

# Functional outcome of proximal fibular osteotomy in medial compartment osteoarthritis knee

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## Abstract

Knee osteoarthritis (OA) being the commonest joint disease has an incidence of 30% in population above 60 yrs. Proximal Fibular osteotomy (PFO) though in exploratory stage has aroused lot of interest in orthopedic surgeons as it seems to be most simple, affordable, safe surgery without any insertion of implants. A prospective study based on 30 knees with medial compartment knee osteoarthritis treated surgically in department of Orthopaedics for a period of 2 years. The data was collected using structured proforma, consent and functional outcome analysed based on Visual Analogue Score and American Knee Society Score. They were evaluated using Visual Analogue Score which was decreased from pre op 7.52 to post op 3.2 and American Knee Society Score which improved from pre op 44.9 to post op 74.1 where Good outcome was found in 23 knees (76.6%), excellent outcome was found in 3 knees (10%), fair outcome was observed in 4 knees (13.33%). Only 2 out of 30 knees had EHL weakness as complications which eventually recovered completely by end of 12 months.

**Keywords:** Knee osteoarthritis, proximal fibular osteotomy, visual analogue score

## Introduction

Osteoarthritis (OA) of the knee joint is a chronic, degenerative problem often associated with pain involving the affected joint, decreased range of motion, and deformity <sup>[1]</sup>. OA affected about 3.8% of the world population according to estimates in 2010, with higher involvement in women (4.8%) as compared to men (2.8%) <sup>[2]</sup>. OA of the knee joint affects about half of the population over the age of 60 years and mainly women, as it is mostly because of osteoporosis as a result of decreased bone mineral density <sup>[3]</sup>. There are multiple options for the management of knee joint OA, both conservative and surgical. Conservative options for OA knee include analgesics, physical therapy, intra-articular injections of steroid or platelet rich plasma and viscosupplementation agents <sup>[4-6]</sup>. Varus or valgus deformity develops due to malalignment of leg in osteoarthritis of knee. In knee varus deformity where mechanical femoro-tibial axis is less than 180 degree and narrowed medial joint space is common in patients with idiopathic osteoarthritis, seen on full leg standing antero-posterior radiographs <sup>[7]</sup>. The medial compartment is most commonly involved in knee joint OA because, in healthy people, it carries almost 60%-80% of the load as the mechanical axis lies more frequently

medial to the center of the knee joint <sup>[8]</sup>.

The surgical methods which are used for treating knee osteoarthritis are high tibial osteotomy and total knee arthroplasty.

A. High tibial osteotomy is the first choice of treatment and a highly demanding procedure.

It is usually reserved for younger patients who are generally more active. This procedure is associated with complications like neurovascular injury, iatrogenic fracture, nonunion etc. <sup>[9, 10]</sup>.

B. Total knee arthroplasty is the main surgical procedure to relieve pain, improve.

Joint function and mobility and corrects lower extremity alignment but it is an expensive and complex procedure. In young, active patients and the patients with moderate osteoarthritis it is not the treatment of choice <sup>[11]</sup>.

Currently proximal fibular osteotomy is the widely accepted modality for the management of medial compartment knee osteoarthritis. The lateral support provided to the osteoporotic tibia by the fibula-soft tissue complex may lead to the non-uniform weight distribution and degeneration of the tibial plateau both laterally and medially <sup>[12]</sup>. This may result in shifting of the load from the normal distribution further medially to the medial plateau and lead to knee varus deformity and aggravate the progression of medial compartment knee OA. The proximal fibular osteotomy (PFO) which decreases the loading force on the medial compartment knee helps in such situations.

Proximal osteotomy of the fibula weakens the lateral fibular support and leads to a correction of the varus deformity, which can subsequently shift the loading force from the medial compartment more laterally, leading to decreased pain and a satisfactory functional recovery.

There are few mentioned studies on proximal fibular osteotomy for medial compartment knee osteoarthritis in literature. With this background, the present study is proposed to study the impact of proximal fibular osteotomy, among the indicated patients, attending in our hospital.

## Methodology

The patients were diagnosed of knee osteoarthritis by American College of Rheumatology criteria and severity of disease was graded by Kellgren and Lawrence grading system.

All characteristics were summarized descriptively. For continuous variables, the summary statistics of mean± standard deviation (SD) were used. For categorical data, the number and percentage were used in the data summaries and diagrammatic presentation.

The difference of the means of analysis variables between two time points in same group was tested by paired t test.

