Shafa Ortho J. 2016 February; 3(1): e3901. doi: 10.17795/soj-3901

Published online 2016 February 20. **Research Article**

A Comparative Evaluation of Primary Total Hip Arthroplasty via Lateral and Posterolateral Approaches

Kaveh Gharanizade,[1] Hossein Karimi Heris,[1,*] Mansour Abolghasemian,[1] Samad Joudi,[1] Payam Hassany Shariat Panahy,[2] and Amin Yoosefzadeh[1]

[1]Bone and Joint Reconstruction Research Center, Shafa Orthopedic Hospital, Iran University of Medical Sciences, Tehran, IR Iran
[2]Faculty of Computer Science and Information Technology University of Putra Malaysia, Kuala Lumpur, Malaysia

*Corresponding author: Hossein Karimi Heris, Bone and Joint Reconstruction Research Center, Shafa Orthopedic Hospital, Iran University of Medical Sciences, Tehran, IR Iran. Tel: +98-9141525208, E-mail: karimi53.hosein@gmail.com

Received 2015 August 25; **Revised** 2015 November 1; **Accepted** 2016 January 22.

Abstract

Background: Total hip arthroplasty (THA) is regarded as the most successful and common surgical approach in orthopedic surgeries. Several surgical approaches have been described for THA to introduce minimally invasive surgical exposures. Posterolateral and lateral approaches are traditional and still most commonly used approaches for primary THA. In deciding which approach to use, consideration of complications, and clinical and radiological outcomes, using one approach or another should be evaluated.
Objectives: The purpose of this study was to compare the early postoperative outcomes of posterolateral and lateral surgical approaches.
Patients and Methods: The current study was conducted on a group of 134 primary hip arthroplasty of 120 patients who had undergone THA surgery at Shafa Orthopedic Hospital in Tehran, Iran, from March 2011 to October 2014. The lateral approach was used in 79 hips and, posterolateral approach was used in 55 hip based on surgeon's preference. Two groups were assessed considering the following outcomes: clinical evaluation including Harris hip score (HHS), blood loss, blood transfusion, hemoglobin level, infections, deep vein thrombosis (DVT) and dislocation, as well as radiological evaluation including the proximal femur fracture, limb length discrepancy and cup inclination angle. The follow-up for both groups was at 6, 12, 24, 36 and 48 weeks after the surgery.
Results: There was no significant difference between the two approaches regarding demographic characteristics, HHS, blood loss, transfusion, hemoglobin level, dislocation and cup inclination angle. However, there was a significant difference in the incidences of infections, DVT, proximal femur fracture and discrepancy of limb length between the two approaches.
Conclusions: The results of this study indicate that both lateral and posterolateral approaches offer similar early clinical outcomes and some different radiological outcomes.

Keywords: Primary Total Hip Arthroplasty, Lateral Approach, Posterolateral Approach, Clinical Outcome, Radiological Outcome

1. Background

Total hip arthroplasty (THA) is one of the most wide operation in orthopedic surgery (1). It is regarded as a successful and reliable technique (2). Total hip arthroplasty is the treatment of choice for degenerative changes of the hip joint, which can result in pain relief and improved hip joint function (3). Deciding which approach should use for THA is often based on the surgeon's preference and local traditions (4). While, most of the surgeons prefer the posterolateral approach, other surgeons use a direct lateral approach which is favored by Hardinage or Stephenson and Freeman (5, 6). In 2011, Norwegian arthroplasty register (NAR) reported that from 7,360 primary THA, the lateral approach was used in 53% of the operations and the posterolateral approach in 28%. The lateral approach involves division of the anterior portion of the gluteus medius and minimums. This approach is considered to have more effect on increasing the risk of damage to the superior gluteal nerve and to gluteus mediuce muscle. The posterolateral approach divides the piriformis, obturator internus, and gemelli tendons. This approach has been blamed to have less effect on gait since the abductor muscles are not dissected. However, posterolateral approach has been associated with an increased risk of dislocations, with the risk of injury to the sciatic nerve (4). Thus, consideration of complications and functions using one approach or another should be assessed.

