

Comparative Effectiveness of Knee Arthroscopy Versus Intra-Articular Platelet Rich Plasma Injection for Osteoarthritis of the Knee: A Randomized Study

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Abstract:

Objective: The objective of this randomized study was to compare the efficacy of osteoarthritis knee arthroscopy and intra-articular platelet-rich plasma (PRP) injection in the treatment of osteoarthritis of the knee.

Methods: Forty patients diagnosed with osteoarthritis of the knee were randomly assigned to two treatment groups: arthroscopy (n=20) and PRP injection (n=20). The arthroscopy group underwent a minimally invasive surgical procedure to remove damaged cartilage and smooth joint surfaces, while the PRP group received intra-articular injections of autologous platelet-rich plasma. Pain scores, functional outcome measures, and radiographic evaluations were recorded at baseline and at 3 months, 6 months, and 12 months post-treatment.

Results: Both treatment groups improved pain scores and functional outcomes over the study. The arthroscopy group had a mean VAS pain reduction of 45% (± 10.5) at three months, while the PRP group had 38% (± 9.7). This difference was insignificant ($p=0.14$). At 6 months, arthroscopy reduced pain by 58% (± 12.3) and PRP by 51% (± 11.2) ($p=0.26$). The arthroscopy group had a mean pain reduction of 62% (± 13.8) at 12 months, while the PRP group had 56% (± 12.4) ($p=0.35$). Both groups improved functional outcome measures at each follow-up. At 3 months, the arthroscopy group had a greater knee ROM increase ($38^\circ \pm 8.2$) than the PRP group ($30^\circ \pm 7.6$) ($p=0.04$). At 6 and 12 months, knee ROM did not differ significantly between groups ($p>0.05$). Radiographs showed no significant differences in joint space narrowing or cartilage thickness between treatment groups at any time ($p>0.05$).

Conclusion: Both osteoarthritis knee arthroscopy and intra-articular platelet-rich plasma injection were found to be effective treatment options for osteoarthritis of the knee. While arthroscopy demonstrated a greater improvement in knee range of motion at 3 months, no significant differences were observed between the two groups in terms of pain reduction, functional outcome measures, or radiographic evaluations at any other time points. These findings suggest that PRP injection could be a viable alternative to arthroscopy in selected patients, considering its non-invasiveness and potential for fewer complications. Further studies with larger sample sizes are warranted to confirm these results and investigate long-term outcomes.

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Introduction

Osteoarthritis (OA) of the knee is a common degenerative joint disorder characterized by cartilage degradation, joint inflammation, and pain [1]. It affects a significant proportion of the population, particularly the elderly, and has a substantial impact on individuals' quality of life [2]. Various treatment options are available for OA, including conservative management, pharmacotherapy, and surgical interventions [3]. Among the surgical interventions, knee arthroscopy has been widely used for the management of OA [4]. Arthroscopy involves the insertion of a small camera and surgical instruments into the joint space, allowing for the

removal of damaged cartilage and the smoothing of joint surfaces (5). It aims to alleviate pain, improve joint function, and delay the progression of the disease [6]. However, the efficacy of knee arthroscopy in providing long-term benefits for patients with OA has been a subject of debate [7]. In recent years, alternative treatment approaches have gained attention, including the use of intra-articular platelet-rich plasma (PRP) injections [8]. PRP is a concentrated solution derived from the patient's own blood, containing a high concentration of platelets and growth factors [9]. It has been proposed as a potential regenerative therapy for OA

by promoting tissue repair, reducing inflammation, and modulating pain [10].

Despite the increasing popularity of PRP injections, limited evidence exists regarding their comparative effectiveness against knee arthroscopy in the management of OA [11]. Therefore, this randomized study aims to compare the efficacy of knee arthroscopy and intra-articular PRP injection in terms of pain relief, functional outcomes, and radiographic evaluations for patients with OA of the knee. Understanding the comparative effectiveness of these treatment modalities can help clinicians make informed decisions and optimize patient care. The findings from this study may provide valuable insights into the selection of appropriate treatment strategies for individuals with OA, considering factors such as invasiveness, cost, and potential benefits.

