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ORIGINAL RESEARCH

Comparison of proximal fibular osteotomy and medial open wedge osteotomy in unicompartmental knee osteoarthritis

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ABSTRACT

Background: Unicompartmental knee osteoarthritis (OA) affects a single compartment of the knee, leading to pain and functional limitations. Proximal fibular osteotomy (PFO) and medial open wedge high tibial osteotomy (MOWHTO) are surgical treatments aimed at relieving symptoms and improving knee alignment, but their comparative effectiveness is still under study. **Objective:** To compare clinical outcomes, pain relief, functional improvement, and alignment correction achieved with PFO and MOWHTO in patients with unicompartmental knee OA. **Methods:** This prospective study included 20 patients with unicompartmental knee OA, divided into two groups of 10 each: one group underwent PFO, and the other received MOWHTO. Outcomes were assessed at 3, 6, 12, and 24 months postoperatively using VAS for pain, KOOS for function, and radiographic analysis for alignment correction. **Results:** Both groups showed significant improvement, but MOWHTO demonstrated superior pain relief, functional improvement, and alignment correction at 24 months. **Conclusion:** Both PFO and MOWHTO are effective for unicompartmental knee OA, but MOWHTO offers better long-term outcomes. These findings assist clinicians in selecting appropriate surgical options based on patient needs.

Keywords: Unicompartmental knee osteoarthritis, proximal fibular osteotomy, medial open wedge high tibial osteotomy, alignment correction

INTRODUCTION

A prevalent degenerative joint disease that mostly affects one compartment of the knee, unicompartmental knee osteoarthritis (OA) causes discomfort, decreased mobility, and a lower quality of life [1]. In order to reduce symptoms and limit the progression of the condition, surgical techniques are frequently undertaken when conservative therapy prove inadequate. Proximal fibular osteotomy (PFO) and medial open wedge high tibial osteotomy (MOWHTO) are two surgical procedures that have drawn interest because to their efficacy in treating medial compartment knee OA [2]. The approach, processes, and long-term results of these treatments vary greatly, though, which makes a comparative analysis necessary to inform treatment choices [3]. A little section of the fibula is removed during a relatively new, minimally invasive treatment called proximal fibular osteotomy. By dispersing stresses throughout the knee joint, this technique seeks to alleviate discomfort, enhance alignment, and lower medial compartment pressure [4]. Patients who are not good candidates for more involved operations find it appealing since it is less intrusive, and it has demonstrated encouraging results in terms of joint function and pain alleviation [5].

In contrast, a more well-established operation called medial open wedge high tibial osteotomy entails making a wedge-shaped incision in the tibia and filling it with graft material to move the knee's weight-bearing axis towards the healthier compartment [6,7]. MOWHTO is a more intrusive procedure that may require a longer recovery period and rigorous postoperative care, despite its effectiveness in transferring the load and restoring knee alignment [8,9]. The purpose of this study is to compare the functional gains, side effects, and clinical results of medial open wedge high tibial osteotomy with proximal fibular osteotomy in patients with unicompartmental knee osteoarthritis. This study

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intends to help doctors make evidence-based decisions that are suited to patient needs by comparing different treatments side by side and providing insights into the relative efficacy, patient satisfaction, and long-term survivability of each approach.

METHODOLOGY

Study Design

This is a comparative, prospective study designed to evaluate the clinical outcomes of proximal fibular osteotomy (PFO) and medial open wedge high tibial osteotomy (MOWHTO) in patients with unicompartmental knee osteoarthritis. The study was conducted over two years, from October 2020 to September 2022, at NRI Medical College, Chinakakani.

Patient Selection

A total of 20 patients diagnosed with unicompartmental knee osteoarthritis were included in the study. Patients were selected based on specific inclusion criteria: they were experiencing significant pain and functional impairment, and non-surgical treatments had proven ineffective. Patients with other knee pathologies, such as ligament injuries or diffuse arthritis, were excluded.

Group Allocation

The 20 patients were randomly divided into two groups of 10. One group underwent proximal fibular osteotomy, while the other group received medial open wedge high tibial osteotomy. Randomization ensured that the groups were comparable in terms of age, gender, and baseline knee function.

Surgical Procedures

- **Proximal Fibular Osteotomy (PFO):** In the PFO group, a small section of the proximal fibula was removed to relieve medial compartment load. This minimally invasive procedure was performed under regional anesthesia.
- **Medial Open Wedge High Tibial Osteotomy (MOWHTO):** In the MOWHTO group, an open wedge was created on the medial side of the tibia, and the space was filled with a bone graft. The goal was to shift weight-bearing forces towards the lateral compartment, thereby reducing medial compartment stress.

Outcome Measures

The primary outcome measures were pain relief, functional improvement, and alignment correction, assessed through the Visual Analogue Scale (VAS) for pain, the Knee Injury and Osteoarthritis Outcome Score (KOOS), and radiographic analysis. Patients were evaluated preoperatively and at 3, 6, 12, and 24 months postoperatively.

Statistical Analysis

Data were analyzed using paired t-tests and chi-square tests to assess the significance of differences between the two groups. A p-value of <0.05 was considered statistically significant.

RESULTS

This study evaluated the clinical outcomes of proximal fibular osteotomy (PFO) and medial open wedge high tibial osteotomy (MOWHTO) in patients with unicompartmental knee osteoarthritis. Outcomes were assessed in terms of pain relief, functional improvement, and alignment correction over a 24-month follow-up period.

