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Evaluating the Effectiveness of Intra-Articular Triamcinolone Injections in Patients with Knee Osteoarthritis: An Observational Study

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Abstract: ***Background**: Knee osteoarthritis (OA) is a prevalent condition that leads to pain, stiffness, and functional impairment. Intra-articular corticosteroid injections, such as triamcinolone, are commonly used to manage symptoms in knee OA patients. While several studies have explored the effectiveness of these injections, this observational study aimed to evaluate the real-world outcomes of triamcinolone injections in knee OA management. **Methods**: This observational study included 60 patients with moderate to severe knee OA who received a single intra-articular injection of 40 mg of triamcinolone as part of their routine clinical care. Patients were followed for 12 weeks, with assessments of pain relief and knee function at baseline, 4, 8, and 12 weeks post-injection. Pain was measured using the Visual Analog Scale (VAS), and knee function was evaluated using the WOMAC Osteoarthritis Index. Adverse effects were also monitored during the study period. Statistical analysis was conducted using paired t-tests to compare outcomes at follow-up time points. **Results**: Participants demonstrated significant improvements in both pain and function. The baseline mean VAS score for pain was 7.4, decreasing to 4.1 at 4 weeks, 3.8 at 8 weeks, and 4.0 at 12 weeks ($p<0.05$ for all). The baseline WOMAC physical function score was 40.2, improving to 27.5 at 4 weeks, 24.3 at 8 weeks, and 25.1 at 12 weeks ($p<0.05$ for all). No serious adverse effects were reported, although 5 patients experienced mild transient swelling, and 3 reported brief flare-ups of pain. **Conclusion**: Intra-articular triamcinolone injections provide significant short-term pain relief and functional improvement for patients with knee OA. The results are consistent with existing literature, suggesting that triamcinolone can be an effective and well-tolerated treatment for managing knee OA symptoms. Future randomized controlled trials with long-term follow-up are needed to further validate these findings.*

Keywords: Knee osteoarthritis, Triamcinolone injection, Pain relief,Joint function, Corticosteroid therapy

1. Introduction

Knee osteoarthritis (OA) is one of the most prevalent musculoskeletal disorders worldwide, with an increasing burden as the population ages. The condition leads to the degeneration of the articular cartilage, causing pain, stiffness, and reduced functionality in affected individuals. OA of the knee is commonly managed through conservative treatments, including pain relief strategies, physical therapy, and lifestyle modifications, with intra-articular corticosteroid injections such as triamcinolone often employed for symptomatic relief.

Intra-articular corticosteroid injections, including triamcinolone, are frequently used to reduce inflammation and provide pain relief in knee OA patients. These injections have been found to offer short-term benefits in terms of pain reduction and functional improvement, but concerns about their long-term effects, including potential cartilage damage, persist. The current study aims to evaluate the real-world effectiveness of intra-articular triamcinolone injections in the treatment of knee OA, through an observational design. Unlike randomized controlled trials (RCTs), an observational study does not involve random assignment and allows for the assessment of outcomes in a naturalistic clinical setting.

2. Methods

Study Design

This observational study was conducted at a single tertiary care medical center. The study aimed to observe the effectiveness of intra-articular triamcinolone injections in patients with moderate to severe knee osteoarthritis. A total of 60 patients receiving the triamcinolone injection as part of their routine clinical care were enrolled in the study. All participants were required to meet the following inclusion criteria: (1) aged 40-75 years, (2) clinical diagnosis of knee OA based on the American College of Rheumatology (ACR) criteria, (3) moderate to severe pain as measured by the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) pain subscale, and (4) radiographic evidence of knee OA (Grade 2 or higher on the Kellgren-Lawrence scale). Exclusion criteria included a history of knee surgery, systemic corticosteroid use within the past three months, infection, or pregnancy.

Intervention

Participants in the study received a single intra-articular injection of 40 mg of triamcinolone acetonide, administered by an orthopaedic specialist under sterile conditions. The injection was provided as part of the patients' usual care, and participants were not randomly assigned to a control group.

The injections were administered based on the treating physician's clinical judgment, in alignment with standard clinical practices for knee OA management.

