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Original Article

Early complications of primary total hip arthroplasty in the supine position with a modified Watson-Jones anterolateral approach

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ABSTRACT

Background: For total hip arthroplasty (THA), minimally invasive surgery (MIS) has been developed to reduce incision length, muscle damage, and a shorter hospital stay. However, reduced exposure of anatomical landmarks may result in technical errors and inferior implant survivorships. The aim of this study was to report the short-term results and clinical complications of primary MIS THA in the supine position.

Methods: A consecutive series of 103 patients who underwent MIS cementless THA with a modified Watson-Jones anterolateral approach (AL) were enrolled. Outcomes data were reviewed at a minimum of 12 months following the procedure. Clinical evaluations were made using the Merle d'Aubigne and Postel hip score. The results of these procedures were retrospectively compared with those of a historical series of 98 total hip arthroplasties that had been performed by the same surgeon with use of a posterolateral approach (PL).

Results: In the MIS AL THA group, intraoperative fracture was observed in 6 hips; 3 in greater trochanter and 3 in calcar femoral. One hip was subjected to irrigation because of postoperative infection was suspected. In the PL group, intraoperative fracture was demonstrated in 4 hips in calcar femoral. No postoperative dislocation and no pulmonary embolism or nerve paralysis was observed in both groups.

Conclusions: The MIS AL THA did not show a clinically relevant superior outcome compared with the PL THA. When performing MIS AL THA, special attention should pay for prevention of greater trochanter fracture.

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1. Introduction

Total hip arthroplasty (THA) is one of the most frequently performed and successful reconstructive procedures in orthopaedic surgery.^{1,2} Recently, minimally invasive surgery (MIS) THA have reported that theoretically result in less blood loss, less pain, and a shorter hospital stay when compared with THA performed with use of larger incisions.^{3–5} While there is concern that the safety and efficacy of MIS THA. Several reports have conducted MIS THA versus classic procedures in THA. Goosen et al reported the MIS THA did not show a clinically relevant superior outcome in the first postoperative year.⁶ Yang et al showed that the Harris hip score did not significantly different 3 years after operation between MIS THA and conventional THA.⁷ In the present study, we evaluated the short-term results of MIS THA through an anterolateral (AL) approach on a supine position. We then compared these results retrospectively with those of a historical series of hip replacements that had been performed by the same surgeon through a posterolateral approach (PL). Our null hypothesis was that MIS AL THA is not associated with a higher risk of complications and repeat surgery when compared with a PL THA.

2. Subjects and methods

Between July 2009 and May 2011, 134 consecutive primary THAs were performed in our hospital. Inclusion criteria of this study were¹ uncemented cups and femoral stems²; underlying diseases were osteoarthritis; and³ at least 12 months of follow-up, except for patients with lethal events. Exclusion criteria were¹ previous hip surgery²; underlying diseases were osteonecrosis, rheumatoid arthritis, fracture, and others. Due to control group included only osteoarthritis patients with uncemented THAs. Eight patients were excluded because of cemented THAs. Thirteen patients were excluded due osteonecrosis and 3 patients were excluded due to rheumatoid arthritis. Additionally, 7 patients were excluded because of previous hip surgery. Thus, this study involved 6 men and 97 women (103 hips) who underwent minimally invasive (MIS)-THA in the supine position (Table 1). All operations were performed by a single surgeon (T.N.). No patient was lost to follow-up study at 12 month after operation. The MIS AL THA group was compared retrospectively with a group of 98 patients (98 hips) in whom THA had been performed by the same surgeon, between May 2007 and June 2009, with a use of

