Piriformis Muscle Sparing Posterior Approach in Total Hip Replacement: Our Experience

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ABSTRACT

Background: The total hip arthroplasty (THA) procedure is effective surgical procedures of twentieth century. THA has been considered using a variety of techniques. The objective of current study was to determine outcome of Piriformis muscle sparing (PSM) posterior approach in total hip replacement.

Materials and Methods: This cohort study was carried out in Institute Of Orthopaedics & Surgery and South City Hospital Karachi. The study includes total 60 patients that underwent THA. Piriformis-sparing posterior approach procedure was performed. Outcome was assessed before procedure and at 2 weeks and 6 weeks, 3 months and 1 year postoperatively. Pain was assessed visual analogue scale (VAS).The Oxford Hip Score (OHS) and 12-item Short Form Survey (SF-12) were applied to evaluate pain and hip function, respectively.

Results: Mean BMI of the patients was 27.5±4.7, Mean pain score on VAS was 6.2±1.5 and OHS score was 20±8.After 1 year of procedure. Mean pain score on VAS was decreased to 1.2±0.5 and mean OHS score was 44±4.9 out of total score of 48, mean SF-12 PCS was 40.2±12.2, mean SF-12 MCS was 56.6±11.3.

Conclusion: Piriformis muscle sparing posterior approach in Total Hip Replacement has better functional outcome in terms of postoperative pain and hip function. Piriformis muscle is very important for the hip function**,** so it should be saved whenever possible to get the best results after Total hip replacement with posterior approach

Keywords: Total Hip Arthroplasty (THA), Piriformis Muscle, Oxford hip Ratio (OHS)

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INTRODUCTION

THA is sometimes referred to as "surgery of the century" since it is one of the most effective surgical treatments of the previous century[1]. However, the ideal surgical technique to adopt in order to obtain an optimal outcome remains a mystery[2].THA has been proposed using a variety of methods to the hip joint, including posterior, lateral, anterolateral, direct anterior, and postero-lateral approaches[3].

The postero-lateral approach is the most common and offers various advantages, including adequate exposure of the acetabular fossa and femur, as well as preservation of abductor muscles in THA[4]. The posterior route is among the most often used techniques for THA.Rate of dislocation is higher than lateral approach. This which may be attributed to the separation of the short external rotators from the greater trochanter[5].Less invasive procedures that preserve the piriformis have been promoted in an effort to minimize dislocation rates[6].

In 2006, Khan et al reported a PSM posterior approach.It involves a small incision and conservation of piriformis tendon and quadratus femoris. It was hypothesized that soft tissue preservation will lead to hip stability, postoperative recovery and fasterrehabilitation[7]. According to a recent study on elongation of the piriformis during THA done by a posterior route if not released from the greater trochanter, this muscle can be extended up to rupture threshold in treatment.[8] Data revealed that

the muscle-sparing technique resulted in improved clinical outcomes, although it was not randomized controlled trail and control group was retrospective. 2 subsequent studies, both of which lacked a suitable control group, showed that preserving the piriformis was beneficial[9]. We performed this study to find out the functional outcome of patients operated with total hip replacement with piriformis muscle sparing approach in terms of postoperative pain and hip function.

MATERIALS AND METHODS

Study Setting: Institute of Orthopaedics & Surgery and South City Hospital Karachi.
Study Design; Cohort Study
Study Duration; 1 year from 15th October 2020 to 14th October 2021
Sampling Technique: Non probability consecutive sampling technique
Sample Size: Total of 60 patients was included in study whose THA was performed during study duration.