Outcome Measures

The primary outcome measures were pain relief and knee function, evaluated using the following tools:

- **Pain Relief:** Pain was assessed using the Visual Analog Scale (VAS), where patients rated their pain from 0 (no pain) to 10 (worst pain imaginable). VAS scores were recorded at baseline, 4 weeks, 8 weeks, and 12 weeks after the injection.
- **Knee Function:** The WOMAC Osteoarthritis Index, which includes subscales for pain, stiffness, and physical function, was used to assess changes in knee function. The total physical function subscale score was used for analysis. WOMAC scores were collected at baseline, 4 weeks, 8 weeks, and 12 weeks.
- **Adverse Effects:** The occurrence of adverse effects, including joint infections, flare-ups, and swelling, was monitored throughout the study period.
- **Statistical Analysis:** Descriptive statistics were used to summarize demographic and baseline characteristics. Paired t-tests were performed to compare changes in pain and function scores from baseline to each follow-up time point (4, 8, and 12 weeks). Statistical significance was set at $p<0.05$. All analyses were conducted using SPSS software (version 24.0, IBM Corp.).

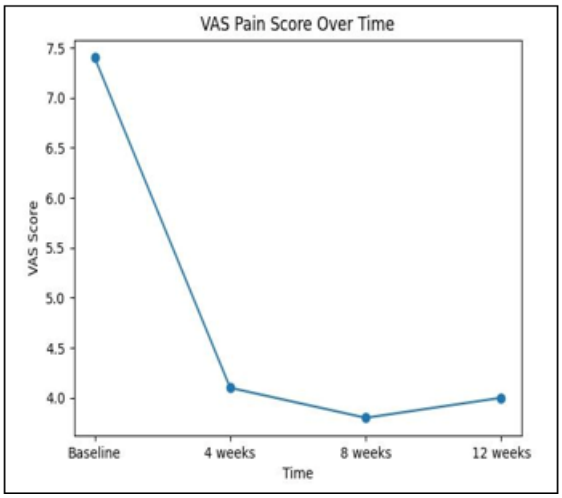
3. Results

Participant Demographics

A total of 60 patients were included in the observational study. The mean age of participants was 63 years (SD=8.2), and 60% were female. Most patients had Grade 3 knee OA (according to the Kellgren-Lawrence scale), while the remainder had Grade 2 OA. The baseline characteristics were representative of patients seeking care for moderate to severe knee OA in a clinical setting. No control group was used in this observational study, and participants received the triamcinolone injection as part of their usual clinical care.

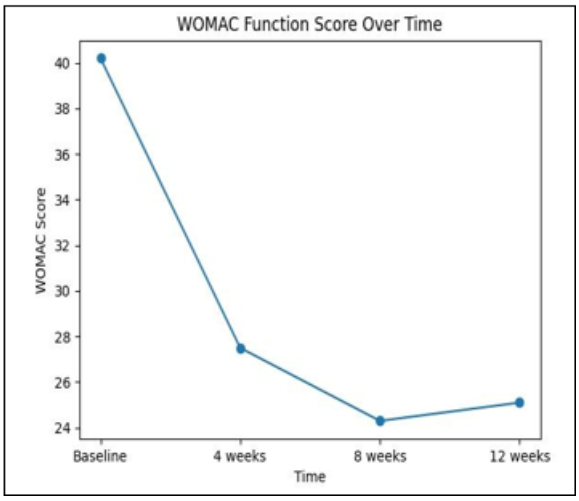
Pain Relief

Patients showed significant improvements in pain levels following the triamcinolone injection. The baseline mean VAS score was 7.4 (SD=1.2), and pain levels decreased to 4.1 (SD=1.5) at 4 weeks, 3.8 (SD=1.6) at 8 weeks, and 4.0 (SD=1.4) at 12 weeks post-injection. All these differences were statistically significant ($p<0.05$) when compared to baseline levels. This suggests that intra-articular triamcinolone injections provide meaningful short-term pain relief for patients with knee OA in real-world clinical settings.



