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## A case series of functional outcome of proximal fibular osteotomy in medial compartmental osteoarthritis of knee

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### Abstract

This study investigates the effectiveness of Proximal Fibular Osteotomy (PFO) as an alternative surgical intervention for managing Medial Compartmental Osteoarthritis (OA) of the knee. Over a period from October 2022 to October 2023, a prospective case series was conducted at Sri Lakshmi Narayana Institute of Medical Sciences, enrolling three patients diagnosed with confirmed Medial Compartmental OA. The inclusion criteria comprised individuals with a Kellgren–Lawrence score of 2 or higher, exhibiting varus deformity, and consenting to PFO. Patients with post-traumatic knee OA, inflammatory joint disease, or prior knee surgeries were excluded.

The patient cohort, ranging in age from 42 to 54 years (mean age: 48.4 years), predominantly demonstrated right knee affliction. Follow-up assessments occurred over an average duration of 10 months post-surgery. Notably, postoperative transient extensor hallucis longus (EHL) weakness emerged in all patients, resolving within 3 to 5 weeks without any reported complications during subsequent follow-up.

Outcome measures encompassed pain relief evaluation through Visual Analog Scale (VAS), functional recovery assessments using Modified Oxford scores, and radiological analysis, focusing on tibiofemoral angle and joint space measurements. Results revealed substantial pain relief, enhanced joint function, and improved joint space post-PFO, suggesting promising outcomes in managing medial knee OA.

In conclusion, PFO emerged as a feasible and minimally invasive approach offering significant symptomatic relief and functional improvement in patients with medial compartmental OA. This procedure could potentially delay or obviate the necessity for more invasive surgical options like total knee arthroplasty. Careful consideration and avoidance of common peroneal nerve injury during PFO are pivotal.

**Keywords:** Proximal fibular osteotomy, medial compartmental osteoarthritis, knee, pain relief, joint function, varus deformity

### Introduction

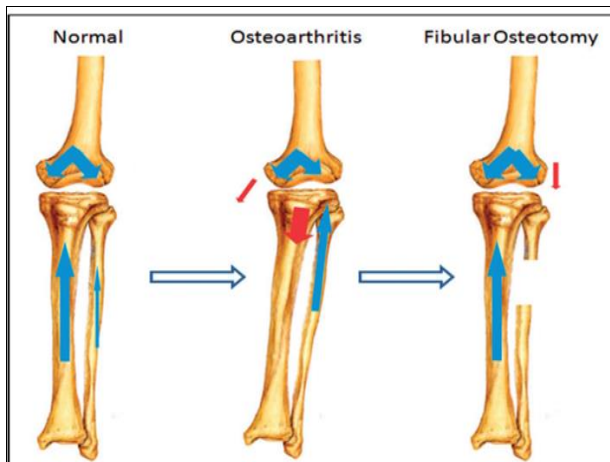
Medial Compartmental Osteoarthritis (OA) of the knee stands as a substantial challenge in orthopedic practice, characterized by the degeneration of the medial knee joint, resulting in reduced joint space, varus deformity, and consequent functional impairment. The conventional treatment approaches for advanced stages of this condition, such as total knee arthroplasty (TKA) or high tibial osteotomy (HTO), though effective, present limitations for specific patient demographics due to their invasive nature and potential for long-term complications. Emerging as an alternative, Proximal Fibular Osteotomy (PFO) offers a less invasive and simpler surgical intervention targeting medial compartmental OA.

Prior literature has extensively explored the biomechanics and pathophysiology of medial compartmental OA, highlighting the predominant load-bearing nature of the medial knee compartment, making it susceptible to progressive degenerative changes. While TKA remains the gold standard for advanced cases, concerns arise regarding its suitability for younger, more active patients, and those with moderate OA. High tibial osteotomy, though effective, is technically demanding and carries risks of neurovascular injuries, fixation failure, and non-union, limiting its applicability.