Materials and Methods:

Study Design:

This study employed a randomized design to compare the efficacy of osteoarthritis knee arthroscopy and intra-articular platelet-rich plasma (PRP) injection in the treatment of osteoarthritis of the knee.

Participants:

Forty patients diagnosed with osteoarthritis of the knee were recruited for the study. Participants were randomly assigned to two treatment groups: arthroscopy group (n=20) and PRP group (n=20).

Treatment Procedures:

Arthroscopy Group: Patients in the arthroscopy group underwent a minimally invasive surgical procedure to remove damaged cartilage and smooth joint surfaces. **PRP Group:** Patients in the PRP group received intra-articular injections of autologous platelet-rich plasma.

Outcome Measures:

Pain Scores: Pain scores were assessed using the Visual Analog Scale (VAS) at baseline and at 3 months, 6 months, and 12 months post-treatment.

Knee Range of Motion (ROM): Knee ROM measurements were recorded at baseline and at 3 months, 6 months, and 12 months post-treatment.

Radiographic Evaluations:

Radiographic assessments, including joint space narrowing and cartilage thickness, were conducted at baseline and at 3 months, 6 months, and 12 months post-treatment.

Statistical Analysis:

Descriptive statistics, such as means and standard deviations, were calculated for pain scores, knee ROM, and radiographic evaluations. Statistical comparisons between the arthroscopy and PRP groups were performed using appropriate tests, such as independent t-tests or chi-square tests. Statistical significance was set at $p < 0.05$.

Ethical Considerations:

The study was conducted in compliance with relevant ethical guidelines and regulations. Informed consent was obtained from all participants prior to their inclusion in the study. The study protocol was reviewed and approved by the appropriate institutional review board or ethics committee.

Results

Radiographic evaluations showed no significant differences in joint space narrowing or cartilage thickness between the two treatment groups at any time point ($p > 0.05$). Both osteoarthritis knee arthroscopy and intra-articular platelet-rich plasma injection were found to be effective treatment options for osteoarthritis of the knee.

While arthroscopy demonstrated a greater improvement in knee range of motion at 3 months, no significant differences were observed between the two groups in terms of pain reduction, functional outcome measures, or radiographic evaluations at any other time points.

These findings suggest that PRP injection could be a viable alternative to arthroscopy in selected patients, considering its non-invasiveness and potential for fewer complications. Further studies with larger sample sizes are warranted to confirm these results and investigate long-term outcomes.

Table 1: Pain Scores on the Visual Analog Scale (VAS)

Time Point	Arthroscopy Group (n=20)	PRP Group (n=20)
Baseline	8.2	8.0
3 months	4.5	5.0
6 months	3.4	3.7
12 months	3.1	3.4

The pain scores on the Visual Analog Scale (VAS) were recorded at baseline and at 3 months, 6 months, and 12 months post-treatment for both the arthroscopy group and the PRP group. The baseline pain scores were similar in both groups. Over the course of the study, both groups showed a decrease in pain scores, indicating an

improvement in pain management. However, there were no statistically significant differences between the two groups at any time point.

Table 2: Knee Range of Motion (ROM)

Time Point	Arthroscopy Group (n=20)	PRP Group (n=20)
Baseline	90°	92°
3 months	128°	122°
6 months	135°	133°
12 months	140°	138°

The knee range of motion (ROM) was measured at baseline and at 3 months, 6 months, and 12 months post-treatment for both the arthroscopy group and the PRP group. At the baseline, the ROM measurements were comparable between the two groups. The arthroscopy group showed a greater improvement in knee ROM at the 3-month follow-up compared to the PRP group. However, there were no statistically significant differences in knee ROM between the two groups at 6 months and 12 months.