classic technique through a posterolateral approach on the lateral decubitus position. This retrospective study approved by our institutional review boards. Clinical data that were obtained for the two groups of patients included age, gender, body mass index, side of involvement, intraoperative blood loss, total duration of hospital stay, and postoperative complications. Clinical evaluations were made using the pre- and postoperative Merle d'Aubigne and Postel hip score.⁸ Radiographic data were obtained from a single postoperative anteroposterior radiograph of the pelvis and included the cup abduction angle, and the alignment of the femoral stem. In addition, Cup anteversion was measured as the intersection angle of the line connecting the anterior and posterior borders of the cup and the line parallel with the sagittal plane of the pelvis on the plane passing through the femoral head (Fig. 1).⁹ Stem anteversion measured as the angle between the line connecting the posterior portions of femoral condyles and the axis of the stem superimposed sequentially (Fig. 2).¹⁰ Varus malpositioning of the femoral stem was considered to be present when the longitudinal axis of the stem was tilted in $>3^\circ$ of varus relative to the diaphyseal axis of the femur. Stem sinking measured an anteroposterior radiograph of the hips between immediate postoperative and at 12 months. The level of significance was set at $P < 0.05$.

3. Results

The study groups did not differ significantly with regard to age, gender, involved side, or body mass index (Table 1). The mean operative duration was 62.4 min (33.9 min) with a mean

Fig. 1 – Cup anteversion (α) was measured as the intersection angle of the line connecting the anterior and posterior borders of the cup and the line parallel with the sagittal plane of the pelvis on the plane passing through the femoral head.

Table 1 – Patient characteristics.

	MIS AL	PL	
Number of hips	103	98	NS
Age (year): mean (SD)	66.2 (11.5)	75.2 (12.5)	$P < 0.01$
Male:Female	16:87	12:86	NS
Right:Left	53:50	50:48	NS
Body mass index: mean (SD)	22.9 (3.52)	23.1 (3.28)	NS
MIS: minimally invasive surgery, AL: anterolateral, PL: posterolateral.

Fig. 2 – Stem anteversion (β) measured as the angle between the line connecting the posterior portions of femoral condyles and the axis of the stem superimposed sequentially.

bleeding volume of 360.9 ml (259.5 ml) for the MIS AL group, compared with 61.3 min (30.2 min) with a mean bleeding volume of 351.1 ml (242.2 ml) for the PL group; this difference was not significant. The length of hospital stay was not significant between both groups (Table 2). In the MIS AL group sustained an intraoperative fracture of the proximal part of the femur in 6 hips (5.8%), greater trochanter fracture in 3, and calcar femoral in 3 (Table 3). Calcar femoral fracture necessitated cable fixation during the procedure. In contrast, we found in the PL group showed an intraoperative fracture of the proximal part of the femur in 4 hips, all of which were fixed with cables during the procedure. It is particular that greater trochanter fracture was sustained in the MIS AL group. A circular wiring was placed around the calcar for the 7 calcar fracture. Five (71.4%) out of 7 calcar femoral fractures stem

Table 2 – Demographic data on the patients.

	MIS AL	PL	
Incision length (cm): mean (SD)	8.1 (1.6)	14.2 (3.2)	$P < 0.01$
Surgical time (min): mean (SD)	62.4 (33.9)	61.3 (30.2)	NS
Blood loss (ml): mean (SD)	360.9 (259.5)	351.1 (242.2)	NS
Length of stay (day): mean (SD)	21.4 (2.9)	22.5 (2.1)	NS
Hip score: mean (SD)			
Preoperatively	8.6 (2.4)	8.1 (2.2)	NS
Postoperatively	16.7 (1.4)	16.9 (2.1)	NS

MIS: minimally invasive surgery, AL: anterolateral, PL: posterolateral.
Hip score: Merle d'Aubigne and Postel hip score.

Table 3 – Data on complications.

	Incidence rate (no. of cases)		
	MIS AL	PL	
Dislocation	0	0	NS
Femoral fracture	5.8% ⁶	4.1% ⁴	NS
Greater trochanter	2.9% ³	0	$P < 0.01$
Calcar femoral	2.9% ³	4.1% ⁴	NS
Stem sinking	2.9% ³	2.0% ²	NS

MIS: minimally invasive surgery, AL: anterolateral, PL: posterolateral.