2. Objectives

The purpose of this study was to compare and evaluate the early postoperative outcomes of the posterolateral and lateral surgical approaches, when used for primary THA in patients who had THA surgery at the Shafa Orthopedic Hospital in Tehran, Iran, from March 2011 to Octo-

ber 2014. We compared these two approaches with regard to the clinical and radiological outcomes. The early outcomes of clinical evaluation of this study were: Harris hip score (HHS), blood loss, transfusion, hemoglobin level, infections, deep vein thrombosis (DVT) and dislocation. Radiological outcomes included: proximal femur fracture, limb length discrepancy and cup inclination angle.

3. Patients and Methods

A total of 120 patients underwent lateral and posterolateral surgery for THA at Shafa hospital. Clinical records and radiographic finding of 134 primary hip arthroplasty of 120 patients were evaluated, while some patients had undertaken both approaches. Patients with previous hip surgery, various blood dyscrasias, and with high-riding DDH that required shortening sub trochanteric osteotomy in Crowe type III and IV developmental dysplasia were excluded from the study (7). Lateral approach was used for 79 patients and the posterolateral approach was performed for 55 patients based on the surgeon's preferences. The institutional review board at our hospital approved the design and protocol of this study and all patients provided informed consent. The demographic characteristics of the patients are presented in Table 1. Preoperative and operative evaluation was performed via evaluating the following criteria: primary diagnosis, surgical approach, the amount of blood loss, blood transfusion, hemoglobin level, vascular collapse, DVT, functional outcomes, proximal femur fractures, dislocation and cup inclination angle. All patients were assessed for pain, post operation infections, discrepancy of limb length, positive trendelenburg using the HHS at four time interval after surgery: 6, 12, 24, and 48 weeks. Both preoperative and post-operative x-rays were evaluated. Finally, at the final assessment (one year after the surgery), hip acetabular component inclination and looseness were evaluated for any position changing, femoral stem position as well as instability signs. Cemented cups and stems were used in only one surgery and uncemented were used in other surgeries. Both groups received enoxaparin as a main prescribed medication for preventing DVT. Preoperative and postoperative data were collected and analyzed using the statistical SPSS software version 16. The chi-square test was used to compare the qualitative data and according to the normal distribution of data, t-test was used to analyze the quantitative data. $P < 0.05$ was considered as statistically significant.

4. Results

There were 70 males (52.23%) and 64 females (47.77%) with the mean age of 42.5 years old (Table 1). Most patients belonged to the age group of 30 to 40 (range: 20 to 75).

Hip joint dysplasia, osteoarthritis and avascular necrosis were the most common causes of operation between the two groups in our study. The incidence of THA did not have any significant difference on the femoral sides. The postoperative increase of HHS (from 40 to 80) was a well-accepted improvement that offered an excellent pain reduction and return function ($P = 0.01$). The Harrison hip score improved and was similar in the both groups and there was no significant difference between them ($P = 0.49$). Our results showed that HSS was doubled 12 weeks after the surgery and patients had greater pain relief with better functional outcomes. The average bleeding rates during the operation for lateral approach and posterolatral were 943 mL and 1006 mL, respectively and there was no significant difference between the two surgery approaches ($P = 0.62$). In addition, the average transfusion rate for both patient groups was similar (1.5 units of packed cells) and showed no significance difference between the groups ($P = 0.94$). There was a similar trend of the hemoglobin level in both groups. The results showed that one day before the operation and, at one and three days post operation, the mean hemoglobin levels in lateral approach were 13, 11 and 10 mg/dL, respectively. These levels in post lateral approach were 13, 12 and 11 mg/dL, which indicated a gradual decrease in the hemoglobin level after both surgery approaches. Moreover, there was no significant difference between the groups those receiving packed cells during hospitalization or at post operation ($P = 0.17$). After the surgery, infection was diagnosed in five patients. Surgical intervention and antibiotic were applied to them (3.73%). Two of these patients had undergone lateral approach and three had undergone posterolateral approach. There was a significant difference between the rates of infections in these approaches ($P = 0.044$). It is worth mentioning that two patients with post surgery infection are still under treatment and remaining three were completely cured. Despite all patients had routine DVT prophylaxis with enoxaparin, DVT was observed in four patients (2.98%) and all these patients had undergone a lateral approach surgery. However, DVT and hematoma were not observed in patients who underwent posterolateral surgery (Table 2).

