

The Functional Outcome of Medial Compartment Osteoarthritis of the Knee Treated with Proximal Fibular Osteotomy: A Prospective Cohort Study

Jyotirmaya Nayak¹, Sridhar Panda², Nagendra Kumar Rajsamant³, Gopabandhu Patra⁴

¹Associate Professor, Department of General Surgery, SCB Medical College, Cuttack

²Assistant Professor, Department of General Medicine, SCB Medical College, Cuttack

³Assistant Professor, Department of General Surgery, SCB Medical College, Cuttack

⁴Assistant Professor, Department of Orthopaedics, Bhima Bhoi Medical College, Balangir

Received: 25-09-2023 / Revised: 28-10-2023 / Accepted: 30-11-2023

Corresponding author: Dr. Gopabandhu Patra

Conflict of interest: Nil

Abstract:

Background: Osteoarthritis (OA) is a polyarticular chronic degenerative disease with multiple aetiology, with the knee being the most often affected joint.

Objective: The purpose of this study was to assess the clinical and functional results of medial compartment OA of the knee treated with PFO in terms of pain, disability, and range of motion.

Materials and Methods: The current prospective cohort research included 60 patients with medial compartment knee OA treated with PFO who visited the orthopaedic department's OPD and emergency department. The research was authorized by the institutional ethics committee, and all subjects provided signed informed permission.

Results: With a M: F ratio of 1:1.5, there were 36 (60%) females and 24 (40%) men. The average age of the patients was found to be 58.728,29 years (P = 0.26). Patients were evaluated for range of motion at three and six months. At the 3-month follow-up, 9 (15%) of the patients had a range of motion of 80, whereas 21 (35%) had a range of motion between 80 and 90. There were 19 (31.67%) individuals with ROM between 90 and 100. There were 11 (18.33%) patients with ROM higher than 100. At the 6-month follow-up, 05 (8.33%) patients had a range of motion of 80, while 21 (35%) had a range of motion between 80 and 90. 23 patients (38.33%) had ROM between 90 and 100. There were 11 (18.33%) patients with ROM higher than 100.

Conclusion: PFO is a simple, safe, quick, and successful surgery for treating medial joint OA of the knee. It does not react to conservative treatment and produces better functional and clinical outcomes, less knee joint discomfort, and a higher ML ratio.

Keywords: Proximal Fibular Osteotomy, Knee, Osteoarthritis, VAS Score, JOA Scores.

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Osteoarthritis (OA) is a polyarticular chronic degenerative disease with a complex origin, with the knee being the most often affected joint [1]. A community-based research that included persons over the age of 40 from five different Indian states found that the disease was prevalent in 28.7% of the population [1]. Knee OA is linked to advanced age, a higher body mass index (BMI), female sex, and a sedentary lifestyle [1]. Knee osteoarthritis (OA) is a painful and persistent ailment that affects a considerable percentage of the population, especially the elderly. One of the most prevalent reasons of impaired mobility in elderly people is symptomatic OA. OA of the knee joint affects almost half of the population over the age of 60, mostly women, due to osteoporosis as a

consequence of decreasing bone mineral density [2]. The compartment-specific narrowing of the joint space, which is related with clinical symptoms of the illness, is a significant characteristic of OA of the knee [3]. The most prevalent kind of narrowing is medial joint space narrowing [3]. There are many treatment options for knee joint OA, both conservative and surgical. Analgesics, physiotherapy, intra-articular injections of steroid or platelet-rich plasma, and viscosity supplementing medicines are all conservative alternatives for knee OA. Intractable instances of knee OA, surgical alternatives include high tibial osteotomy (HTO) and total knee arthroplasty (TKA). HTO is a technically rigorous treatment with unique complications such as neurovascular

damage, iatrogenic fracture, and non-union. Total knee replacement is an effective operation for pain alleviation, deformity correction, and function improvement, but it is not a viable choice for young patients with mild-to-moderate OA [4].

In compared to HTO, proximal fibular osteotomy (PFO) is a great therapeutic choice for medial compartment OA since it is linked with fewer or no problems [5]. PFO works on the principle that it supports the lateral tibial plateau, and by removing the wedge from the fibula, it weakens the support of the lateral tibial plateau provided by the fibula, resulting in varus correction and shifting the loading force from the medial compartment more laterally, causing pain to decrease and function to improve.

