

Comparison of Various Modalities in the Treatment of Early Knee Osteoarthritis

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Abstract:

Background: Knee osteoarthritis (OA) is a prevalent degenerative joint disease, causing significant morbidity. Various treatment modalities, including pharmacological, non-pharmacological, and surgical options, are employed to manage early-stage knee OA. This retrospective study aims to compare the efficacy of these treatment modalities in alleviating symptoms and improving the quality of life in patients diagnosed with early knee OA.

Materials and Methods: This study was conducted at the Department of Orthopedics, Government Medical College & Hospital, Bettiah, West Champaran, Bihar, India, from July 2023 to April 2024. Medical records of 200 patients diagnosed with early knee OA were reviewed. Patients were categorized into three groups based on the treatment modality received: Group A (pharmacological treatment with NSAIDs and corticosteroid injections), Group B (non-pharmacological treatment including physiotherapy and lifestyle modifications), and Group C (surgical intervention with arthroscopic lavage). Clinical outcomes were assessed using the Western Ontario and McMaster Universities Arthritis Index (WOMAC) and Visual Analog Scale (VAS) for pain at baseline, 3 months, and 6 months post-treatment.

Results: Out of 200 patients, 65 received pharmacological treatment (Group A), 75 underwent non-pharmacological treatment (Group B), and 60 had surgical intervention (Group C). At 6 months, Group A showed a 20% reduction in WOMAC scores and a 25% reduction in VAS pain scores. Group B exhibited a 35% reduction in WOMAC scores and a 40% reduction in VAS pain scores. Group C demonstrated the highest improvement with a 50% reduction in WOMAC scores and a 55% reduction in VAS pain scores. The differences in outcomes between the groups were statistically significant ($p < 0.05$).

Conclusion: Surgical intervention through arthroscopic lavage provided the most significant improvement in symptoms and quality of life for patients with early knee OA. Non-pharmacological treatments also showed substantial benefits, whereas pharmacological treatments were the least effective among the three modalities. These findings suggest a multimodal approach may be beneficial, emphasizing the importance of individualized treatment plans for early knee OA.

Keywords: Early knee osteoarthritis, treatment modalities, pharmacological treatment, non-pharmacological treatment, surgical intervention, arthroscopic lavage, WOMAC, VAS, retrospective study.

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Introduction

Knee osteoarthritis (OA) is a common degenerative joint disease characterized by the progressive breakdown of articular cartilage, leading to pain, stiffness, and impaired function. It is a leading cause of disability among the elderly, significantly affecting the quality of life and imposing a substantial economic burden on healthcare systems globally [1]. The prevalence of knee OA increases with age, with estimates suggesting that approximately 10% of men and 13% of women

aged 60 years and older are affected by symptomatic knee OA [2].

The management of knee OA, particularly in its early stages, is multifaceted, involving pharmacological, non-pharmacological, and surgical interventions. Pharmacological treatments, including nonsteroidal anti-inflammatory drugs (NSAIDs) and corticosteroid injections, are commonly used to alleviate pain and inflammation [3]. However, these treatments are often associated

with adverse effects, particularly with long-term use [4]. Non-pharmacological approaches, such as physiotherapy, weight management, and lifestyle modifications, aim to improve joint function and reduce symptoms without the side effects associated with medications [5]. Surgical interventions, such as arthroscopic lavage, are considered for patients who do not respond adequately to conservative treatments and aim to provide symptomatic relief and improve joint function [6].

Despite the availability of various treatment options, there is limited consensus on the most effective approach for managing early knee OA. Previous studies have shown variable results regarding the efficacy of different treatments, and there is a need for more comprehensive comparisons to guide clinical decision-making (7). This retrospective study aims to compare the efficacy of pharmacological, non-pharmacological, and surgical treatments in patients with early knee OA, providing valuable insights into optimizing treatment strategies for this condition.

Materials and Methods

Study Design and Setting: This retrospective study was conducted in the Department of Orthopedics at Government Medical College & Hospital, Bettiah, West Champaran, Bihar, India. The study period was from July 2023 to April 2024. The study was approved by the institutional ethics committee, and the need for informed consent was waived due to the retrospective nature of the study.

Patient Selection: Medical records of patients diagnosed with early-stage knee osteoarthritis (OA) were reviewed. Inclusion criteria were:

1. Patients aged 40-70 years.
2. Diagnosis of early knee OA based on clinical and radiographic criteria (Kellgren-Lawrence grade I-II).
3. Availability of complete medical records, including treatment details and follow-up data for at least 6 months. Exclusion criteria were:
4. Patients with advanced knee OA (Kellgren-Lawrence grade III-IV).
5. Previous knee surgery.
6. Inflammatory arthritis or other joint diseases.

7. Incomplete medical records.

Treatment Modalities: Patients were categorized into three groups based on the treatment modality received:

Group A (Pharmacological Treatment): Patients received nonsteroidal anti-inflammatory drugs (NSAIDs) and corticosteroid injections.

Group B (Non-Pharmacological Treatment): Patients underwent physiotherapy, including supervised exercise programs, weight management counseling, and lifestyle modifications.

Group C (Surgical Intervention): Patients underwent arthroscopic lavage to remove loose debris and inflammatory mediators from the knee joint.

Outcome Measures:

Clinical outcomes were assessed using the Western Ontario and McMaster Universities Arthritis Index (WOMAC) and the Visual Analog Scale (VAS) for pain. Assessments were conducted at baseline, 3 months, and 6 months post-treatment. The primary outcome measure was the change in WOMAC and VAS scores from baseline to 6 months.

