



## Role of Fibular Osteotomy in Medial Compartment Osteoarthritis of the Knee Joint

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### Abstract

*Osteoarthritis is the most common joint disease and the second most common rheumatologic problem in India, with a frequency of 22 % to 39 %. Knee OA is a leading cause of increased mobility, particularly in women. OA is the 10th major cause of nonfatal burden.*

**Method:** *The present study was conducted after obtaining clearance and approval from the Institutional Ethics Committee Katihar Medical College & Hospital. Written informed consents were taken from the patients' side. This study was conducted in the Department of Orthopaedics, Katihar Medical College & Hospital and it was a prospective study. The study was conducted over a period of 2 years. The current randomized clinical trial was performed on 34 consecutive cases of medial compartment osteoarthritis with varus deformity clinically and radiologically diagnosed. The detailed history of the patient was taken and a complete medical examination was done as per our department protocol.*

**Results:** *The majority of the study subjects were aged between 51 to 60 years (50%) followed by 10 patients (29.4%) who were aged between 61-65 years and 7 (20.6%) patients who were aged between 40 to 50 years. The mean age was 57.17±6.59 years.*

**Conclusion:** *Medial compartment OA knee is a fairly frequent condition that affects the older population's lifestyle. A wide range of treatments is available. Based on the findings of this study, we may infer that PFO is a potential therapeutic option for osteoarthritis affecting the medial compartment of the knee joint. Its popularity may be related to the fact that it is less complicated, less costly, and requires less rehabilitation than other treatments such as HTO, UKA, and TKA. Early medial compartment arthritis of the knee can be treated with a PFO. It might also be a viable alternative treatment for osteoarthritis of the knee's medial compartment, especially for individuals who are unable to undergo TKA due to medical complications. Furthermore, if TKA is required in the future, these individuals will be able to do so.*

**Keywords:** *osteoarthritis, knee, PFO.*

### Introduction

Osteoarthritis (OA) is a significant cause of impairment in the across the world. It is also known as degenerative joint disease, primary OA, wear-and-tear arthritis, or age-related arthritis.<sup>[1]</sup>

The term arthritis is used by doctors to describe

joint inflammation. Arthritis is a broad word used in public health to describe more than 100 different conditions. Because of the aging population and the obesity pandemic, the number of persons with symptomatic knee OA is expected to rise.<sup>[2]</sup>

Knee OA affects the medial, lateral, and patellofemoral compartments of the knee joint, and generally progresses slowly over 10 to 15 years, limiting everyday activities.<sup>[3]</sup>

It was formerly thought to be a "wear-and-tear" of the articular cartilage condition caused only by aging and not by inflammation. Although the etiology of the illness is still unknown and under research, it is widely acknowledged that knee OA is complex in nature. While both inflammatory and biomechanical whole-organ disease processes play a role, family history, age, obesity, diabetes, synovitis, systemic inflammatory mediators, innate immunity, lower limb alignment (genu valgum and genu varum), joint shape and dysplasia, trauma, and inflammation caused by metabolic syndromes all play a role in knee OA.<sup>[4]</sup>

OA causes articular cartilage degradation, bony osteophyte development, and sclerosis of the subchondral bone, as well as the creation of subchondral cysts in advanced instances, regardless of the underlying etiology.

Nonmodifiable and modifiable risk factors for the development of knee OA can be separated. Hereditary (genetic mutations that may predispose a person to the development of OA of the knee) and congenital (inherited abnormalities in the structure of the bone that surrounds the knee joint) risk factors are non-modifiable risk factors. Treatment might be focused towards modifiable risk factors.

The OA Research Society International (OARSI) has released worldwide, evidence-based, consensus recommendations for hip and knee OA therapy.<sup>[5]</sup> 35 of the 51 treatment modalities included in the OARSI guidelines have been thoroughly examined, including a wide range of nonsurgical options (e.g., physiotherapy, bracing, education, weight reduction, visco supplementation, corticoid injections, analgesia, other anti-inflammatory treatments, etc.). Knee OA should be treated conservatively at first. Surgery should only be considered if symptoms persist after nonsurgical therapy has been tried.