When compared to a PFO, an HTO is a very uncomplicated surgical operation [6]. In weight-bearing films, ideal indicators of PFO include largely medial compartment arthritis with varus knees and excellent lateral joint space, as well as at least a 2 mm gap in AP stress. Varus X-rays, a determined patient who realizes that this operation saves time and postpones knee replacement surgery, and individuals with a BMI of 23 [7]. In comparison to TKA or HTO, PFO is a simple, safe, quick, and inexpensive operation that does not need the insertion of extra implants. As a result, PFO is an appropriate surgical choice for the majority of patients who lack financial and medical resources [8]. There are rarely problems associated with proximal fibula removal [9].

Aims and objectives: The aim of the present study is to evaluate the clinical and functional outcomes of medial compartment OA of the knee treated with PFO with respect to pain, disability, and range of movements.

Materials and Methods

The current prospective cohort research included 60 patients of both genders who visited the orthopaedic department for OPD and emergency. The research was carried out at SCB medical college and Hospital, Cuttack at the orthopedic and surgery department. This research comprised 60 individuals with medial compartment knee OA treated with PFO. The research lasted 24 months, beginning in January 2019 and finishing in December 2021.

The research was authorized by the institutional ethics committee, and all subjects provided signed informed permission. Demographic information such as age and gender were recorded in all instances. The BMI of each instance was calculated. The diagnosis of medial compartment knee OA was established based on a history and clinical examination, and it was verified by a weight-bearing X-ray, which was performed in all

cases except those who were too fragile. Patients with Kellgren Lawrence radiographic evidence [10] Knee OA ranging from Grade II to IV was included. A computed tomography of the knee was performed in selected patients (where subchondral bone abnormalities and chondro-calcinosis were suspected). Imaging data were used to evaluate the degree of varus deformity. Patients who did not respond to conservative therapy and had pain severe enough to interfere with their quality of life and daily activities were chosen for surgical surgery.

When PFO was performed for knee OA, the sample size was estimated using prior reference studies. Keeping power (1-beta error) at 80% and confidence interval (1-alpha error) at 95%, the minimum sample size necessary was 60 patients; hence, 60 (the minimum required number of cases) patients were included in the current investigation. All patients provided informed written permission for surgery. After receiving anesthetic fitness for surgery, all patients were electively posted for PFO, with only ASA Grade I and II patients chosen for operation. PFO was performed, and full weight bearing with quadriceps drills and knee range of motion exercises was permitted from day one if there was no substantial discomfort. On the second day after PFO, a full-weight bearing X-ray was performed. Follow-up appointments were arranged at one month, three months, and six months. During each follow-up appointment, an X-ray was taken.

The Japanese Orthopaedic Association (JOA) score for osteoarthritic knee was used to measure functional outcome [11]. Other characteristics evaluated during follow-up visits were range of motion, visual analogue scale (VAS) ratings, and complications. The mean with standard deviation was used to represent quantitative data, whereas percentages were used to express qualitative data. To compare the differences in outcome scores, a paired t-test was utilized. Microsoft 16 and SSPS 22.0 software were used for the statistical analysis, and P0.05 was considered statistically significant.

Inclusion criteria:

1. Age more than 40 years
2. Patients gave written consent.
3. patients with clinical OA of the knee diagnosed as per the ACR
4. Patients with medial compartment OA are treated by PFO.
5. Mild-to-moderate genu varus deformity (<15°)
6. ASA Grade I/II

Exclusion criteria:

1. Patients who refused to give consent
2. Patients with concomitant arthritis due to any other cause (rheumatoid, seronegative OA).

3. Patients with post-traumatic arthritis of the knee.
4. Patients with a history of a ligament or meniscus injury to the knee.
5. Patients with clinical valgus deformity of the knees as measured using a goniometer.
6. ASA Grades III and IV

Results: The present prospective study consists of 60 patients with medial compartment knees treated by PFO.

There were 36 (60%) females and 24 (40%) males with an M: F ratio of 1:1.5 (Figure 1). The mean age of patients was found to be 58.72±8.29 years (P value = 0.26).

