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## Isolated medial compartment osteoarthritis of knee, treated by proximal fibular osteotomy

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### Abstract

**Aim:** Study the results in patients of isolated medial compartment Osteoarthritis of Knee, treated by Proximal Fibular Osteotomy.

**Material and Methods:** The study was conducted on 34 patients amounting to 50 knee joints (male and female between the age of 45-65 years) with medial compartment OA Knee. Patients were followed up till 6 months. Medial and joint spaces along-with visual analogue score for pain were recorded pre-operative, immediate post-operative and at final follow up.

**Result:** Significant improvement in mean visual analogue pain score (VAS), from 6.12 preoperative to 2.19 at the final follow up was observed (p-value <0.001). Medial joint space opening from 1.11 to 4.21 at final follow up was observed.

**Conclusion:** The objectives as well as functional outcome after proximal fibular osteotomy were satisfactory.

**Keywords:** medial compartment osteoarthritis knee, PFO

### Introduction

Knee joint is one of the largest synovial joint in human body <sup>[1]</sup>. It is a complex hinge joint which consists of 3 partially separated compartments, medial and lateral tibiofemoral compartments and a patellofemoral compartment <sup>[1]</sup>. It is the major weight bearing joint and as a result of inherent complex anatomy, subcutaneous nature with large surface area, it is prone to get affected by various traumatic and nontraumatic disorders <sup>[2]</sup>. The joint is constantly exposed to loading and bending and/or rotation acting in coupled fashion <sup>[3]</sup>. Primary osteoarthritis of knee is more common than that of the other joints <sup>[4, 5]</sup>. The main triggering factors for development of osteoarthritis are biomechanical due to microfracture of subchondral bone or fatigue fracture of collagen fibres.

Although it is common knowledge and observation that medial compartment is the weight bearing component and it draws upon itself 60-80% of the load, none has accurately described the reason behind this non-uniformity of load sharing <sup>[6]</sup>. The current consensus is that the weight is distributed along the mechanical axis, which due to the anatomy of the joint lies medial to the knee centre. It is evidently clear that in an osteoporotic setup, fibula delivers a lateral support to the tibia which is responsible for uneven settlement of the plateau leading to its regression. This causes an axial shift of load going medially away from the medial plateau and contributes in the development of knee varus, which in turn forms a vicious cycle further accelerating the rate of progression of OA of medial compartment of knee. Taking this into consideration, fibular osteotomy alleviates the escalating load from the medial compartment and mitigate the symptoms of medial compartment OA of the knee joint. Hence the present study was conducted to determine the efficacy of the procedure in terms of clinical improvement.

### Material and Methods

Institutional review board approval was obtained for this study. All patients were informed about the benefits and complications of the procedure. Written informed consent was obtained from all patients in study group.

The study was conducted on 34 patients amounting to 50 knee joints (male and female between

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the ages of 45-65 years) with medial compartment OA Knee in the Department of Orthopaedics, for the duration of 1 year.

### Patient selection

#### Inclusion criteria

- Symptomatic isolated medial compartment OA knees,
- Radiographically falling into Ahlback [7] grade 1 or 2, aged between 45-65 years who consented for surgery.

#### Exclusion criteria

- Post Traumatic arthritis, patello-femoral OA, Bi or Tri Compartmental OA, Inflammatory Joint Disease
- Patients who had history of Previous Operations or fractures around the knee joint,
- Patients with deformity associated with tumours around the knee
- Patients with comorbid conditions like deranged Hepatic or Renal Functions, uncontrolled Diabetes or Hypertension.

### Outcomes measured

The primary measured outcome was difference in medial joint space, pre-operatively, immediate post-operative and at final follow up. Measurements were done on weight bearing radiograph using Indian one-rupee coin (diameter 20mm) as standardisation tool. Secondary measure outcome was pain measured by visual analogue score (VAS) [8-10]. Data pertaining to age, sex, height, affected side, lateral joint space and American knee society score [11] (2 subsets, knee and functional score) were recorded at baseline, immediate follow up and at final follow up. Intra-operative data such as use of tourniquet, requirement of blood transfusion and operative time were also recorded.

### Surgical technique

Under Spinal / Epidural anaesthesia, patient was made to lie in supine position. Tourniquet was applied in all cases but inflated according to need. The knee over the affected side was prepared with an aqueous iodine-based scrub, followed by painting the part with povidone iodine solution from middle of the thigh up to the ankle and covered with sterile drapes. Fibular head palpated and marked. Level for osteotomy was then localised 7.5-8.5 cm below the fibular head using sterile metal scale. A hypodermic needle was placed at that point and position re-confirmed under C-arm. This over-jealous approach of correct level aided in prevention of injury to the common peroneal nerve and other post-op neurovascular complications. The level for fibular cut was decided based upon guidelines in literature.<sup>12</sup> In patients with height less than five and half foot (165cms), cut was taken at 7.5-8cms and for those more than 165cms was taken at 8-8.5 cms. A generous 5-7 cms lateral skin incision centred over the location of hypodermic needle was given and fibula is exposed between the Peroneus and Soleus muscle. Retractors were carefully placed and gently retraced so as to avoid injury to nearby neurovascular bundle. Bone levers were avoided as they present with higher chances of neuropraxia. Multiple drill holes were done in proximal and distal margin of the segment to be resected. Osteotome used to mobilise the segment and a 1-2 cm section was removed using Kocher forceps. After resecting, open ends of the fibula were sealed off with the application of Bone Wax. Gentle thorough lavage with normal saline was done and incision was closed in layers achieving complete haemostasis. Aseptic