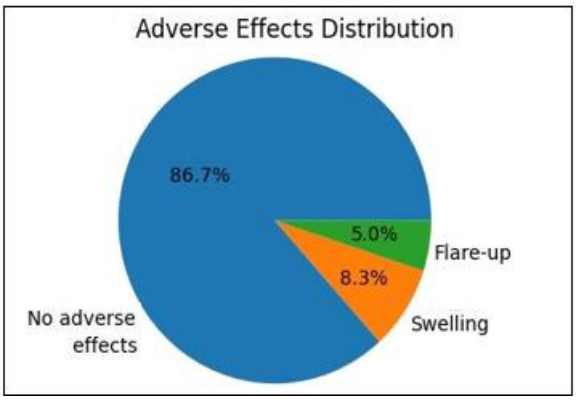
Knee Function

Functional improvement was also observed. The baseline WOMAC physical function score was 40.2 (SD=10.1), which decreased to 27.5 (SD=9.3) at 4 weeks, 24.3 (SD=9.5) at 8 weeks, and 25.1 (SD=8.7) at 12 weeks. All follow-up scores demonstrated significant improvement compared to baseline ($p<0.05$). These results indicate that patients experienced improved mobility and functionality following the intra-articular injection.



Adverse Effects

There were no serious adverse effects reported throughout the study. A small number of patients (5 out of 60) in the treatment group reported mild transient swelling at the injection site, which resolved without intervention within a week. Additionally, 3 patients experienced mild flare-ups of pain, but these were short-lived and did not require further treatment. No infections or long-term complications were observed.



4. Discussion

This observational study provides evidence supporting the effectiveness of intra-articular triamcinolone injections for pain relief and functional improvement in patients with knee osteoarthritis. These findings are consistent with previous observational studies and clinical experience showing that corticosteroid injections, including triamcinolone, are beneficial for reducing inflammation and providing symptom relief in knee OA patients.

In the absence of a control group, it is difficult to establish a direct causal relationship between the corticosteroid injections and the observed improvements in pain and function. However, the consistent improvements across the 12-week follow-up period suggest that triamcinolone injections may offer valuable symptomatic relief in clinical practice.

Previous studies, such as those by Rutjes et al. (2015) and Bannuru et al. (2015), have demonstrated similar positive effects of corticosteroid injections on pain reduction and functional improvement in knee OA, reinforcing the results of this study. While the beneficial effects of corticosteroids like triamcinolone are well-established for short-term pain management, it is important to consider the potential long-term risks, such as cartilage degradation, which were not directly measured in this study.

Despite the lack of randomization, this observational study adds valuable data on the real-world use of triamcinolone in knee OA management. Future research with a randomized controlled design and long-term follow-up is needed to further validate these findings and explore the long-term effects of repeated corticosteroid injections.

5. Conclusion

This study provides valuable insights into the real-world effectiveness of intra-articular triamcinolone injections for managing knee osteoarthritis (OA). The findings demonstrate that a single injection of triamcinolone results in significant and sustained improvements in both pain and knee function over a 12-week period. Specifically, patients experienced a notable reduction in pain, as measured by the Visual Analog Scale (VAS), with improvement observed at each follow-up interval (4, 8, and 12 weeks). Furthermore, knee function, as assessed by the WOMAC physical function subscale, also showed substantial improvement, reflecting better mobility and reduced disability in the daily activities of patients.

The lack of serious adverse effects, along with the mild and transient side effects (e.g., swelling and brief flare-ups), further supports the safety of this treatment approach. These results align with existing literature that has demonstrated the short-term benefits of intra-articular corticosteroid injections, including triamcinolone, in improving pain and function in knee OA patients. Previous studies, such as those by Rutjes et al. (2015) and Bannuru et al. (2015), have shown similar outcomes, reinforcing the validity of these findings within a broader clinical context.

In summary, intra-articular triamcinolone injections appear to be an effective and well-tolerated treatment option for the short-term management of knee OA symptoms. This observational study contributes to the growing body of evidence supporting the use of corticosteroid injections in clinical practice, providing a practical approach for improving the quality of life in knee OA patients, particularly those with moderate to severe symptoms.

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