If the p-value was < 0.05, then the results were considered to be statistically significant otherwise it was considered as not statistically significant. Data were analyzed using SPSS software v <sup>[23]</sup>. (IBM Statistics, Chicago, USA) and Microsoft office 2007.

## Inclusion criteria

- Predominantly medial compartment osteoarthritis with Varus knees.
- Patients with Kellgren-lawrence grade 1, 2 and 3.
- At least 2mm gap in AP stress varus X-rays.
- Good lateral joint space in weight bearing X-rays.
- A motivated patient, who understands that this is a simple procedure that buys time and delays knee replacement surgery.
- Patients who are medically fit and willing for surgery.
- Patients with BMI less than <sup>[23]</sup>.
- Patients in whom conservative management has failed and who have radiographic

evidence of significant Varus.

### Exclusion criteria

- Patients with post traumatic knee osteoarthritis or inflammatory joint disease.
- Patients with history of previous operations or fractures of knee joint.
- Kellgren-Lawrence Grade 4 osteoarthritis.
- Septic or tubercular arthritis and genu valgus of knee joint.
- Local infection.
- Anatomic anomalies.
- Patients refusing informed consent.
- Patients with irregular follow up.

### VAS score

The visual analogue scale is a psychometric response scale which can be used in questionnaires. It is a measurement instrument for subjective characteristics or attitudes that could not be directly measured. To measure Visual Analogue Score, respondents were asked to specify their level of agreement to a statement (e.g. pain) by indicating a position along a continuous line between two points.

### Knee society scoring

It is a simple objective scoring system to rate the knee and patient functional abilities before and after proximal fibular osteotomy. It contains minimum score of 0 and maximum of 100. It contains 6 parameters which include pain, range of motion, stability both anteroposterior and mediolateral, flexion contracture, extension lag and alignment.

### Results

Among 20 cases, minimum duration of surgery was 22min and maximum duration of surgery was 33min, with an average of 27.3min per knee. 8 cases were done within 20-25min, 18 cases were done within 26-30 min and 4 cases were done in >30min.

**Table 1:** Distribution of Cases According to ot Time (MINS)

OT Time (In Mins)	N	Percent
20-25	8	26.7
26-30	18	60
>30	4	13.3
Total	30	100

The measurement of medial joint space is done using anteroposterior weight bearing radiograph of the affected knees. Among 30 knees, the preoperative mean medial joint space was 1.9mm. Immediate post-operative measurement of MJS increased to 3,9mm which remained the same after 6 months and gradually reduced to 3.8mm and 3.6mm later at 12months and 18months respectively.

**Table 2:** Change in MJS According to Time

MJS (in mm)	Mean	SD	t value	p value
Pre OP	1.9	0.6	-	-
Immediate	3.9	0.4	-32.1	<0.001*

6 Months	3.9	0.4	-29.4	<0.001*
12 Months	3.8	0.4	-28.0	<0.001*
18 Months	3.6	0.5	-24.3	<0.001*

**Note:** \*significant at 5% level of significance ( $p < 0.05$ ).

### Visual analogue score: Pre-operative

Visual analogue score is used for analysis of severity of pain. Lowest score was 6 and highest score was 9. Among 30 knees, 4 patients scored 6, 10 patients scored 7, 14 patients scored 8 and 2 patients scored 9. The average score was 7.5.

### Visual analogue score: Post-operative

The mean of immediate Post-operative Visual analogue score came out to be 2.8 and later on during follow up at 6 months it remained same i.e. 2.8 but later on increased to 3.2 and further 3.3 during 12 months and 18 months follow up respectively.

**Table 3:** Change in Vas According to Time

VAS	Mean	SD	t value	p value
Pre OP	7.5	0.8	-	-
Immediate	2.8	1.0	34.3	<0.001*
6 Months	2.8	1.0	34.3	<0.001*
12 Months	3.2	1.3	18.0	<0.001*
18 Months	3.3	1.3	15.1	<0.001*

**Note:** \*Significant at 5% level of significance ( $p < 0.05$ ).

### Knee society score: Pre-operative

Knee ambulation activity was assessed by using Knee Society Score. In our study, the lowest score was 38 and the highest was 52 with an average of 44.9. Among 30 knees, 18 patients scored between 35-45, 11 patients scored between 46-50 and 1 patient scored >50.

### Knee society score: post-operative

The mean of immediate Post-operative Knee Society Score came out to be 75.1 and later on during follow up at 6 months it remained same i.e. 75.1 but later on decreased to 74.4 and further 74.1 during 12 months and 18 months follow up respectively.