Inclusion Criteria:
All the patients of either gender, age ≥ 18 years undergoingwithout previouship arthroplasty were included in study

Exclusion Criteria:
- Prior hip surgery
- Post-traumatic arthritis
- Those who decline to participate

Data Collection Procedure:
The study was started after approval from ERC of Institute of Orthopaedics & Surgery Karachi. Patients meeting the inclusion criteria were selected for surgery. Piriformis-sparing posterior approach procedure was performed or directly supervised by author. Patients were anasthetized with combined spinal-epidural anesthesia, They were placed in lateral position, Standard posterior posterior approach was carried out. piriformis muscle was spared while obturator externus and internus were lifted from bone along with posterior hip capsule. During closure obturator externus and internus were repaired back to bone using Ethibond sutures, rest of the wound closed in standard fashion[5] All of the patients were mobilized by physiotherapist utilizing a predefined quick rehabilitation plan. Within 24 hours after surgery, patients were mobilized for weight-bearing as per their tolerance and released when they were freely mobile. After ten days of surgery staples were removed and fresh big dressing was placed till two-week follow-up appointment.Outcome was assessed preoperatively and at 2, 6 weeks, 3 months and 1 year after surgery.VAS was used to assess pain. OHS and the 12-item Short Form Survey (SF-12) general health score were used to evaluate hip function.OHS compriseof 12 questions scored from 0 to 4 and total score of 48[10]. It collects precise data on patients' perceptions of hip issues with an emphasis on pain and functional restrictions[11]. SF-12 comprise of 12 items. It has two portions. One includesPhysical Component Summary while second portion include Mental Component Summary score. In general population it has mean score of 50±10[10].

Statistical Analysis
Data was analyzed in SPSS version 25. Frequency and percentage was used to report qualitative variables. Quantitative variables are presented as mean ± SD. P value <0.05 was considered statistically significant.

RESULTS

Total 60 patients included in study out of which 34 were male and 26 females.The demographic characters are presented in Table I. Surgery was performed on left side in 26 patients and right side in 34 patients. Uncemented THR was done in all the cases of Zimmer company. Major reason for procedure was OA in 53 (83%) patients. 41(68%) patients were of physical status I and 19 (31%) of ASA-II. From total 60 patients, 27 (45%) patients were able to walk without aid while 33 (55%) were waking with aid.

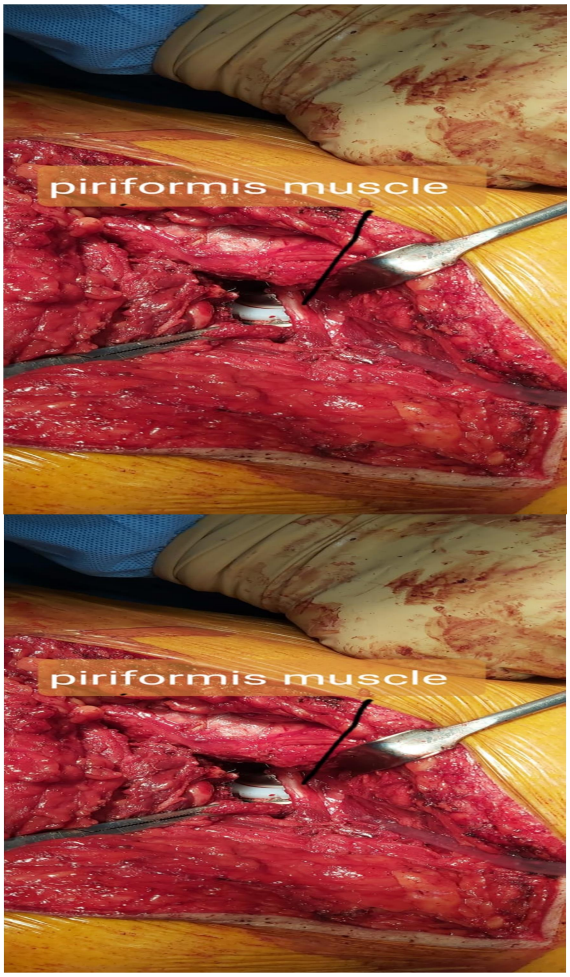

Figure 1: Intraoperative pictures illustrating piriformis muscle

Table 1: Demographic characters of Patients

Variables	N	%
Gender		
Male	36	60.0
Female	24	40.0
Side		
Left	26	43.3
Right	34	56.7
Reason for procedure		
OA	53	88.4
RA	5	8.3
Avascular necrosis	2	3.3
ASA score		
I	41	68.3
II	19	31.7
Baseline walking ability		
With aid	33	55
Unaided	27	45
Total	**60**	**100.0**

Table 2 is showing baseline pain, OH and patient satisfaction scores of patients. Mean BMI of the patients was 27.5±4.7, Mean pain score on VAS was 6.2±1.5 and OHS score was 20±8.