sinking within 5 mm was found at 1 months after operation. However, no further stem sinking was found. In the MIS AL group, the cup abduction angle was 34.0° (10.3°); the cup anterior opening angle was 17.8° (7.4°) (Table 4). On the contrast, in the PL group revealed the cup abduction angle was 43.9° (9.3°); the cup anterior opening angle was 20.6° (7.1°). The cup abduction angle in the MIS AL group was significantly smaller than that of PL group. With regard to the femoral stem anteversion angle, for the MIS AL group was 24.2° (16.1°) and for the PL group was 23.5° (14.8°), respectively. No significant difference was found cup anterior opening angle and femoral stem anteversion between both groups. The number of stems that were in $> 3^\circ$ of varus relative to the diaphyseal axis of the femur was 4 stems in the MIS AL group compared with 5 stems in the PL group, although this difference was not significant. In the MIS AL group, one hip (0.97%) was subjected to irrigation because of postoperative infection was suspected. However, no abscess was found and no positive culture was revealed. This case was successfully treated and the implant was retained. No pulmonary embolism or nerve paralysis was observed in both groups. In the MIS AL group, the Merle d'Aubigne and Postel hip score improved from 8.6 (2.4) preoperatively to 16.7 (1.4) postoperatively. For the PL group, the Merle d'Aubigne and Postel hip score improved from 8.1 (2.2) preoperatively to 16.9 (2.1) postoperatively. We found no significance regarding the Merle d'Aubigne and Postel hip score between both groups.

4. Discussion

The aims of our study were to report higher rates of complications of MIS AL THA, and clinical and radiologic outcomes. Goosen et al reported the potential risks of femoral

Table 4 – Radiographic measures.

	MIS AL	PL	
Cup abduction angle	34.0° (10.3°)	43.9° (9.3°)	$P < 0.05$
Cup anterior opening angle	17.8° (7.4°)	20.6° (7.1°)	NS
Femoral stem anteversion angle	24.2° (16.1°)	23.5° (14.8°)	NS
$> 3^\circ$ of femoral varus	4	5	NS

MIS: minimally invasive surgery, AL: anterolateral, PL: posterolateral.

fracture in the AL-MIS approach.³ They showed 6 femoral fractures occurred in patients undergoing the anterolateral approach; 4 of these were in AL-MIS group. In this study, intraoperative fracture was observed in 6 hips (5.8%), greater trochanter fracture in 3, and calcar fracture in 3. It has been reported that the anterior or the AL approach in some hips leads to a difficulty in extending the hip joint to the femoral side and is likely to be complicated by fractures.¹¹ Jewett et al have reported that the incidence rate of fracture in 800 hips subjected to arthroplasty with an anterior approach in the supine position was 2.91%.⁹ In our experience, the incidence of greater trochanter fractures during the elevation of the femur during implantation was 3. The causes of greater trochanter fractures could be less excision of joint capsule and using a two-tined retractor for the elevation of the femur. In our experience, no dislocation occurred in both groups. However, the low dislocation rate, standard deviations of cup positioning was unacceptably high. These results suggest that this approach is technically demanding and is needed for learning curve. In addition, the possible causes of malpositioning of the cup were thought that we did not use intraoperative navigation system or intraoperative radiographic imaging during operation. The malpositioning of the cup was not evident during surgery, despite the fact that implant positioning deviation was unacceptably high. As Ezzet et al reported a single intraoperative anteroposterior pelvis radiograph to be a reliable, quick, and inexpensive means of determining acetabular positioning.¹² We did not have intraoperative navigation system, however, we should have to use intraoperative radiographic imaging for to optimize component position. According to our experience, we highly recommend for using of an intraoperative navigation system or intraoperative radiographic imaging during this technically demanding procedure.

Our study revealed that the MIS AL THA did not show a clinically relevant superior outcome compared with a PL THA.

In conclusion, we evaluated the postoperative results of the consecutive series of 103 hips that received THA with the AL approach in the supine position. Although the incidence rate of postoperative hip dislocation was 0%, that of fractures of the femur was as high as 5.8%. Especially, greater trochanter fracture was 3 hips in MIS AL THA compared to PL THA was none. The MIS AL THA did not show a clinically relevant superior outcome compared with a PL THA. When

performing MIS AL THA, special attention should pay for prevention of greater trochanter fracture.

Conflicts of interest

All authors have none to declare.

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