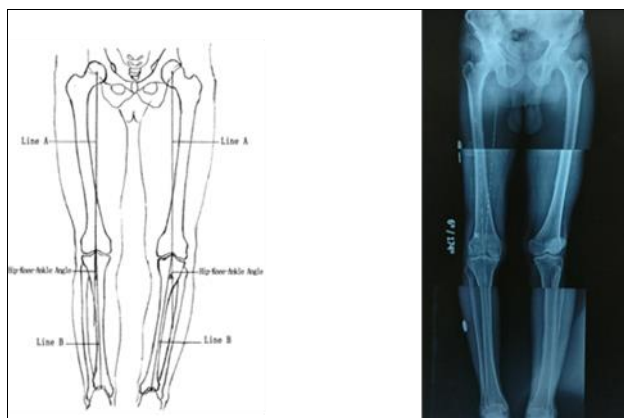
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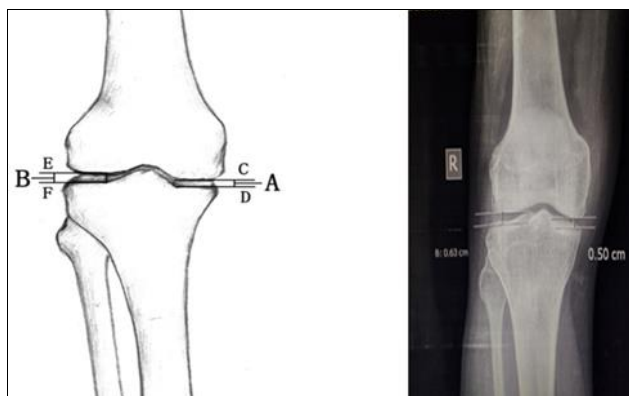
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**Fig 1:** Yang *et al.* theory behind proximal fibular osteotomy



**Fig 2:** Measurement of the hip-knee-ankle angle. Line A was drawn from the centre of the femur to the centre of the knee, and line B was drawn from the centre of the knee to the centre of the ankle. The hip-knee-ankle angle is the intersection angle  $\alpha$  between lines A and B.



**Fig 3:** The medial joint space was determined by a vertical line (A) between two horizontal lines (C and D) that were drawn from the lowest point of the medial condyle of the femur and medial plateau of the tibia, respectively. The lateral joint space was determined by a vertical line (B) between two horizontal lines (E and F) that were drawn from the lowest point of the lateral condyle of the femur and lateral plateau of the tibia, respectively.

Proximal Fibular Osteotomy, on the other hand, has garnered attention as a viable alternative. The rationale behind PFO revolves around relieving pressure from the medial compartment by altering the mechanical axis of the knee, aiming to postpone or circumvent the need for more invasive procedures. Prior studies have indicated the potential of PFO

in restoring joint function and alleviating symptoms, paving the way for its consideration in managing medial compartmental OA.

This study aims to further explore the efficacy of PFO as a surgical intervention for medial knee OA, considering pain relief, functional recovery, and joint space preservation as primary outcome measures. By examining these parameters in a prospective case series, this investigation seeks to contribute to the existing body of literature, providing insights into the feasibility and effectiveness of PFO in managing this challenging orthopedic condition.

**Materials and Methods**

**Study Design and Participants**

A prospective case series study was conducted at Sri Lakshmi Narayana Institute of Medical Sciences between October 2022 and October 2023. The study included three consenting patients diagnosed with Medial Compartmental OA of the knee, meeting the inclusion criteria of Kellgren–Lawrence score  $\geq 2$ , varus deformity, and exclusion criteria of post-traumatic knee OA, inflammatory joint disease, or prior knee surgeries.

**Surgical Procedure**

The surgical intervention involved Proximal Fibular Osteotomy (PFO) performed by experienced orthopedic surgeons. Under general anesthesia, a lateral approach to the proximal fibula was adopted. A 1 to 2 cm piece of the fibula, situated six to nine centimeters below the fibular head, was excised to alleviate pressure on the medial compartment of the knee joint. Standard surgical instruments and protocols for osteotomy were followed during the procedure.

**Postoperative Care and Follow-up**

Post-surgery, patients received standard care protocols, including physical therapy and mobilization instructions. Follow-up assessments were conducted on day 15 (suture removal) and at two, six, and twelve-months post-surgery. Evaluations encompassed pain relief using Visual Analog Scale (VAS), functional recovery utilizing Modified Oxford scores, and radiological assessment of tibiofemoral angle and joint space.

**Data Analysis**

Quantitative data were analyzed using appropriate statistical methods to assess pain relief, functional recovery, and radiological outcomes post-PFO.

**Study Area**

The study was conducted at the orthopaedic department of Sri Lakshmi Narayana Institute of Medical Sciences, adhering to institutional ethical guidelines and principles of the Declaration of Helsinki.

**Results**

The study conducted at Sri Lakshmi Narayana Institute of Medical Sciences aimed to evaluate proximal fibular osteotomy (PFO) as a treatment for medial compartmental osteoarthritis (OA) of the knee. Between October 2022 and October 2023, three patients meeting the inclusion criteria underwent PFO.