Table 1: Age-wise distribution of the present studied patients

Age (years)	No. of patients	Percentage
<40	00	00
40-49 years	03	05
50-59 years	10	16.67
60-69 years	15	25
≥70	32	53.33
Total	60	100
Mean age	58.72±8.29 years, P value= 0.26	

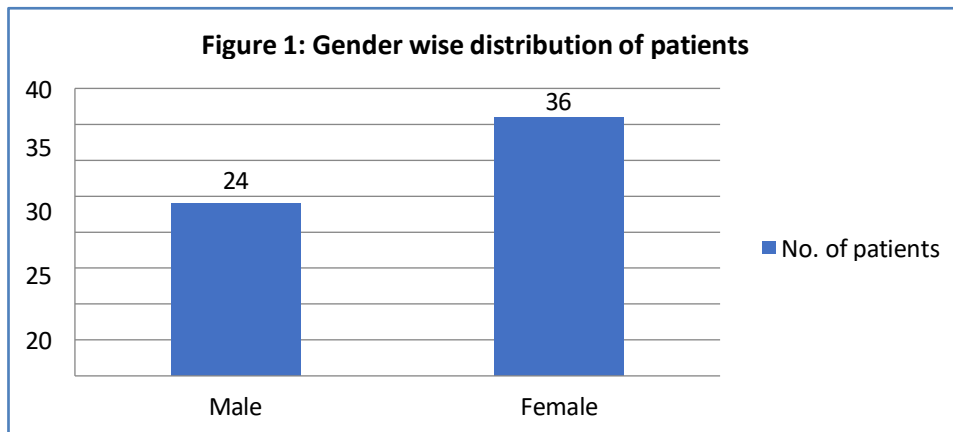


Figure 1: Gender wise distribution of patients

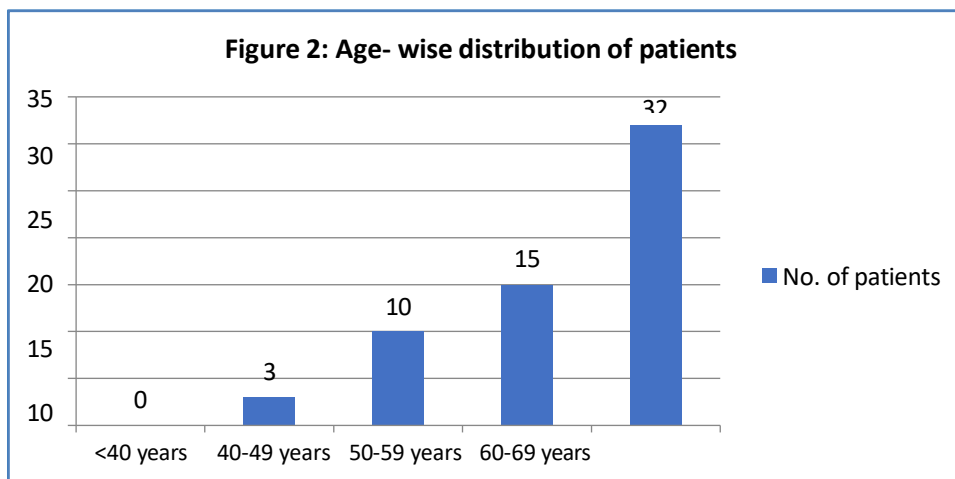


Figure 2: Age-wise distribution of patients

Table 2: Body mass index (BMI) of the present studied patients

BMI	No. of patients	Percentage
Normal (<25)	15	25
25-30 (Overweight)	25	41.67
More than 30 (Obese)	20	33.33
Total	60	100.00

Overweight and obesity were shown to be significant characteristics in people with knee OA. The examination of BMI in patients revealed that 20 (33.33%) were obese (BMI30) and 25 (41.67%) were overweight (BMI25 but 30). 15 (25%) of the patients had a BMI of 25 or above (Table 2).