Table 2: Patients score at baseline Scores

	Mean	**SD**
BMI (kg/m^2)	27.5	4.7
Baseline pain	6.2	1.5
Baseline OHS^s	20	8
Baseline SF-12 PCS	25.5	4.5
Baseline SF-12 MCS	45.2	11.3

Table 3 is showing scores of patients after 1 year of procedure. Mean pain score on VAS was decreased to 1.2±0.5 and mean OHS score was 44±4.9 out of total score of 48, mean SF-12 PCS was 40.2±12.2, mean SF-12 MCS was 56.6±11.3.

Table 3: Patient score at follow-up

	Mean	**SD**
Pain score	1.2	0.5
OHS	44	4.9
SF-12 PCS	40.2	12.2
SF-12 MCS	50.6	11.3

Table 5: Piriformis muscle grade at 1 year follow-up

PM grade	**N**	**%**
0	51	85
1	9	15
2		0
3		0
4		0

DISCUSSION

Our study showed good to excellent functional outcome of patients operated with piriformis muscle sparing posterior approach total hip replacement in terms of pain score and patient satisfaction. A few RCTs comparing minimally invasive approach to posterior technique have been conducted.The majority contrasted a posterior approach via a mini-incision to a posterior approach using a normal incision[12, 13].

Current study displays long-term outcome of a cohort of patients who were treated for THA with PSMI posteriorapproach in a tertiary care hospital of Multan. Results showed excellent functional outcomes at12weeks follow-up. The mean OHS after procedure was 44 and mean pain score was 1.2.these results are quite comparable to our study results. There are no studies in the literature that

investigated the results of the PSMI method in Pakistan. However several international studies are available that compared PSMI with standard posterior approach.

Our study results were supported by Procyk who published a case series study with a one-year follow-up that used a similar method to ours. In his study all mean BMI was< 30 and age< 70 years of age. This technique leads to quick functional recovery, less post-operative discomfort, shorter hospital stays, fewer problems, and perfect component location[14].

With a one-year follow-up, Prigent described 98 patients who were operated using PSM and a control group who underwent standard procedure[9]. PSM group had results comparable to our study.

Other pilot study compared patients treated by PSM technique and retrospective control group for two years. The study reported reduced hospitalization, reduced blood loss and improved WOMAC scores in PSM group, again comparable to our study[5].

Results of our study showed after 1 year of procedure was mean pain score on VAS was decreased to 1.2±0.5 and mean OHS score was 44±4.9 out of total score of 48, mean SF-12 PCS was 40.2±12.2, mean SF-12 MCS was 56.6±11.3.

The results of this study are in accordance with a study B.K.L. Tan et al[7].Stevenson et al. conducted a randomized study to compare the 10-year results of the mini-incision versus usual posterior method.There were no significant differences in WOMAC, HHS,SF-12 and OHS scores intwo groups[15].

Documented success of THA using standard procedures makes it difficult to enhance existing outstanding results with minor surgical changes in technique. THA aims to alleviate discomfort, enhance function, and provide stability. Examining the postoperative shape and function of muscles round hip might help in these areas.There are no high-level studies in the literature evaluating long-term muscle morphology after THA surgery, in addition to the lack of long-term functional findings.Muller et al compared minimally invasive muscle-sparing antero-lateral technique to muscle-cutting modified direct lateral method for a year in a prospective study. They reported that direct lateral approach had more significant fatty atrophy of gluteus medius on MRI[16].

Critics of PSM approach argue that failure to separate the piriformis or obturators may result in harm due to overstraining and muscle rupture[6].

