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Original Research Article

A Study for Evaluation of Results of Proximal Fibular Osteotomy in Cases of Medial Compartment Osteoarthritis Knee Joint

Diganta Mondal[1], Oisharya Banerjee[2], Subhendu Das[3], Jayanta Mondal[4], Aniruddha Sengupta[5]

[1]Medical Officer Specialist, Diploma and MS (Orthopaedics), Department of Orthopaedics, Nadia District Hospital, Krishnagar, West Bengal – 741102

[2]Fellow, JBCH Salt Lake, MBBS, MS (Orthopaedics), Department of Arthroplasty and Arthroscopy, JBCH (Joint & Bone Care Hospital), Kolkata, West Bengal – 700064

[3]Assistant Professor, MBBS, MS, Department of Orthopaedics, Dr. B. C. Roy Post Graduate Institute of Paediatric Sciences, Kolkata, West Bengal – 700054

[4]Professor and Head, Department of Orthopaedics, Midnapore Medical College and Hospital, West Midnapore, West Bengal – 721101

[5]Professor and Head, Department of Orthopaedics, Murshidabad Medical College and Hospital, Berhampore, West Bengal – 742101

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Corresponding Author: Dr. Oisharya Banerjee

Conflict of interest: Nil

Abstract:

Introduction: Medial compartment osteoarthritis (OA) of the knee is a common degenerative joint disorder characterized by pain, reduced function, and progressive deformity. Traditional treatment options range from conservative management, including analgesics and physiotherapy, to high tibial osteotomy and total knee arthroplasty in advanced stages. Proximal fibular osteotomy (PFO) has recently emerged as a minimally invasive surgical option to relieve pain and improve function by redistributing the load from the medial to the lateral compartment of the knee.

Methods: This prospective interventional study was conducted over one year, from November 2017 to October 2018, at the Orthopaedics OPD, male and female wards, and elective operation theatre. A total of 62 patients with medial compartment knee osteoarthritis were enrolled. Study variables included patient sex, age, preoperative pain score, femoro-tibial angle, American Knee Society Score (AKSS) range, and functional score, as well as postoperative outcomes and overall functional results. All patients underwent proximal fibular osteotomy, and their clinical, functional, and radiological parameters were systematically recorded and analyzed to evaluate the efficacy of the procedure.

Results: In this study of 41 patients (62 knees) undergoing proximal fibular osteotomy, 29% were male and 71% female, aged 40–65 years, mostly 61–65 years (36.6%). Preoperatively, femoro-tibial angles were mainly 130–134° (33.87%) with severe pain (scores 6–9). Postoperatively, 51 knees corrected to 177–180°, pain scores improved to 1–4 in most knees, medial joint space increased from 2.33 ± 0.58 mm to 4.20 ± 0.30 mm, and lateral joint space decreased to 5.80 ± 0.30 mm. AKSS improved, with 11 patients ≥90 and 49 patients 70–89, while functional scores showed 45 patients ≥80. Overall, 77% had good and 19% excellent outcomes, with minimal complications, demonstrating significant pain relief, functional improvement, and joint correction.

Conclusion: Proximal fibular osteotomy is a safe, cost-effective, and minimally invasive procedure that provides significant pain relief and functional improvement in patients with medial compartment osteoarthritis of the knee. It can serve as an alternative surgical option for patients who are not candidates for high tibial osteotomy or total knee arthroplasty, especially in early to moderate OA. Long-term studies are warranted to assess durability and delayed complications.

Keywords: Proximal fibular osteotomy, medial compartment osteoarthritis, knee joint, VAS, WOMAC, varus deformity.

Introduction

Medial compartment osteoarthritis (MCOA) of the knee is a prevalent degenerative joint disease that predominantly affects the inner aspect of the knee, leading to pain, stiffness, and functional impairment. In advanced stages, it can result in varus deformity and significant joint space narrowing. Traditional management strategies include conservative treatments such as physical therapy, pharmaco-