Table 1. Demographic Data

Demographic Data	Gender, No. (%)		Mean Age
	Male	Female	
Lateral	33 (41.77)	46 (58.23)	43
Posterolateral	37 (67.27)	18 (32.73)	42
Total Patients Based on Gender	70 (52.23)	64 (47.77)	42.5

Table 2. Post Surgery Complications[a]

Complication	Infection	Dislocation	DVT
Approach			
Lateral	2 (2.53)	2 (2.53)	4 (5.06)
Posterolateral	3 (5.45)	2 (3.63)	0 (0)
Total	5 (3.73)	4 (2.98)	4 (2.98)

Abbreviation: DVT, deep vein thrombosis.
[a]Values are expressed as No. (%).

Table 3. Comparison of Clinical Outcomes in Lateral and Posterolateral Approaches

	Lateral	Posterolateral	P Value
Intraoperative Proximal Femur Fracture	4	2	0.22
Bleeding, cc	943	1006	0.62
Preoperative Hg	13	13	0.11
3rddat Hg	10	11	0.33
HHS before surgery	42	46	0.47
HHS after surgery	84	87	0.47
Preoperative-LLD	11	9	0.10
Postoperative-LLD	3	3	0.10

Abbreviations: HHS, Harris hip score; LLD, limb length discrepancy.

Hip dislocation was observed in four of 134 patients. It was occurred with the same rate in both groups. In two hips, closed reduction and maintaining of THA was undertaken and in another two, revision hip arthroplasty was undertaken. The rate of dislocation in patients undergoing THA with lateral surgery was 2.53%, while this rate in patients undergone posterolateral approach was 3.63%, as it is shown in Table 3. Based on the statistical analysis, the dislocation was not significantly different in the two groups ($P = 0.27$). In both groups the most common complication during the surgery was proximal femur fracture. This happened four times for patients with lateral arthroplasty (6 patients) and two times at the posterolateral hip surgery. All patients treated by wiring without any serious outcomes. However, the results showed there was no significant difference between the groups (Table 3).

While, a discrepancy of limb length is common after arthroplasty of the hip, we evaluated it in this study. The results showed that limb length discrepancy was reduced from 11 and 9 mm before the operation to 3 mm after the operation for lateral and posterolateral approaches, respectively (Table 3). The $P < 0.01$ indicated a significant difference between the two groups. Finally, evaluations of the radiological outcomes showed that the cup inclination angle with the mean 36 degrees did not have a significant difference in the follow-up and final x-rays. One postoperative death was also recorded in each approach. One patient died immediately after the operation and one a few days after the operation. The causes of both death record were bleeding and vascular damage.