**Table 4:** Change in KSS According to Time

KSS	Mean	SD	t value	p value
Pre OP	44.9	3.4	-	-
Immediate	75.1	4.2	-116.2	<0.001*
6 Months	75.1	4.2	-116.2	<0.001*
12 Months	74.4	4.3	-67.7	<0.001*
18 Months	74.1	4.6	-58.6	<0.001*

**Note:** \*significant at 5% level of significance ( $p < 0.05$ ).

Among 30 knees, 2 patients developed ipsilateral EHL weakness, associated with numbness over dorsum of foot, otherwise no other complications were noted.

**Table 5:** Distribution of Cases According to Complications

Complications	N	Percent
None	28	93.34
EHL Weakness	2	6.66
Total	30	100

Besides all of the above findings, the improvement of the whole lower limb alignment was observed in 8 cases. The lower limb alignment was determined by the Hip-Knee-Ankle angle (HKA) which was measured in whole lower limb standing weight bearing radiographs. In our study, we had no superficial or deep wound infection or wound dehiscence.

## Discussion

The visual analogue scale is used for the assessment of pain in preoperative and post-operatively in every follow up. In our study, symptomatic pain improvement was seen in all patients irrespective of effect of visual analogue scale score. In our study, the visual analogue scale score was decreased significantly from 7.5 to 3.2.

Our study is comparable with the following previous study, in respect to the pre- operative and post- operative visual analogue score.

**Table 6:** Comparison of Pre-Op and Post-Op Vas

Study	Year of study	Vas	
		Pre-Op	Post-Op
Zong-You Yang , Y Zhang <i>et al.</i> <sup>[13]</sup>	2015	7	2
Xioahu Wang, Lei Wei <i>et al.</i> <sup>[14]</sup>	2016	8.02+-1.50	2.74+-2.34
Guoping Zou, Weibin Lan <i>et al.</i> <sup>[15]</sup>	2017	4.6+-1.3	0.5 +-0.2
Y. Zhang, Y. Yu <i>et al.</i> <sup>[16]</sup>	2017	6.5	1.5
Present Study	2018-2020	7.5	3.2

The knee society score was used for the assessment of functional outcome of the patients. Knee society score was assessed and noted in every follow up. In our study, 4 patients had poor outcome in terms of knee society score. This results are comparable to various other studies mentioned below in the table.

**Table 7:** Comparison of Pre-Op and Post-Op KSS

Study	Year of Study	KSS	
		Pre-Op	Post-Op
Zong-You Yang, Y Zhang <i>et al.</i> <sup>[13]</sup>	2015	45+-21.3	92.3+-31.7
Xioahu Wang, Lei Wei <i>et al.</i> <sup>[14]</sup>	2016	44.41+-8.9	69.02+-11.12
Present Study	2018-2020	44.9	74.4

Proximal fibular osteotomy is a simple procedure. The mean duration of this surgery was 27.3 min and the operations were performed uneventfully without any intra-operative complications.

**Table 8:** Comparison of Duration of Surgery in Various Studies

Study	Year of Study	Mean Duration of Surgery (Min)
Xioahu Wang, Lei Wei <i>et al.</i> <sup>[14]</sup>	2016	32.23 +-9.13
Guoping Zou, Weibin Lan <i>et al.</i> <sup>[15]</sup>	2017	35.6+-9.5
Present Study	2018-2020	27.3

Post-operatively, no wound complications were noted. In our study, 2 patients developed ipsilateral EHL weakness post-operatively, probably due to traction injury of the superficial peroneal nerve. In these limbs, the skin over the distal lateral calf muscle and the dorsal foot exhibited varying degree of numbness. Among the 2 limbs with apparent superficial peroneal nerve injury, the symptoms of nerve injury had disappeared in 1 limb at 6 months follow-up, in 1 limb at 12 months.

**Table 9:** Comparison of Complications

Study	Year of Study	Complications
Zong-You Yang, Y Zhang <i>et al.</i> <sup>[13]</sup>	2015	4(3.64%)
Xioahu Wang, Lei Wei <i>et al.</i> <sup>[14]</sup>	2016	0(0%)
Present Study	2018-2020	2(6.66%)

## Conclusion

- Proximal fibular osteotomy reduce knee pain in medial compartment knee osteoarthritis with or without varus deformity.
- It is safe, simple, minimally invasive, effective procedure for the treatment of medial compartment OA.
- This procedure also improves the lower limb alignments.
- The surgical outcome depends on the severity of the disease, and preoperative knee function.
- It is a cost effective procedure, so it's a promising alternative in most developing countries.

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