Table 3: The mean VAS score of the patients at presentation and during the 6- month follow-up

Mean VAS score	Mean \pm SD	P-value
At presentation	6.21 \pm 1.82	P<0.0001 (Paired t-test) Highly significant
At 1 month	4.10 \pm 1.50	
At 3 months	3.72 \pm 1.42	
follow-up (6 months)	1.50 \pm 0.89	

VAS: Visual analogue scale. All patients were in moderate pain at the time of presentation. At the time of the presentation, the mean VAS score was 6.21 1.82. The pain steadily decreased over time, and by the time of the last follow-up appointment, the pain had been significantly reduced, as shown by mean VAS ratings of 1.500.89. The change in VAS score between presentation and final follow-up was statistically significant (P0.0001) (Table 3).

Table 4: Range of motion at presentation and during follow-up

Range of motion	No. of patients	Percentage	95% CI (confidence interval)
At the time of 3-month follow-up			
<80	09	15	4.4–31.6
80–90	21	35	20.5–56.1
90–100	19	31.67	15.4–49.6
>100	11	18.33	8.4–39.1
At the time of 6-month follow-up			
<80	05	8.33	1.2–23.5
80–90	21	35	17.9–52.9
90–100	23	38.33	20.5–56.1
>100	11	18.33	10.6–42.7

The range of motion (ROM) of a joint or muscle in your body specifies how far it may be moved or stretched. A goniometer is used to determine the range of motion of the body's joints. Patients were evaluated for range of motion at three and six months. At the 3-month follow-up, 9 (15%) of the patients had a range of motion of 80, whereas 21 (35%) had a range of motion between 80 and 90.

There were 19 (31.67%) individuals with ROM between 90 and 100. There were 11 (18.33%) patients with ROM higher than 100. At the 6-month follow-up, 05 (8.33%) patients had a range of motion of 80, while 21 (35%) had a range of motion between 80 and 90. 23 patients (38.33%) had ROM between 90 and 100. 11 (18.33%) of the patients had ROM higher than 100 (Table 4).

Table 5: Functional outcomes as assessed by JOA scores

Mean JOA score	Mean \pm SD	P-value
At presentation	56.50 \pm 10.31	P<0.0001 (Paired t test) Highly significant
At 1 month	76.70 \pm 12.64	
At 3 months	85.42 \pm 14.92	
follow-up (6 months)	88.69 \pm 16.75	

JOA: Japanese Orthopaedic Association. For 6 months, the patients were monitored for improvements in functional outcomes. The JOA score for osteoarthritic knee was used to determine functional outcome.

The mean pre-operative JOA was 56.5010.31. The mean JOA score was 88.6916.75 at the time of the last follow-up visit (at 6 months). The mean JOA scores at the time of final follow-up were much higher than the JOA scores at the time of presentation, and the difference was statistically significant (Table 5). Finally, the frequency of problems in the patients analyzed was determined. At the final follow-up, there was a considerable

improvement in all instances in terms of VAS ratings, range of motion, and joint function. In the vast majority of instances, there were no issues. Only 10 individuals were reported to have complications, with 7 (11.67%) having extensor hallucis longus weakening and 3 (05%) having dorsal numbness.

Conclusions

PFO is a very simple, safe, quick, and successful operation for the treatment of medial joint OA of the knee that has not responded to conservative therapies. It improves functional and clinical results, decreases knee joint discomfort, and raises the ML ratio. It is an appealing therapeutic option

for addressing Knee OA since it requires minimum post-operative rehabilitative treatments and has a low complication rate.