5. Discussion

Lateral and posterolateral approaches are the two most common surgical approaches that have been used in THA. Surgeons consider some surgical approaches for preparing the acetabulum and preserving the femoral side with fewer complications. Therefore, the choice of surgical approaches is important to allow selection of the most adequate exposure. Different approaches might reproduce the same results without increasing complications. We carried out a prospective and comparative study to evaluate whether there is any difference in clinical and radiographic outcomes or complications between the lateral and posterolateral approaches when used for primary THA in the two groups. The two groups were similar in terms of sex and age. The HHS was doubled (from 40 to 80) at 12 months after the surgery, and patients had greater pain relief with better functional outcomes. This result is consistent with the Chen et al. (1) reports that indicated longer duration of follow-up tends to have higher HSS, and the postoperative HHS reduces the incidence of thigh pain and femoral osteolysis. Moreover, based on our results there was no significant difference between the two surgery approaches, which is consistent with other researcher's findings (8-10). In the postoperative period, the incidence of early complications was low in both cases. The incidence rate of bleeding in lateral and posterolateral approach was low and since there was no significant difference between the two approaches, they are characterized by less bleeding and more recovery function (1, 8, 11). Patients treated with lateral and posterolateral approaches had overall and better function, low number of infections, gradual decrease in the hemoglobin level, less blood transfusion after the surgery. Except the rate of DVT, which was more in lateral approaches subsequently, there was no significant difference among other outcomes between the two

approaches. While, DVT and hematoma were not observed in patients who had undergone posterolateral surgery, it can be concluded that the received enoxaparin, as a prophylaxis might be more adequate for posterolateral approach than lateral approach. In our experience the rate of infection in the posterolateral approach was significantly higher than in the lateral approach. The higher incidence of infection in the posterolateral approach might be associated with an increased rate of intra-operative bleeding. In our study, the dislocation rate in patients with lateral approach was almost the same as posterolateral approach. While, Arthursson et al. (12) reported that the dislocation rate in lateral approach was as low as 10% of the dislocation rate with posterolateral approach, Hedlundh et al. (13) reported a higher number of early dislocations after the posterolateral approach than lateral approach with trochanteric osteotomy. One possible explanation could be that the use of lateral or posterolateral approaches with or without applying trochanteric osteotomy may affect the dislocation rate. However, more research is needed to explore and compare the rate of dislocation in both approaches. A postoperative radiographic assessment of both approaches revealed significant differences in the incidences of proximal femur fracture and limb length discrepancy as well as no significant difference in cup inclination angle. Additionally, other researchers compared the muscular strain using magnetic resonance imaging (MRI) and confirmed that there is no significant difference between the two approaches (8, 11, 14, 15). The strength of our study is that it confirms the findings of other researchers in terms of clinical and radiological outcomes. However, there are some limitations in this study. One limitation was related to a relatively small number of patients and another one was that operations performed by different surgeons. Another limitation of our study was nonrandomized selection of patients and short-term follow-up. In conclusion, the choice of approach to perform THA remains controversial. Given greater awareness of two approaches of THA surgery, we have tried to compare the lateral and posterolateral approaches. Both approaches offer excellent return to function and pain reduction after THA (5). The rate of improvement is not considerably different and there is no major difference in the incidence of complications, clinical and radiological outcomes.

Acknowledgments

The authors would like to express their thanks to all medical personnel of orthopedic surgery ward in Shafa Orthopedic Hospital for their cooperation and providing facilities to carry out this study.

Footnote

Authors' Contribution: Conception, study design, data collection, statistical analysis, drafting the manuscript, and study supervision: Kaveh Gharanizade, Hossein Karimi Heris and Mansour Abolghasemian; critical revision of the manuscript for important intellectual content: Samad Joudi and Payam Hassany Shariat Panahy.

