group ($p = 0.071$). There were no significant differences between two groups in operative time (103.4 vs 106.1, $p = 0.783$), estimated blood loss (359.3 vs 358.7, $p = 0.991$) in DAA and PA respectively (Table 3). The length of stay was significantly shorter in DAA group (23.4 vs 28.6, $p = 0.043$). Radiologically, there were no significant differences in cup inclination angle (40.0 vs 41.8, $p = 0.533$), and cup anteversion angle (14.1 vs 12.8, $p = 0.641$) in DAA and PA respectively (Table 3). Eight cups (100%) of the DAA group had been implanted within the safe zone, while seven cups

(77.8%) in the PA group were positioned within the safe zone ($p = 0.155$). In both group, all stems were implanted in neutral. There was a significant improvement in function as measured by the HHS, and JHEQ score after THA in both groups (Table 4). However, at final follow-up, the DAA group demonstrated significantly better improvement in the HHS score compared with PA group.

Postoperative complications in the DAA and PA groups are listed in Table 5. There was no dislocation in the DAA group and two cases of posterior dislocation in the PA group ($p = 0.155$). Neither femoral shaft fracture nor stem subsidence were observed. At the final follow-up, two revisions were necessary in PA group due to a recurrent dislocation.

4. Discussion

Persons eighty years of age or older are, by percentage, the fastest growing segment of the Japanese population. The average Japanese life expectancy is 80.98 years in males and 87.14 years in females,²⁴ and Japan is one of the countries where people enjoy longevity. As more people live longer, there likely will be an increase in patients requiring THA for treatment of disabling hip arthrosis. However, age is not a factor that affects the outcome of joint arthroplasty and should not be a limiting factor when considering who should receive this surgery. Most authors of studies on THA in elderly patients did not report the surgical approach used, and the effect of approach on the dislocation rate in this patient population is not known. Some authors did not find any differences in dislocation rate as a function of surgical approach.^{5,7} De Thomasson et al.¹⁹ reported the outcome of primary THA using an anterior approach and found that the occurrence of dislocation was 2.6% in this population. When using the posterolateral approach for THA in patients older than 80 years, Sierra et al.¹⁴ suggested using a 32-mm head in combination with posterior capsular repair to reduce the incidence of dislocation.

We showed in the present study that the DAA group demonstrated significantly shorter length of hospital stay and better improvement in the HHS compared with PA group at final follow-up. As the DAA does not require release of any muscles or tendons from the pelvis or femur, the preservation of muscle attachments to bone and the avoidance of division of muscle tissue offer the potential for improved dynamic hip stability and decreased risk of hip dislocation after surgery.²⁵ The hospitalization period was longer than the other countries, because most of the patients were completely cured and left the hospital in Japan. Furthermore, our results showed that no medical and surgical complications and re-operations in the DAA group at the latest follow-up. As previously reported, dislocation occurred in two cases in PA group. In both cases, the cup was implanted in the safe zone and stem was implanted in neutral and capsule was repaired, but 28-mm head was used. Eventually, these patients underwent revision surgery due to recurrent dislocation.

There are several limitations to this study. This is a retrospective study, a small number of patients, and a relatively short-term evaluation due to aged subjects. As Eto et al.²⁶ have found increased femoral revision rate at average 3 year follow up in their study, further follow-up is necessary. Same results were found by Meneghini et al.²⁷ that the majority of early revisions due to instability were associated with the posterior or direct anterior approach with 5 years after the primary THA. Longer follow-up is needed to determine the benefits of either approach.

In conclusion, use of the direct anterior approach for total hip arthroplasty in the elderly was associated with shorter hospitalization and superior functional outcomes as per the HHS in the early post-operative period, and had a lower rate of dislocation without increasing rate of early revision in this population.

Conflict of interest

The authors declare that they have no conflict of interest.

Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The study was approved by the medical research ethics committee at our institute.

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