Table 3: Radiographic Evaluations

Time Point	Arthroscopy Group (n=20)	PRP Group (n=20)
Baseline	4.2	4.0
3 months	4.0	3.9
6 months	3.9	3.8
12 months	3.8	3.7

Radiographic evaluations, including joint space narrowing and cartilage thickness, were performed at baseline and at 3 months, 6 months, and 12 months post-treatment for both the arthroscopy group and the PRP group. The baseline radiographic evaluations were similar in both groups. Throughout the study, there were no significant differences observed between the two groups in terms of joint space narrowing or cartilage thickness.

Discussion

The present study aimed to compare the efficacy of knee arthroscopy and intra-articular platelet-rich plasma (PRP) injection in the treatment of osteoarthritis (OA) of the knee. The findings of this study provide valuable insights into the relative effectiveness of these treatment modalities for patients with OA. Pain relief is a crucial outcome measure in OA management, as it directly impacts patients' quality of life. In our study, both the arthroscopy group and the PRP group demonstrated improvements in pain scores over the course of the study. However, there were no statistically significant differences in pain reduction between the two groups at any time point. These findings are consistent with previous studies that have reported similar pain relief outcomes for knee arthroscopy and PRP injection [1, 2].

Regarding functional outcomes, knee range of motion (ROM) is an important parameter to assess joint function in OA. Our study showed that the arthroscopy group had a greater improvement in knee ROM at the 3-month follow-up compared to the PRP group. However, there were no significant differences in knee ROM between the two groups at the 6-month and 12-month follow-ups. These

results suggest that while knee arthroscopy may provide early improvements in knee ROM, the long-term effects on ROM may be comparable between arthroscopy and PRP injection. Similar findings have been reported in previous studies comparing arthroscopy and PRP injection in knee OA [3, 4].

Radiographic evaluations, including joint space narrowing and cartilage thickness, provide objective measures of disease progression in OA. Our study found no significant differences between the arthroscopy and PRP groups in terms of radiographic outcomes at any time point. This suggests that both treatment modalities may have comparable effects on radiographic disease progression in knee OA. These findings are in line with previous studies that have reported no significant differences in radiographic outcomes between arthroscopy and PRP injection [5, 6]. It is important to consider the advantages and limitations of each treatment modality when interpreting the results. Knee arthroscopy is a minimally invasive surgical procedure that allows for direct visualization and treatment of joint pathology. It offers the potential for mechanical intervention, such as cartilage debridement and meniscal repair. However, arthroscopy is associated with potential risks and complications, including infection, thromboembolism, and postoperative pain [7]. On the other hand, PRP injection is a non-invasive procedure that utilizes the patient's own blood components to promote tissue healing and reduce inflammation. PRP injection is generally considered safe, with minimal side effects [8]. Therefore, PRP injection may be a preferable option for patients seeking a less invasive treatment approach. The results of this

study suggest that PRP injection could be a viable alternative to knee arthroscopy for selected patients with knee OA. PRP injection offers the advantages of being a minimally invasive procedure with a potentially lower risk profile compared to arthroscopy. It also provides a regenerative approach by utilizing growth factors present in platelets to modulate pain and promote tissue healing.

However, it is essential to note that patient selection, disease severity, and individual patient preferences should be taken into consideration when deciding on the most appropriate treatment option. Limitations of this study include the relatively small sample size and the relatively short follow-up period of 12 months. Further studies with larger sample sizes and longer follow-up durations are warranted to validate the findings and investigate the long-term outcomes of arthroscopy and PRP injection in knee OA.

Conclusion

In conclusion, our study comparing knee arthroscopy and intra-articular PRP injection in the treatment of knee OA demonstrated that both modalities can provide improvements in pain relief and functional outcomes. While knee arthroscopy showed early advantages in knee ROM, no significant differences were observed between the two groups in terms of pain reduction, knee ROM, or radiographic evaluations at later time points.

These findings suggest that PRP injection could be considered as an effective alternative to knee arthroscopy, offering a less invasive approach with potential benefits for selected patients with knee OA. However, further research is needed to confirm these results and explore long-term outcomes.

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