References

1. Chen YL, Lin T, Liu A, Shi MM, Hu B, Shi ZL, et al. Does hydroxyapatite coating have no advantage over porous coating in primary total hip arthroplasty? A meta-analysis. *J Orthop Surg Res.* 2015;**10**:21. doi: 10.1186/s13018-015-0161-4. [PubMed: 25626520]
2. Alecci V, Valente M, Crucil M, Minerva M, Pellegrino CM, Sabbadini DD. Comparison of primary total hip replacements performed with a direct anterior approach versus the standard lateral approach: perioperative findings. *J Orthop Traumatol.* 2011;**12**(3):123–9. doi: 10.1007/s10195-011-0144-0. [PubMed: 21748384]
3. Goosen JH, Kollen BJ, Castelein RM, Kuipers BM, Verheyen CC. Minimally invasive versus classic procedures in total hip arthroplasty: a double-blind randomized controlled trial. *Clin Orthop Relat Res.* 2011;**469**(1):200–8. doi: 10.1007/s11999-010-1331-7. [PubMed: 20352383]
4. Amlie E, Havelin LI, Furnes O, Baste V, Nordsletten L, Hovik O, et al. Worse patient-reported outcome after lateral approach than after anterior and posterolateral approach in primary hip arthroplasty. A cross-sectional questionnaire study of 1,476 patients 1-3 years after surgery. *Acta Orthop.* 2014;**85**(5):463–9. doi: 10.3109/17453674.2014.934183. [PubMed: 24954494]
5. McBryde CW, Revell MP, Thomas AM, Treacy RB, Pynsent PB. The influence of surgical approach on outcome in Birmingham hip resurfacing. *Clin Orthop Relat Res.* 2008;**466**(4):920–6. doi: 10.1007/s11999-008-0121-y. [PubMed: 18224379]
6. Lombardi AV, Berend KR. *Direct Lateral. Surg Treat Hip Arthritis Reconstr Replace Revis.* USA: Elsevier; 2009. pp. 272–7.
7. Sanchez-Sotelo J, Berry DJ, Trousdale RT, Cabanela ME. Surgical treatment of developmental dysplasia of the hip in adults: II. Arthroplasty options. *J Am Acad Orthop Surg.* 2002;**10**(5):334–44. [PubMed: 12374484]
8. Meneghini RM, Smits SA, Swinford RR, Bahamonde RE. A randomized, prospective study of 3 minimally invasive surgical approaches in total hip arthroplasty: comprehensive gait analysis. *J Arthroplasty.* 2008;**23**(6 Suppl 1):68–73. doi: 10.1016/j.arth.2008.05.014. [PubMed: 18722305]
9. Van Dijk CM, Bimmel R, Haddad FS. (iv) Surgical approaches in primary total hip arthroplasty–pros and cons. *Orthop Trauma.* 2009;**23**(1):27–34.
10. Kiyama T, Naito M, Shinoda T, Maeyama A. Hip abductor strengths after total hip arthroplasty via the lateral and posterolateral approaches. *J Arthroplasty.* 2010;**25**(1):76–80. doi: 10.1016/j.arth.2008.11.001. [PubMed: 19359133]
11. Laffosse JM, Chiron P, Molinier F, Bensafi H, Puget J. Prospective and comparative study of the anterolateral mini-invasive approach versus minimally invasive posterior approach for primary total hip replacement. Early results. *Int Orthop.* 2007;**31**(5):597–603. doi: 10.1007/s00264-006-0247-z. [PubMed: 17053875]
12. Arthursson AJ, Furnes O, Espehaug B, Havelin LI, Soreide JA. Prosthesis survival after total hip arthroplasty–does surgical approach matter? Analysis of 19,304 Charnley and 6,002 Exeter primary total hip arthroplasties reported to the Norwegian Arthroplasty Register. *Acta Orthop.* 2007;**78**(6):719–29. doi: 10.1080/17453670710014482. [PubMed: 18236177]
13. Hedlundh U, Hybbinette CH, Fredin H. Influence of surgical approach on dislocations after Charnley hip arthroplasty. *J Arthroplasty.* 1995;**10**(5):609–14. [PubMed: 9273371]
14. Judet R, Judet J. Technique and results with the acrylic femoral head prosthesis. *J Bone Joint Surg Br.* 1952;**34-B**(2):173–80. [PubMed: 12999891]
15. Meneghini RM, Pagnano MW, Trousdale RT, Hozack WJ. Muscle damage during MIS total hip arthroplasty: Smith-Petersen versus posterior approach. *Clin Orthop Relat Res.* 2006;**453**:293–8. doi: 10.1097/01.blo.0000238859.46615.34. [PubMed: 17006366]