Arthroscopic debridement, cartilage repair surgery, osteotomy with axis-correction, and unicompartmental or total knee arthroplasty are surgical possibilities (TKA).

Unicompartmental OA with concomitant varus or valgus deformity is commonly treated by osteotomies around the knee. Since the eighteenth century, osteotomies have been performed.<sup>[6]</sup> Despite the fact that osteotomies were common in the early twentieth century, the true breakthrough came with the late 1950s and 1960s publications of Jackson, Waugh, Gariépy, Coventry, and others.<sup>[7]</sup> For unicompartmental OA of the knee, osteotomy has become a common therapeutic option. A closed-wedge valgization with a fibula osteotomy was performed proximal to the tibial tuberosity in the traditional Coventry osteotomy.<sup>[8]</sup> For a long period, this was the most commonly utilized method. Because of the success of knee arthroplasty in the 1980s and 1990s, osteotomy around the knee became less popular. Compared to arthroplasty, osteotomy was thought to be a difficult surgery with an unclear outcome and a high risk of complications. The development of new plates (particularly plates with angular stability) and the trend toward open-wedge osteotomy without bone graft interposition and the absence of risk of peroneal nerve damage have led to a revival of osteotomy around the knee, particularly in younger patients, over the last decade.<sup>[9]</sup>

Tibial osteotomy (TO), unicompartmental knee arthroplasty (UKA), and total knee arthroplasty are all surgical alternatives for treating medial OA (TKA). Proximal fibular osteotomy (PFO) or higher partial fibulectomy is a relatively new treatment for reducing knee pain in patients with medial OA that is being used by an increasing number of orthopedic surgeons.

#### Aims & Objectives

- To achieve symptomatic and functional improvement assessed by visual analogue score and knee society scoring system.

- To achieve well aligned knee joint in the form of radiological outcome through increase medial compartment joint space.
- To find out any complication in the management by fibular osteotomy, if any.

### Methods

**Place of Study:** Department of Orthopaedics, Katihar Medical College & Hospital Katihar

**Type of Study:** Prospective Study

**Duration:** 2 years

**Procedure of Data Collection:** Patients presenting with medial compartment osteoarthritis with varus deformity attended the outdoor Department of Katihar Medical College & Hospital were included in the study. **Sample Size:** 34 patients

### Inclusion Criteria

- Patient age group between 40-65 years.
- Patients in whom conservative management has failed.
- Predominantly medial compartment primary osteoarthritis with varus deformity.
- Radiographic evidence of medial compartment knee osteoarthritis with an Ahlback's grade I, II, and III.

### Exclusion Criteria

- Secondary knee OA.
- Inflammatory joint disease.
- Patient with severe co-morbidity and who are unfit for surgery.
- History of previous operation in affected knee joint.
- Obese patient with BMI more than 30.
- Anterior and lateral compartment OA only.

### Methodology

The present study was conducted after obtaining clearance and approval from the Institutional Ethics Committee Katihar Medical College & Hospital. Written informed consents were taken from the patients' side. This study was conducted in the Department of Orthopaedics, Katihar Medical College & Hospital and it was a

prospective study. The study was conducted during the period of 2 years. The current randomized clinical trial was performed on 34 consecutive cases medial compartment osteoarthritis with varus deformity clinically and radiologically diagnosed. Detailed history of the patient was taken and complete medical examination done as per our department protocol. Selection of cases was done based on medical history (Name, age, sex, history of any trauma and history of any pathology, etc). Examination of knee was done through the attitude disability, deformity, muscle wasting. Relevant laboratory investigations like- Complete blood count, haemoglobin estimation, fasting and post prandial Blood sugar, Blood urea, serum creatinine, bleeding and clotting time were performed. Plain X- ray of knee AP and Lateral view was also assessed.