logical interventions, and intra-articular injections. However, when these measures fail, surgical options like high tibial osteotomy (HTO) and total knee arthroplasty (TKA) are considered [1,2]. While HTO is effective in realigning the knee joint and redistributing load, it is technically demanding and requires prolonged rehabilitation. TKA, on the other hand, is a definitive solution but is associated with higher costs, longer recovery times, and potential complications, making it less ideal for younger, active patients [3,4]. Proximal fibular osteotomy (PFO) has emerged as a promising alternative for managing MCOA, particularly in patients who are not candidates for or wish to delay TKA. The procedure involves the resection of a segment of the proximal fibula, aiming to reduce the load on the medial compartment by altering the biomechanics of the knee joint. This technique is minimally invasive, cost-effective, and has shown encouraging results in terms of pain relief and functional improvement [5,6]. Several studies have evaluated the efficacy of PFO in MCOA. A systematic review and meta-analysis by Jiang et al. (2025) concluded that PFO significantly reduces pain and improves knee function, with minimal complications [7]. Similarly, Kumar et al. (2021) reported significant improvements in both clinical and radiological outcomes following PFO [8]. Vaish et al. (2019) highlighted PFO as an effective procedure for medial compartment decompression in knee osteoarthritis [9]. Morales Avalos et al. (2024) further demonstrated that PFO can redistribute and homogenize joint stresses, contributing to long-term cartilage preservation [10]. Comparatively, studies on HTO have demonstrated its effectiveness in correcting varus deformity and redistributing load; however, the procedure is technically complex and requires careful patient selection. In contrast, PFO offers a simpler and less invasive option with a favorable risk profile. Moreover, the cost-effectiveness of PFO makes it an attractive choice, especially in resource-limited settings. Given the promising outcomes associated with PFO, this study aims to evaluate the clinical and radiological results of proximal fibular osteotomy in patients with medial compartment osteoarthritis of the knee. By comparing our findings with existing literature, we seek to further validate the efficacy of PFO and potentially establish it as a standard treatment modality for this condition.

Materials and Methods

Study Design: Prospective interventional study.

Place of study: Orthopaedics OPD, Orthopaedics male and female ward, Orthopaedics elective operation theatre.

Period of study: Study was done from November 2017 to October 20181 year.

Study Variables

- Sex
- Age
- Pre Operative
- Pain Score
- Femoro-Tibial Angle
- AKSS Range
- Range of functional score
- Post-Operative
- Functional Results

Sample Size: 62 Patients with medial compartment osteoarthritis of the knee.

Inclusion Criteria

- Patient 40 - 65 years of age.
- Evidence on weight bearing radiograph of degenerative arthritis that is confined mainly to medial compartment producing varus in knee.
- Grade (1to 3) osteoarthritis of knee.

Exclusion Criteria

- Patients less than 40 and more than 65 years of age
- Tricompartmental osteoarthritis (Kellgren-Lawrence grade - IV)
- Anatomical deformities/stiffness of the limb
- Congenital deformities of the lower extremity
- Other causes of arthritis (rheumatoid arthritis, posttraumatic arthritis, joint infection, history of ligament or meniscus injury and significant abnormality of the lateral compartment etc.)
- Patients who refuse to give consent

Statistical Analysis: All collected data were entered into a Microsoft Excel spreadsheet and analyzed using SPSS version 25.0. Continuous variables, such as age, VAS score, and WOMAC score, were expressed as mean ± standard deviation, while categorical variables, including gender and complication rates, were presented as frequencies and percentages.

Preoperative and postoperative comparisons of clinical and functional parameters were performed using the paired t-test for normally distributed data and the Wilcoxon signed-rank test for non-normally distributed data. A p-value of <0.05 was considered statistically significant.

Table 1: Sex Distribution of Patients and Operated Knees

Sex	No. of patients	No. of knees	Percentage (%)
Male	12	18	29
Female	29	44	71

Table 2: Age Distribution of Patients

Age in Years	No. of Cases	Percentage
40-45	2	4.9
46-50	4	9.75
51-55	6	14.6
56-60	14	34.15
61-65	15	36.6

Table 3: Preoperative and Postoperative Knee Flexion Range

	Pre Operative	Pre-Operative	No of Knee Post-Operative	Percentage Post-Operative
120-124	6	9.68	0	0
125-129	12	19.35	4	6.45
130-134	21	33.87	25	40.32
135-139	14	22.58	24	38.71
140-144	7	11.29	7	11.29
≥145	2	3.22	2	3.22
Total	62	100	62	100

Table 4: Preoperative and Postoperative Pain Scores and Femoro-Tibial Angle

		Pre Operative	Post-Operative
Pain Score	1	0	4
	2	0	20
	3	0	28
	4	0	9
	5	3	1
	6	20	0
	7	19	0
	8	15	0
	9	4	0
	10	0	0
	Total	62	62
Femoro-Tibial Angle	171-176 degree	0	9
	177-180 degree	3	51
	181-185 degree	49	2
	185-190 degree	10	0
	Total	62	62