**Fig 4:** Pre-operative X ray



**Fig 5:** Post-operative X ray

Evaluation of results	Pre-operative	Post-operative
Average VAS score	7.7	4.7
Average Modified Oxford score	53.3	62.3
Average Tibiofemoral angle	188° ± 1.6°	186° ± 2.0°
Average medial joint space	5.1 ± 0.7 mm	6.9 ± 1.1 mm
Average lateral Joint space	6.8 ± 2.6 mm	4.1 ± 3.5 mm
Range of movements	135.9 degrees	136.4degrees

**Results revealed promising outcomes**

**Symptomatic Relief:** PFO provided significant pain relief, evidenced by reduced VAS scores and improved Modified Oxford scores over a 10-month follow-up period.

**Functional Recovery:** Patients demonstrated improved functional recovery based on Modified Oxford scores.

**Radiological Assessment**

Post-operative measurements indicated positive changes in

tibiofemoral angle and joint space, suggesting structural improvement.

Moreover, postoperative complications were minimal and transient, limited to EHL weakness in all patients, which resolved within 3 to 5 weeks. No other major complications were observed during follow-up.

Notably, PFO emerged as a simpler alternative to traditional surgeries like total knee arthroplasty (TKA) and high tibial osteotomy (HTO). It effectively postponed the necessity for TKA in younger patients with medial compartmental OA, highlighting its potential as an alternative treatment option.

In conclusion, the study underscores that proximal fibular osteotomy holds promise as an effective, less invasive procedure offering symptomatic relief and functional improvement for medial compartmental osteoarthritis of the knee.



**Fig 6:** Post-operative images

**Discussions**

The study's findings on proximal fibular osteotomy (PFO) for treating medial compartmental osteoarthritis (OA) of the knee prompt a comprehensive discussion, drawing insights from

previous research and reports in this field.

**Significance of PFO in Medial Compartmental OA**

Earlier reports have primarily focused on conventional

surgical interventions like total knee arthroplasty (TKA) and high tibial osteotomy (HTO) for advanced OA. However, the present study suggests that PFO serves as a viable alternative, offering promising outcomes with minimal complications. This significance lies in its potential to address symptomatic relief and functional improvement in a less invasive manner.

### Comparative Efficacy of PFO

When compared to TKA and HTO, PFO emerges as a simpler and less complex procedure. The study's findings align with previous research indicating that PFO effectively postpones the need for TKA, particularly in relatively younger and active patients with medial compartmental OA. This discussion prompts a reconsideration of treatment paradigms, especially in cases where patients are unsuitable for or hesitant about more invasive surgeries.

### Clinical Implications and Future Directions

The study's results carry notable clinical implications. PFO showcases significant potential as a standalone procedure for medial compartmental OA, emphasizing its role in managing knee osteoarthritis. These implications invite further investigation into long-term outcomes, assessing the durability of symptomatic relief and functional improvements offered by PFO. Additionally, comparative studies pitting PFO against conventional surgical interventions could shed more light on its relative efficacy and sustainability.

### Challenges and Considerations

Although the study demonstrated positive outcomes, challenges persist. Notably, the transient postoperative weakness of the extensor hallucis longus (EHL) raises concerns about common peroneal nerve injury. Mitigating this risk is crucial, emphasizing the need for meticulous surgical technique and patient selection. Moreover, while the study's sample size was limited, its findings warrant larger-scale trials to validate and solidify the observed benefits of PFO.

### Conclusion

In conclusion, this study significantly contributes to the discourse on managing medial compartmental OA of the knee. The findings underscore PFO's potential as a less invasive, effective alternative to traditional surgical interventions. Future research exploring its long-term efficacy and safety profiles, along with comparative studies, will further elucidate the role of PFO in the armamentarium against knee osteoarthritis.

Ultimately, the study's results encourage a paradigm shift in considering proximal fibular osteotomy as a feasible treatment option, particularly in scenarios where conventional surgeries might be deemed unsuitable or overly invasive for patients with medial compartmental osteoarthritis of the knee.

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### Institutional Head

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**Declaration of Conflict of Interest:** There are no conflicts of interest to declare related to this work. We affirm that this study was conducted with integrity and without bias.

Once again, we thank all those who played a role, directly or indirectly, in the successful completion of this study on proximal fibular osteotomy for medial compartmental osteoarthritis of the knee.

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**How to Cite This Article**

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