1. Pain Relief (VAS Scores)

Table 1 shows the Visual Analog Scale (VAS) scores for pain relief in both groups at different follow-up intervals. Both PFO and MOWHTO groups experienced significant pain relief, with the MOWHTO group showing slightly more reduction in pain scores over time.

Follow-Up Interval	PFO Group (Mean ± SD)	MOWHTO Group (Mean ± SD)
Preoperative	7.6 ± 1.2	7.4 ± 1.1
3 Months	4.8 ± 1.1	4.2 ± 0.9
6 Months	3.5 ± 1.0	3.1 ± 0.8
12 Months	2.8 ± 0.9	2.5 ± 0.7
24 Months	2.2 ± 0.8	2.0 ± 0.6

The MOWHTO group showed a greater reduction in VAS scores over 24 months, suggesting a slightly better improvement in pain relief compared to the PFO group.

2. Functional Improvement (KOOS Scores)

Table 2 displays the Knee Injury and Osteoarthritis Outcome Score (KOOS) in both groups over the follow-up period. Both groups showed substantial improvements, with the MOWHTO group achieving higher functional scores overall.

Follow-Up Interval	PFO Group (Mean ± SD)	MOWHTO Group (Mean ± SD)
Preoperative	45.3 ± 5.8	46.1 ± 6.0
3 Months	58.7 ± 6.2	60.9 ± 5.9
6 Months	66.1 ± 5.5	69.3 ± 5.2

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12 Months	71.8 ± 5.4	75.2 ± 4.8
24 Months	76.9 ± 5.1	80.4 ± 4.5

KOOS scores increased significantly in both groups, indicating improved knee function. However, the MOWHTO group consistently scored higher, reflecting better functional outcomes.

3. Alignment Correction (Radiographic Analysis)

Table 3 summarizes the mean correction in alignment (degrees) for both groups. MOWHTO showed greater alignment correction compared to PFO.

Follow-Up Interval	PFO Group (Mean ± SD)	MOWHTO Group (Mean ± SD)
Preoperative	8.4° ± 1.3°	8.2° ± 1.2°
24 Months	4.1° ± 1.1°	2.6° ± 1.0°

At 24 months, the radiographic study showed that MOWHTO had improved alignment correction, indicating superior biomechanical improvements in load distribution. According to the study, patients with unicompartmental knee osteoarthritis experienced notable pain reduction, functional improvement, and alignment correction from both PFO and MOWHTO. Nonetheless, over the 24-month follow-up period, the MOWHTO group showed somewhat better results in terms of alignment correction, functional improvement, and pain alleviation.

DISCUSSION

The results of medial open wedge high tibial osteotomy (MOWHTO) and proximal fibular osteotomy (PFO) in patients with unicompartmental knee osteoarthritis are compared in this study. The data suggest that MOWHTO consistently produces better benefits over a 24-month follow-up period, even if both procedures are helpful in reducing pain, improving functionality, and correcting alignment. Both groups' VAS scores significantly improved in terms of pain alleviation; however, the MOWHTO group's pain reduction was somewhat higher. These results are consistent with earlier research. According to Yang et al. (2019), MOWHTO significantly reduced discomfort and improved function; they attributed this to improved biomechanical stability and efficient weight redistribution [10,11]. The findings of our investigation are corroborated by Qin et al. (2021), who discovered that patients undergoing MOWHTO demonstrated larger improvements in pain and joint function than those undergoing PFO [12]. Nonetheless, some research has highlighted PFO's minimally invasive characteristics, indicating that it may be a good substitute for patients unable to have more invasive treatments as MOWHTO [13].

According to KOOS scores, the functional outcomes of this study demonstrate a steady improvement in both groups, with the MOWHTO group achieving a better overall score. This is in line with the results of Lee et al. (2020), who found that patients who had MOWHTO restored better alignment and reduced medial compartment stress more effectively than those who had PFO, resulting in improved KOOS scores and overall knee function [14]. According to this study's radiographic analysis, MOWHTO outperforms PFO in terms of alignment correction. A recent study by Sun et al. (2021) indicated that MOWHTO produced higher and more sustained alignment correction than PFO [15], which validates the biomechanical reasoning behind MOWHTO due to the observed correction in mechanical alignment. The alignment correcting capabilities of MOWHTO are confirmed by the results of our study, which could lead to more durable results.

Even though MOWHTO shows better results in this study, more research is required to examine each procedure's long-term effectiveness and any side effects. For instance, research may look at whether PFO can produce results that are comparable to those of optimized postoperative rehabilitation regimes or changed surgical techniques. Future studies might also concentrate on characteristics unique to each patient, like age, weight, and degree of exercise, as they could affect the choice of surgical technique. Additionally, the creation of less invasive methods for MOWHTO may increase its application and make it a more practical choice for a larger group of patients.

CONCLUSION

Proximal fibular osteotomy and medial open wedge high tibial osteotomy help unicompartmental knee osteoarthritis patients manage pain and improve function. MOWHTO yields better pain alleviation, functional improvement, and alignment correction over 24 months. PFO is beneficial for patients who cannot undergo more invasive operations, however, MOWHTO may yield more lasting and biomechanically stable results. This study compares PFO with MOWHTO's efficacy, helping clinicians choose the best treatment for each patient.

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