Statistical Analysis:

Data were analyzed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarize the demographic and clinical characteristics of the study population. Changes in WOMAC and VAS scores were compared within and between the three treatment groups using repeated measures ANOVA. Post-hoc analysis with Bonferroni correction was performed to identify significant differences between groups. A p-value of <0.05 was considered statistically significant.

Results

A total of 200 patients with early knee osteoarthritis (OA) were included in this study. The demographic and baseline clinical characteristics of the patients in the three treatment groups are summarized in Table 1. The mean age of the patients was 55.3 years (range: 40-70 years), with a female predominance (60%).

Table 1: Baseline Characteristics of the Study Population

| Characteristic | Group A (n=65) | Group B (n=75) | Group C (n=60) | Total (n=200) |
|--------------------------|----------------|----------------|----------------|---------------|
| Age (years) | 54.8 ± 7.1 | 55.6 ± 6.8 | 55.4 ± 6.9 | 55.3 ± 7.0 |
| Female (%) | 62% | 58% | 60% | 60% |
| BMI (kg/m ²) | 28.5 ± 4.2 | 27.9 ± 4.5 | 28.2 ± 4.3 | 28.2 ± 4.3 |
| Kellgren-Lawrence Grade | | | | |
| I (%) | 45% | 48% | 50% | 48% |
| II (%) | 55% | 52% | 50% | 52% |

Table 2: Changes in WOMAC and VAS Scores from Baseline to 6 Months

| Outcome Measure | Group A (n=65) | Group B (n=75) | Group C (n=60) | p-value |
|-----------------|----------------|----------------|----------------|---------|
| WOMAC Score | | | | |
| Baseline | 60.2 ± 9.3 | 61.0 ± 8.7 | 60.8 ± 8.9 | 0.78 |
| 3 Months | 52.5 ± 8.7 | 47.5 ± 8.2 | 42.0 ± 7.5 | <0.001 |
| 6 Months | 48.2 ± 7.9 | 39.7 ± 7.1 | 30.4 ± 6.8 | <0.001 |
| % Reduction | 20% | 35% | 50% | <0.001 |
| VAS Pain Score | | | | |
| Baseline | 7.8 ± 1.1 | 7.9 ± 1.2 | 7.7 ± 1.0 | 0.65 |
| 3 Months | 6.0 ± 1.0 | 4.7 ± 0.9 | 3.9 ± 0.8 | <0.001 |
| 6 Months | 5.2 ± 0.8 | 3.9 ± 0.7 | 3.0 ± 0.6 | <0.001 |
| % Reduction | 25% | 40% | 55% | <0.001 |

Patients in Group C (surgical intervention) demonstrated the greatest improvement in both WOMAC and VAS pain scores at 6 months post-treatment, with a 50% reduction in WOMAC scores and a 55% reduction in VAS pain scores. Group B (non-pharmacological treatment) showed a 35% reduction in WOMAC scores and a 40% reduction in VAS pain scores. Group A (pharmacological treatment) exhibited the least improvement, with a 20% reduction in WOMAC scores and a 25% reduction in VAS pain scores. The differences in outcomes between the groups were statistically significant ($p < 0.001$).

These results suggest that surgical intervention is the most effective modality for improving symptoms and quality of life in patients with early knee OA, followed by non-pharmacological treatments. Pharmacological treatments were the least effective among the three modalities.

Discussion

This retrospective study aimed to compare the efficacy of pharmacological, non-pharmacological, and surgical treatments in patients with early knee osteoarthritis (OA). Our findings indicate that surgical intervention, specifically arthroscopic lavage, provided the most significant improvement in symptoms and quality of life, as evidenced by the substantial reductions in WOMAC and VAS pain scores. Non-pharmacological treatments also showed notable benefits, whereas pharmacological treatments were the least effective among the three modalities.

The superior outcomes observed in the surgical intervention group align with previous studies highlighting the benefits of arthroscopic procedures in managing knee OA. Arthroscopic lavage has been shown to effectively remove loose debris and inflammatory mediators from the joint, leading to symptomatic relief and improved joint function [1].

However, it is important to note that the long-term benefits of arthroscopic interventions in knee OA remain a subject of debate, with some studies suggesting limited efficacy beyond short-term relief [2]. Non-pharmacological treatments, including physiotherapy and lifestyle

modifications, demonstrated significant improvements in WOMAC and VAS pain scores. These findings are consistent with the current literature, which emphasizes the importance of exercise and weight management in the management of knee OA [3]. Exercise has been shown to enhance muscle strength, improve joint stability, and reduce pain, thereby improving overall function and quality of life in patients with knee OA [4]. Additionally, weight management is crucial in reducing the mechanical load on the knee joint, thereby slowing disease progression [5].

Pharmacological treatments, while providing some symptomatic relief, were the least effective modality in our study. NSAIDs and corticosteroid injections are commonly used to manage pain and inflammation in knee OA, but their long-term use is associated with adverse effects such as gastrointestinal complications and potential cardiovascular risks [6]. Moreover, the transient nature of pain relief from corticosteroid injections may not address the underlying disease pathology effectively [7].

Our study has several limitations that should be acknowledged. The retrospective design inherently carries the risk of selection bias, and the reliance on medical records may lead to incomplete data collection.

Additionally, the follow-up period of 6 months may not capture the long-term outcomes and sustainability of the observed benefits. Future prospective studies with longer follow-up durations are needed to validate our findings and provide more comprehensive insights into the optimal management of early knee OA.

Conclusion

In conclusion, our study suggests that surgical intervention through arthroscopic lavage is the most effective treatment modality for early knee OA, providing significant symptomatic relief and improvement in quality of life. Non-pharmacological treatments, including physiotherapy and lifestyle modifications, also offer substantial benefits, whereas pharmacological treatments are the least effective. These findings

highlight the importance of a multimodal approach and individualized treatment plans in the management of early knee OA.

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