Main drawback of this study is that it is was done on a cohort of patients with no controls. We recommend Randomized control trial study on this topic to further confirm our findings

CONCLUSION

Piriformis muscle sparing posterior approach in Total Hip Replacement has better functional outcome in terms of postoperative pain and hip function. Piriformis muscle is very important for the hip function**,** so it should be saved whenever possible to get the best results after Total hip replacement with posterior approach

Conflict of Interest: None

Grants/Funding: None

REFERENCES

1. Barry JJ, Masonis JL, Mason JB. Recovery and outcomes of direct anterior approach total hip arthroplasty. Annals of joint. 2018;3(6):1-8.
2. Aggarwal VK, Iorio R, Zuckerman JD, Long WJ. Surgical approaches for primary total hip arthroplasty from Charnley to now: the quest for the best approach. JBJS reviews. 2020;8(1):e0058.
3. Wang T, Zhou Y, Li X, Gao S, Yang Q. Comparison of postoperative effectiveness of less invasive short external rotator sparing approach versus standard posterior approach for total hip arthroplasty. Journal of Orthopaedic Surgery and Research. 2021;16(1):1-8.
4. Peters RM, van Beers LW, van Steenbergen LN, Wolkenfelt J, Ettema HB, Ten Have BL, et al. Similar superior patient-reported outcome measures for anterior and posterolateral approaches after total hip arthroplasty: postoperative patient-reported outcome measure improvement after 3 months in 12,774 primary total hip arthroplasties using the anterior, anterolateral, straight lateral, or posterolateral approach. The Journal of arthroplasty. 2018;33(6):1786-93.
5. Khan R, Maor D, Hofmann M, Haebich S. A comparison of a less invasive piriformis-sparing approach versus the standard posterior approach to the hip: a randomised controlled trial. The Journal of bone and joint surgery British volume. 2012;94(1):43-50.
6. Solomon LB, Naal FD, Howie DW. Piriformis muscle rupture during total hip arthroplasty using a muscle-preserving posterior approach. Acta Orthop Belg. 2013;79(6):616-9.
7. Tan BK, Khan RJ, Haebich SJ, Maor D, Blake EL, Breidahl WH. Piriformis-sparing minimally invasive versus the standard posterior approach for total hip arthroplasty: a 10-year follow-up of a randomized control trial. The Journal of arthroplasty. 2019;34(2):319-26.
8. Solomon L, Lee Y, Callary S, Beck M, Howie D. Anatomy of piriformis, obturator internus and obturator externus: implications for the posterior surgical approach to the hip. The Journal of Bone and Joint Surgery British volume. 2010;92(9):1317-24.
9. Prigent F. Incidence of capsular closure and piriformis preservation on the prevention of dislocation after total hip arthroplasty through the minimal posterior approach: comparative series of 196 patients. European Journal of Orthopaedic Surgery & Traumatology. 2008;18(5):333-7.

10. Ostendorf M, Van Stel H, Buskens E, Schrijvers A, Marting L, Verbout A, et al. Patient-reported outcome in total hip replacement: a comparison of five instruments of health status. The Journal of Bone and Joint Surgery British volume. 2004;86(6):801-8.
11. Murray D, Fitzpatrick R, Rogers K, Pandit H, Beard D, Carr A, et al. The use of the Oxford hip and knee scores. The Journal of bone and joint surgery British volume. 2007;89(8):1010-4.
12. 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. Clinical Orthopaedics and Related Research®. 2011;469(1):200-8.
13. Shitama T, Kiyama T, Naito M, Shiramizu K, Huang G. Which is more invasive—mini versus standard incisions in total hip arthroplasty? International orthopaedics. 2009;33(6):1543-7.
14. Procyk S. Initial results with a mini-posterior approach for total hip arthroplasty. International orthopaedics. 2007;31(1):17-20.
15. Stevenson C, Ogonda L, Blaney J, Dennison J, O'Brien S, Beverland D. Minimal incision total hip arthroplasty: a concise follow-up report on functional and radiographic outcomes at 10 years. JBJS. 2017;99(20):1715-20.
16. Müller M, Tohtz S, Springer I, Dewey M, Perka C. Randomized controlled trial of abductor muscle damage in relation to the surgical approach for primary total hip replacement: minimally invasive anterolateral versus modified direct lateral approach. Archives of orthopaedic and trauma surgery. 2011;131(2):179-89.