dressings was done, followed by application of compression bandage. Patient was allowed weight bearing according to tolerance, at 1st post-op day.

### Follow-up

After discharge, patients were called for follow up on post op day 12-14 for sutural removal. Then they were followed up monthly for 6 months. Data recording was done during immediate post op period (POD 2-4) and at final follow up (6 months post-op).

### Statistical analysis

Data collected was entered into Microsoft Excel worksheet and analysed statistically by using Statistical Package for Social Sciences (SPSS Inc., Chicago, IL). Mean and standard deviation was calculated for all quantitative variables for description and measures of dispersion. For normally distributed data means of two groups was compared using paired student t-test. Qualitative or Categorical variables were described as frequencies and proportions. The nonparametric test (Wilcoxon's signed rank test) was applied to analyse the VAS and KSS data. p-value less than 0.05 was considered statistically significant.

### Discussion

Knee osteoarthritis is a joint disorder that is very commonly encountered with an incidence of 30% in population aged more than 60 years [12]. It is reported that even in a healthy knee, medial compartment bears around 60-80% of the total load. This is why early changes of OA are encountered most commonly in this compartment. Treating the disease at the stage of uni-compartmental pathology hence saves the patient from debilitating complications that follow later on. Conservative modalities employed at early stages include intra-articular injection of steroids, PRP or hyaluronic acid. Various studies have shown that these modalities lead to an acceleration of disease pathology due to excessive joint loading after temporary pain relief is achieved, and thus the harms out-weight pain relief in long term [13, 14].

**Table 1:** Comparing improvement in medial joint space with landmark studies

Series	Pre-Op	Post-Op	t	p-value
L Prakash <sup>15</sup>	1.2 ± 0.7	4.5 ± 2.7	40.3	< 0.001
Current	1.11 ± 0.29	4.21 ± 0.69	22.166	< 0.001

Compares current study against other landmark studies, thus cementing reproducibility of results. It was also observed that lateral joint space reduced from 7.20 + 0.46 pre-operatively to 5.11 + 0.64 at final follow up.

**Table 2:** Comparing improvement of VAS with similar studies

Series	Follow Up (Months)	Pre-Op	Final Follow Up
Zong-You Yang <i>et al.</i> [6]	49.1	7.0	2.0
Xiaohu Wang <i>et al.</i> [16]	13.38	8.02	2.74
L Prakash [15]	12	6.7	2.2
Current	6	6.32	2.19

Patients reported excellent pain relief, even in the immediate post-operative period. The 10-point VAS score improved from 6.32±0.18 pre-operative to 4.64±1.26 immediate post-operative and 2.19±1.20 at the final follow up (p-value < 0.001).

**Table 3:** Improvement of American knee society score

Knee Score	Mean	SD	t	p-value
Pre-op	38.12	3.17	-28.710	< 0.001
6 months	85.18	9.19		
Functional Score	Mean	SD	t	p-value
Pre-op	43.20	6.17	-23.118	< 0.001
6 months	83.60	6.38		

Part-1 of American knee society score focuses on objective scoring including pain on various activities of daily living, range of motion, stability of the joint and rest pain, if any. There was significant improvement of knee score from  $38.12 \pm 3.17$  pre-op to  $68.12 \pm 9.85$  immediate post-op (p-value < 0.001). Improvement continued up-to final follow up as knee score was  $85.18 \pm 9.19$  at 6 months follow-up (p-value < 0.001).

Part-2 of American knee society score focuses on functional capabilities of the joint of patient. It includes parameters like how much is the patient able to walk without pain, whether he can climb up and down the stairs normally and functional deductions like use of crutches or walker, if any. There was improvement of functional score from  $43.20 \pm 6.47$  pre-op to  $71 \pm 8.15$  immediate post-op (p-value < 0.001). Improvement from immediate post-op to final follow up was also significant,  $83.60 \pm 6.38$  (p-value < 0.001).

### Conclusion

The current study advocates PFO as a tool to decelerate the progression of the disease and hence help delay or even prevent arthroplasty. It provides excellent pain relief to the patient and improves function. It is by no means a replacement for knee arthroplasty and high tibial osteotomy which remain gold standard procedures in advanced knee OA.

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