Reference

- Epidemiology of knee osteoarthritis in India and related factors. Pal CP, Singh P, Chaturvedi S, Pruthi KK, Vij Indian J Orthop. 2016; 50:518–522.
- Im GI, Kwon OJ and Kim CH. The relationship between osteoarthritis of the knee and bone mineral density of proximal femur: A cross-sectional study from a Korean population in women. Clin Orthop Surg.2014; 6(4):420-425.
- Neogi T, Felson D, Niu J, et al. Association between radiographic features of knee osteoarthritis and pain: results from two cohort studies. BMJ. 2009; 339:0.
- Khan M, Adili A, Winemaker M and Bhandari M. Management of osteoarthritis of the knee in younger patients. CMAJ. 2018;190(3):E72-E79.
- Utomo DN, MahyudinF, Wijaya AM and Widhiyanto L. Proximal fibula osteotomy as an alternative to TKA and HTO in late-stage varus type of knee osteoarthritis. J Orthop.2018; 15(3):858-861.
- VaishA, Kathiriya Y K and Vaishya R. A critical review of proximal fibular osteotomy for knee osteoarthritis. Arch Bone Jt Surg. 2019;7(5):453-462.
- Dumond H, Presle N, TerlainB, Mainard D, Loeuille D, Netter P, et al. Evidence for a key role of leptin in osteoarthritis. Arthritis Rheum.2003;48(11):3118-3129.
- Iannone F and Lapadula G. Obesity and inflammation—targets for OA therapy. Curr Drug Targets. 2010;11(5):586-598.
- Zhang W, Doherty M, Peat G, Bierma-Zeinstra MA, Arden NK, Bresnihan B, et al. EULAR evidence-based recommendations for the diagnosis of knee osteoarthritis. Ann Rheum Dis.2010;69(3):483-489.
- Kellgren JH, Lawrence JS. Radiological assessment of osteo-arthrosis. Ann Rheum Dis. 1957; 16:494–502.
- Okuda M, Omokawa S, Okahashi K, Akahane M and Tanaka Y. Validity and reliability of the Japanese orthopaedic association score for osteoarthritic knees. J Orthop Sci. 2012; 17(6):750-756.
- Vashisht A, Menwal Gand Bhatnagar R. A clinico-radiological evaluation of functional outcome of proximal fibular osteotomy for medial compartment knee osteoarthritis: A new emerging technique. Int J Res Orthop. 2020;6(3):515-520.
- Vina ER, Youk AO, Quinones C, Kwok CK, Ibrahim SA and Hausmann LR. Use of complementary and alternative therapy for knee osteoarthritis: Race and gender variations. ACR Open Rheumatol.2021;3(9):660-667.
- Fukui N, Yamane S, Ishida S, Tanaka K, Masuda R, Tanaka N, et al. Relationship between radiographic changes and symptoms or physical examination findings in subjects with symptomatic medial knee osteoarthritis: A three-year prospective study. BMC MusculoskeletDisord.2010; 11:269.
- Anderson AS and Loeser RF. Why is osteoarthritis an age-related disease? Best Pract Res ClinRheumatol.2010; 24(1):15-26.
- Roy M K, Hossain M Z, Siddiquee A H, Alauddin M, Islam M K, Minto A K, et al. Study of relationship between age and body mass index on knee osteoarthritis in advanced aged females in a divisional city of Bangladesh. Int J Res Orthop.2021;7(4):705-708.
- Ananda Coomasamy A, Catterson I, Sambrook P, Fransen M and March L. The impact of obesity on the musculoskeletal system. Int J Obes (Lond).2008;32(2):211-222.
- Rai AK, Saurabh A, Shekhar S, Kunwar A, Verma V: Proximal fibular osteotomy for pain relief and functional improvement in patients of osteoarthritis of knee. Int Surg J. 2019, 6:2368-72.
- Prakash L: PFO—proximal fibular osteotomy in medial compartment arthritis of the knee with varus deformity. EC Orthopaedics. 2019, 10: 315-21.
- Huda N, Islam MS, Kumar H, Pant A, Bishnoi S: Proximal fibular osteotomy for medial compartment knee osteoarthritis: is it worth?. Indian J Orthop. 2020, 54:47-51.
- Wang X, Wei L, Lv Z, Zhao B, Duan Z, Wu W, et al. Proximal fibular osteotomy: A new surgery for pain relief and improvement of joint function in patients with knee osteoarthritis. J Int Med Res.2017;45(1):282-289.
- Zou G, LanW, ZengY, Xie J, Chen S and QiuY. Early clinical effect of proximal fibular osteotomy on knee osteoarthritis. Biomed Res.2017; 28(21):9291-9294.
- Qin D, Chen W, Wang J, Lv H, Ma W, Dong T, et al. Mechanism and influencing factors of proximal fibular osteotomy for treatment of medial compartment knee osteoarthritis: A prospective study. J Int Med Res.2018; 46(8):3114 -3123.