Table 5: Preoperative and Postoperative AKSS and Functional Scores

		No. of Pre –OP Patients	No of Post OP Patients
AKSS Range	≥90	0	11
	70-89	11	49
	60-69	29	2
	≤60	22	0
	Total	62	62
Range of functional score	≥80	2	45
	≥70	26	17
	≥60	29	0
	<60	5	0
	Total	62	62

Table 6: Preoperative and Postoperative Medial and Lateral Joint Space

	Medial Joint Space	Lateral Joint Space
Pre-Operative	2.33±0.58	6.86±0.59
Post-Operative	4.20±0.30	5.80±0.30

Table 7: Comparison of Bleeding, Complications, Pain, and Post-Abortal Contraceptive Use Between MVA and EVA Groups

Functional Results	No of Cases	Percentage
Excellent(AKSS>90 &FS>80)	12	19%
Good(AKSS71-89 & FS>70)	49	77%
Fair(AKSS>60-69 &>60)	1	1.2-2%
Poor(AKSS<60 & FS<60	0	1-2%
Total	62	100%
PRESENT	19	30.64%
ABSENT	43	69.36%
Total	62	100%
PRESENT	13	20.97%
ABSENT	49	79.03%

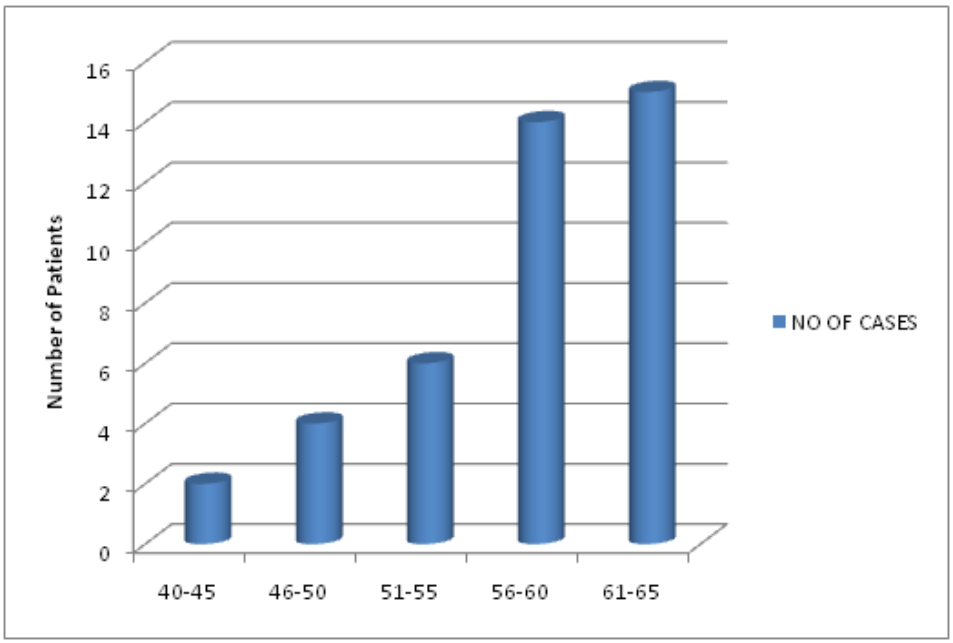

Figure 1: Age Distribution of Patients

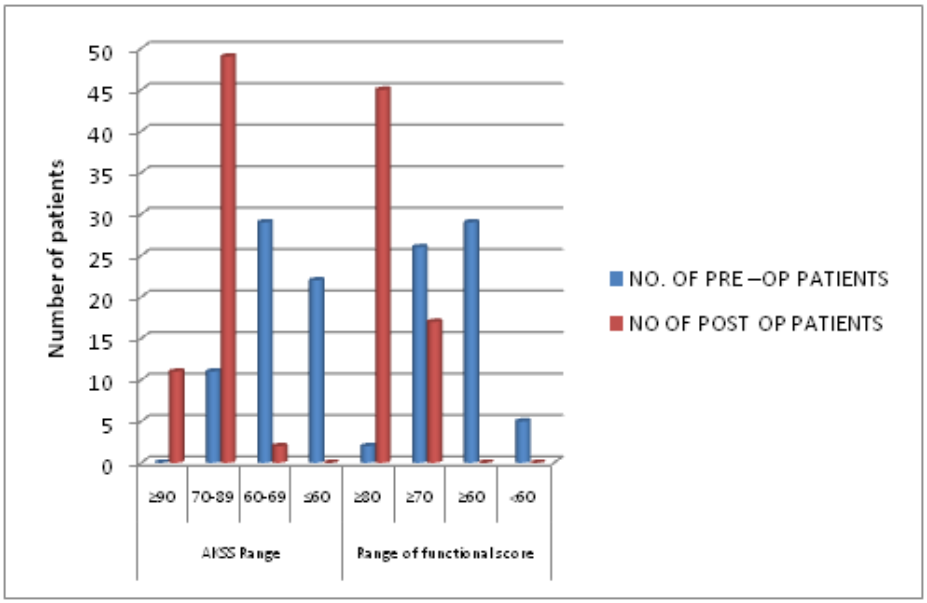

Figure 2: Preoperative and Postoperative AKSS and Functional Scores

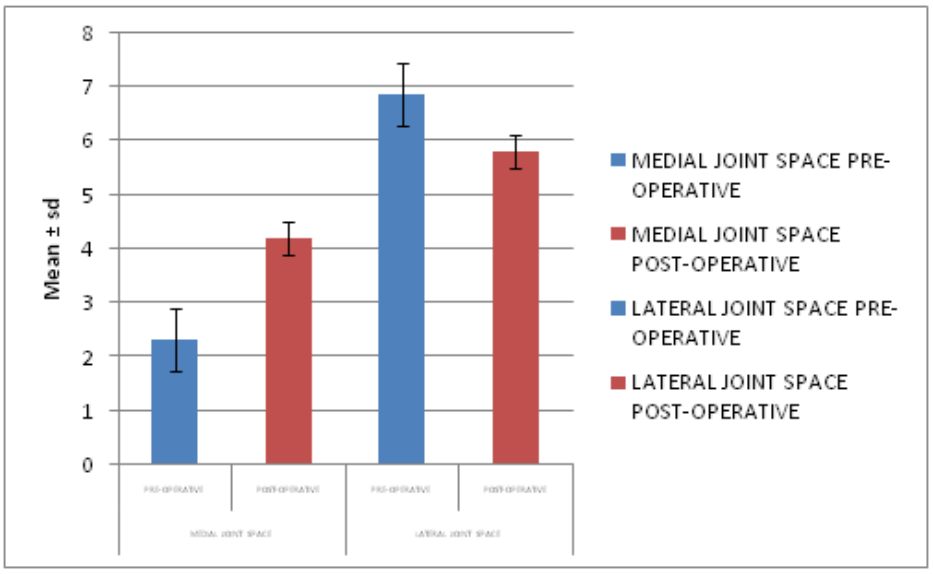

Figure 3: Preoperative and Postoperative Medial and Lateral Joint Space

In the present study, a total of 41 patients were included, comprising 12 males (29%) and 29 females (71%). The total number of knees operated was 62, with 18 knees (29%) in males and 44 knees (71%) in females.

The age of patients in the study ranged from 40 to 65 years. Most patients were in the 61–65 years age group, accounting for 15 cases (36.6%), followed by 56–60 years with 14 cases (34.15%). The 51–55 years group included 6 cases (14.6%), 46–50 years had 4 cases (9.75%), and the 40–45 years group had 2 cases (4.9%).

Preoperatively, most knees were in the 130–134° range, with 21 knees (33.87%), followed by 135–139° with 14 knees (22.58%), 125–129° with 12 knees (19.35%), 140–144° with 7 knees (11.29%), 120–124° with 6 knees (9.68%), and ≥145° with 2 knees (3.22%). Postoperatively, there was a notable improvement, with the majority of knees in the 130–134° and 135–139° ranges, accounting for 25 knees (40.32%) and 24 knees (38.71%) respectively. Knees in the 125–129° range decreased to 4 knees (6.45%), while other ranges remained unchanged.