All the patients selected were operated and followed up to 2 weeks then 1 month, 3, 6, and 12 months with clinical and radiological assessment at each visit. In All cases pre and post operative charts were maintained with regular assessment for proper post operative recovery assessment. A visual analogue scale was used to measure knee pain.. Knee ambulation activities were recorded using oxford knee score.

**Surgical Procedure:** Under regional anesthesia, in supine position, involved limb was prepared and draped. Tourniquet was routinely applied and inflated unless contraindicated. A 3-4 cm incision was given on the lateral aspect of the leg, over the fibula, 6- 8 cms below the fibular head. The position of the incision was marked using the scale. Soft tissue and muscles were retracted using the Hohmann's retractor. Fibular shaft was exposed and stripped of periosteum. 2-3 holes were drilled over the exposed fibula with 2mm K wire, 1-1.5 cm apart, marking the segment of fibula to be removed. Marked fibular segment t was then excised using the oscillating saw, or osteotome. Patient was discharged on the same day and allowed full weight bearing. Standard weight bearing post operative radiographs were

obtained. Patients were followed up in the outpatient department on regular basis. Knee pain was assessed using a visual analogue scale. Knee ambulation activities were recorded using oxford knee score at 2 weeks then 1 month, 3, 6, and 12 months follow up.

**Statistical Analysis:** Data was checked for accuracy and completeness then coded and entered into (Statistical Package for the Social Sciences) version 19.0 for analysis. The results presented in frequency tables, cross tabulations and figures. Categorical data are presented as frequency with percentages. Continuous data with normal distribution are presented as mean with standard deviation. Mean values of different variables were compared using one way ANOVA and p value <0.05 was considered significant.

**Results**

**Table 1: Age Distribution**

Age Group	Frequency	Percentage
40-50 years	7	20.6
51-60 years	17	50.0
61-65 years	10	29.4
<b>Total</b>	34	100.0
<b>Mean Age</b>	57.17±6.59	

Presents the distribution of the study subjects according to age. Majority of the study subjects were aged between 51 to 60 years (50%) followed by 10 patients (29.4%) who were aged between 61-65 years and 7 (20.6%) patients who were aged between 40 to 50 years. The mean age was 57.17±6.59 years.

**Table 2: Sex Distribution**

Sex	Frequency	Percentage
Male	13	38.2
Female	21	61.8
<b>Total</b>	34	100.0

Sex distribution of the study subjects showed there was a female predominance with 61.8% female participants.

**Table 3: BMI**

BMI	Mean	±SD
<b>Mean BMI (kg/m<sup>2</sup>)</b>	25.61	±1.95

The mean BMI of the study participants was 25.61±1.95 kg/m<sup>2</sup>.

**Table 4: Side of Affection**

Side of Affection	Frequency	Percentage
Right	17	50.0
Left	17	50.0
<b>Total</b>	34	100.0

The side of affection among study population. It shows that there was a similar distribution of left sided (50%) and right sided (50%) affection.

**Table 5: Medial Joint Space at different time interval**

Medial Joint Space (mm)	Mean	±SD
Pre-operative	1.34	±0.20
2 <sup>nd</sup> week	2.49	±0.21
1 <sup>st</sup> month	3.61	±0.23
3 <sup>rd</sup> month	4.20	±0.19
6 <sup>th</sup> month	4.32	±0.21
12 <sup>th</sup> month	4.63	±0.20
<b>Statistical Inference</b>	<b>p value: &lt;0.0001</b>	

Presents medial joint space preoperatively and at different time interval postoperatively. Preoperatively the mean medial joint space was 1.34mm while it opened up gradually at post operative follow up. At 12<sup>th</sup> month follow up the mean medial joint space become 4.63 mm. Above analysis we found it significantly widen up with a p value of <0.0001.