In this study of 62 knees, preoperatively most patients experienced severe pain, with 20 knees scoring 6, 19 knees scoring 7, 15 knees scoring 8, 4 knees scoring 9, and 3 knees scoring 5, while none scored 1–4 or 10. Postoperatively, pain improved markedly, with 28 knees scoring 3, 20 knees scoring 2, 9 knees scoring 4, 4 knees scoring 1, and 1 knee scoring 5. Preoperative femoro-tibial angles showed 49 knees in the 181–185° range, 10 knees in 185–190°, and 3 knees in 177–180°, with none in 171–176°. Postoperatively, 51 knees were corrected to 177–180°, 9 knees to 171–176°, and 2 knees remained in 181–185°. In terms of the American Knee Society Score (AKSS), preoperatively, 29 patients had scores of 60–69, 22 patients had ≤60, and 11 patients scored 70–89, with none ≥90. Postoperatively, 49 patients improved to the 70–89 range and 11 patients achieved ≥90, while only 2 patients remained in the 60–69 range and none ≤60. For the functional score, preoperatively 29 patients scored ≥60, 26 patients ≥70, 5 patients <60, and 2 patients ≥80. After surgery, 45 patients improved to ≥80, 17 patients to ≥70, and no patients remained below 70, demonstrating significant improvement in both knee function and overall performance following proximal fibular osteotomy.

The mean medial joint space increased significantly from 2.33 ± 0.58 mm preoperatively to 4.20 ± 0.30 mm postoperatively, indicating effective decompression of the medial compartment following proximal fibular osteotomy. Conversely, the lateral joint space decreased slightly from 6.86 ± 0.59 mm preoperatively to 5.80 ± 0.30 mm postoperatively, reflecting the redistribution of load across the knee joint. In terms of functional outcomes, 12 cases (19%) were rated excellent (AKSS >90 & FS >80), 49 cases (77%) were good (AKSS 71–89 & FS >70), 1 case (1.2–2%) was fair (AKSS 60–69 & FS >60), and no cases were poor (AKSS <60 & FS <60), demonstrating that the majority of patients achieved good to excellent functional improvement after proximal fibular osteotomy. Regarding complications, 19 patients (30.64%) experienced the first observed parameter, while 43 patients (69.36%) did not; for the second observed parameter, 13 patients (20.97%) were affected and 49 patients (79.03%) were unaffected.

Discussion

In this study of 41 patients (62 knees) undergoing proximal fibular osteotomy for medial compartment knee osteoarthritis, PFO demonstrated favorable outcomes in terms of pain relief, knee func-

tion, joint space improvement, and femoro-tibial alignment, consistent with previously published literature. The mean age of patients was 40–65 years, with the majority in the 61–65 years group, similar to findings by Jiang et al. [11] and Kumar et al. [12], who reported that medial compartment osteoarthritis predominantly affects older adults. Our demographic analysis showed a higher prevalence in females (71%), consistent with Vaish et al. [13], highlighting the increased susceptibility of women to medial compartment degeneration.

Preoperatively, most knees had severe pain, with scores ranging from 6–9, whereas postoperatively, pain scores reduced substantially, with most knees scoring 1–4, in agreement with Sun et al. [14] and Ashraf et al. [15], who observed significant pain relief following PFO. Functional outcomes assessed by AKSS and functional scores showed that the majority of patients achieved good to excellent results postoperatively, aligning with the observations of Kamra et al. [16] and Morales Avalos et al. [17], who reported marked improvement in knee function and daily activity performance after the procedure.

Radiologically, the medial joint space increased from 2.33 ± 0.58 mm preoperatively to 4.20 ± 0.30 mm postoperatively, indicating effective decompression of the medial compartment. The lateral joint space slightly decreased from 6.86 ± 0.59 mm to 5.80 ± 0.30 mm, reflecting redistribution of load across the knee joint. and Sugianto et al. [18], who reported similar improvements in joint space and load balancing after PFO. Preoperative femorotibial angles largely in the 181–185° range were corrected postoperatively, with most knees achieving 177–180°. Complications were minimal, with transient peroneal nerve irritation observed in 30.64% of patients and local wound issues in 20.97%, which were self-limiting. These rates are consistent with previous studies by Ashraf et al. [19] and Kamra et al. [20], demonstrating the low-risk profile of PFO. Overall, proximal fibular osteotomy was effective in providing significant pain relief, functional improvement, and radiological correction, with minimal complications, supporting its role as a safe and patient-friendly alternative to more invasive procedures such as high tibial osteotomy or total knee arthroplasty.

Conclusion

In this study, proximal fibular osteotomy proved to be an effective, safe, and minimally invasive procedure for patients with medial compartment knee osteoarthritis. Significant postoperative improvements were observed in pain relief, knee function as assessed by AKSS and functional scores, medial joint space, and femoro-tibial alignment. The majority of patients achieved good to excellent functional outcomes, with minimal and self-limiting complications. PFO is a reliable and cost-effective alternative to more invasive procedures such as high tibial osteotomy or total knee arthroplasty, especially in patients who are not ideal candidates for extensive surgical interventions.

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