**Table 6: Lateral Joint Space at different time interval**

Lateral Joint Space (mm)	Mean	±SD
Pre-operative	7.37	±0.50
2 <sup>nd</sup> week	6.78	±0.49
1 <sup>st</sup> month	6.55	±0.48
3 <sup>rd</sup> month	6.12	±0.50
6 <sup>th</sup> month	5.52	±0.51
12 <sup>th</sup> month	5.25	±0.48
<b>Statistical Inference</b>	<b>p value: &lt;0.0001</b>	

Lateral joint space preoperatively and at different time interval postoperatively. Preoperatively the mean medial joint space was 7.37 mm while it reduced gradually at post operative follow ups. At 12<sup>th</sup> month follow up the mean medial joint space reduced to 5.25 mm. Above analysis we found it significantly reduced with a p value of <0.0001.

**Table 7:** Tibio femoral angle at different time interval

Tibio femoral angle (°)	Mean	±SD
Pre-operative	183.79	±1.72
2 <sup>nd</sup> week	183.73	±1.75
1 <sup>st</sup> month	183.76	±1.73
3 <sup>rd</sup> month	183.53	±1.88
6 <sup>th</sup> month	180.76	±2.66
12 <sup>th</sup> month	179.38	±2.38
Statistical Inference	p value: <0.0001	

Tibio femoral angle preoperatively and at different time interval postoperatively. Preoperatively the mean varus angle was 183.79° while it increased up gradually at post operative follow up. At 12<sup>th</sup> month follow up the mean varus angle become 179.38°. There was a significant difference in mean tibio femoral angle preoperatively postoperatively (p value = <0.0001).

**Table 8:** VAS at different time interval

VAS	Mean	±SD
Pre-operative	7.82	±0.75
2 <sup>nd</sup> week	5.67	±0.90
1 <sup>st</sup> month	4.59	±0.49
3 <sup>rd</sup> month	3.05	±0.72
6 <sup>th</sup> month	2.23	±0.64
12 <sup>th</sup> month	1.85	±0.77
Statistical Inference	p value: <0.0001	

Preoperative the mean VAS score was 7.82 however, during the follow up period it gradually decreases at finally at 12<sup>th</sup> month follow up it reduced to 1.85 with a significant difference (p value =<0.0001).



**Intra operative (fibular osteotomy)**



**Post operative x-ray**



**Pre-operative X-ray**

**Discussion**

The most prevalent kind of OA is osteoarthritis of the knee. It's a regular occurrence in the medial compartment. In senior people over 60 years old, the prevalence of radiographic and symptomatic OA of the knee is estimated to be 37 % and 12 %, respectively, with a lifetime risk of symptomatic knee OA of %.<sup>[10]</sup>

Radiological evidence of grade 3–4 OA was seen in up to 34% of women and 31% of men over the age of 70. The frequency was 27 percent in individuals under the age of 70, rising to 44 percent in those over the age of 80.<sup>[11]</sup> In one of the most recent investigations, the prevalence of radiographic OA (grade 2 Kellgren-Lawrence (KL)) was reported to be 25.4 percent among 10,000 patients in Sweden. 15.4 percent of the participants had symptoms of OA, and 25.1 percent of them had regular knee discomfort.<sup>[12]</sup>

PFO (proximal fibular osteotomy) is a novel treatment option for osteoarthritis of the medial compartment of the knee. This treatment is straightforward, quick, and risk-free. It offers instant pain relief as well as increased functional ability.

Another less invasive surgical therapy for KOA, proximal fibular osteotomy (PFO), has recently been proposed. This method is gaining a lot of traction in the East (China and India) compared to the rest of the world. Its popularity may be related to the fact that it is less complicated, less costly, and requires less rehabilitation than other treatments such as HTO, UKA, and TKA. The PFO aids in the treatment of a varus deformity in KOA, which causes the loading force to move laterally from the medial compartment. As a result, it aids in the reduction of pain and the attainment of a good functional recovery. To assess the utility of PFO, we conducted a comprehensive assessment of the current literature.

Zhang et al. published a study in 2015 that found proximal fibular osteotomy (PFO) reduces pain and improves joint function in people with osteoarthritis of the knee.<sup>[13]</sup> This new procedure is straightforward, safe, and inexpensive. Almost of patients get pain alleviation following surgery. In a subset of patients with knee osteoarthritis, PFO may be used to postpone or replace TKA.

In this trial, we used a visual analogue score to assess clinical and functional improvement, as well as a radiological outcome based on increased medial compartment joint space.

The research was carried out at Katihar Medical College & Hospital Katihar's Department of Orthopaedics. In the current investigation, 34 patients with medial compartment primary osteoarthritis with varus deformity were included. Osteoarthritis (OA) of the knee joint is a frequent problem among the elderly, with a prevalence rate of around 30% in those over 60 years old<sup>[14]</sup>. Because of the prevalence of varus knees, OA involving the medial compartment is extremely prevalent in the Asian population. This results in

an uneven weight distribution on the knees, which damages the articular cartilage and leads to OA.<sup>[14]</sup>

In terms of demographic data, we discovered that the average age of the research participants was 57.176.59 years. The great majority of the research participants (79.4%) were between the ages of 51 and 65, according to our findings. With 61.8 percent of the research participants being female, the gender distribution revealed a female majority. The research participants' average BMI was 25.611.95 kg/m<sup>2</sup>. Left-sided (50 percent) and right-sided (50 percent) love were distributed in a comparable way.

Mayank Bansal and colleagues looked into the effects of PFO on pain alleviation and functional improvement in osteoarthritis of the medial compartment of the knee joint. They said that the average age of the research participants was Female patients were 55.4 years old (range 38-81 years) while male patients were 66.5 years old (range 44-85 years). Gender distribution in their investigation revealed a feminine majority, with 54 female patients and 18 male patients.<sup>[15]</sup>

In their study, Wang et al found that following PFO, all patients experienced alleviation from medial pain. Preoperatively, the mean visual analogue scale scores were 8.021.50; postoperatively, they were 2.74 2.34. The mean preoperative American Knee Society knee and function sub scores were 44.418.090 and 41.2413.48, respectively. They improved considerably postoperatively, to 69.0211.12 and 67.6313.65, respectively. The study's most notable findings were alleviation from medial joint discomfort and an increase in medial joint space. Although the mechanism remained unknown and the follow-up was brief, the majority of patients in their research had considerable pain reduction immediately after PFO. Surprisingly, pain alleviation improved with time, and several patients reported no discomfort at the last check-up.<sup>[16]</sup>

Thus, based on the findings of this study as well as previous studies, we can conclude that ideal

indications for PFO include: primarily medial compartment arthritis with varus knees, good lateral joint space in weight bearing films, at least 2mm gap in AP stress Varus X-rays, a motivated patient who understands that this is a procedure that buys time and delays knee replacement surgery, and patients with a BMI less than 30.<sup>[17]</sup>

### Conclusion

Medial compartment OA knee is a fairly frequent condition that affects the older population's lifestyle. A wide range of treatments are available. Based on the findings of this study, we may infer that PFO is a potential therapeutic option for osteoarthritis affecting the medial compartment of the knee joint.

It is considerably more popular in the East than it is in the West. Its popularity may be related to the fact that it is less complicated, less costly, and requires less rehabilitation than other treatments such as HTO, UKA, and TKA. Early medial compartment arthritis of the knee can be treated with a PFO.

It might also be a potential alternative treatment for osteoarthritis of the medial compartment of the knee, particularly for individuals who are unable to undergo TKA due to medical complications. Furthermore, if TKA is required in the future, these individuals will be able to do so.

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