Original Article

Outcome of Intra-Articular Triamcinolone Acetonide Injection in Osteoarthritis of Knee

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ABSTRACT

Objective: To evaluate the outcome of intra-articular triamcinolone acetonide injection in patients with osteoarthritis of the knee.

Study Design: Cross-sectional analytical study

Place and Duration of Study: This study was conducted at the Department of Orthopedic surgery, National Hospital & Medical Center Lahore from 15th October 2025 till 15th of January 2026.

Methods: This cross-sectional analytical study, including 85 patients with clinically and radiologically diagnosed knee osteoarthritis. All patients received intra-articular triamcinolone acetonide injection. Pain and functional outcomes were assessed using the Visual Analog Scale (VAS) and WOMAC score before and after treatment.

Results: The mean age was 58.6 ± 9.4 years, with a female predominance (57.6%). The mean BMI was 28.9 ± 3.8 kg/m². Significant improvement was observed in pain and function, with VAS scores decreasing from 7.8 ± 1.2 to 3.9 ± 1.5 and total WOMAC scores improving from 63.3 ± 11.4 to 35.5 ± 10.2 ($p < 0.001$). Overall, 72.9% of patients showed good to excellent improvement. Better outcomes were associated with younger age, lower BMI, shorter symptom duration, and less severe disease.

Conclusion: Intra-articular triamcinolone acetonide injection provides significant short-term pain relief and functional improvement in knee osteoarthritis. It is an effective treatment option, particularly in patients with early-stage disease and fewer risk factors.

Key Words: Osteoarthritis knee; Triamcinolone acetonide; Intra-articular injection; VAS; WOMAC; Pain relief

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INTRODUCTION

Knee osteoarthritis is one of the most common degenerative joint diseases and is a major cause of chronic pain, stiffness, and loss of functional ability in adults in the global population[1]. It is defined by the progressive erosion of cartilage, subchondral bone, development of osteophytes and differing levels of synovial inflammation, which eventually result in the loss of mobility and quality of life[2]. Knee osteoarthritis keeps on increasing its burden because of the prolonged life span, sedentary living and escalating cases of obesity[3]. There is no clear-cut curative treatment of knee osteoarthritis thus the treatment is mostly symptomatic[4].

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The common treatment methods are lifestyle change, weight loss, physiotherapy, and medications like nonsteroidal anti-inflammatory drugs[5]. Nevertheless, numerous patients get poor improvements using conservative treatments, which requires them to take intra-articular interventions[6]. The reason behind the use of intra-articular corticosteroid injections is the fact that they act quickly and are effective in alleviating pain associated with inflammation[7]. One of the corticosteroids that are mostly used in this case due to its strong anti-inflammatory effects and rather long-lasting intra-articular action is triamcinolone acetonide[8]. Its mechanism of action is by inhibiting the inflammatory mediators in the joint and subduing synovitis and enhancing the joint functioning[9].

A number of studies have also revealed that intra-articular injections of triamcinolone can bring a lot of short-term pain and functional improvement especially in patients with moderate to severe symptoms[10]. But the length of benefit is not fixed and there is some data to indicate that repeated use could be linked to structural alterations including cartilage loss which causes concern over long term safety[11]. Although these issues have been raised, corticosteroid injections are still a valuable treatment tool, particularly in patients who need to have a temporary symptom relief to continue with their daily functions and be able to take part in the rehabilitation process[12]. The effect of intra-articular

corticosteroid injections can be different with regard to the severity of the disease, starting levels of pain, and personal characteristics of the patient[13]. As such, assessments of treatment outcomes among certain groups of people are necessary to maximize clinical decision-making[14]. In Pakistan, there is little local information on the efficacy of intra-articular injection of triamcinolone acetonide in knee osteoarthritis[15]. Creating this evidence is significant to inform practice in resource-constrained environments[16].

Therefore, the purpose of the study is to determine the result of intra-articular triamcinolone acetonide injection as a treatment to patients with knee osteoarthritis.

METHODS

This was an analytical cross-sectional study conducted at Department of Orthopedic surgery, National Hospital & Medical Center Lahore from 15th October 2025 till 15th of January 2026, including 85 patients diagnosed with osteoarthritis of the knee.

Inclusion Criteria

- Patients aged ≥40 years diagnosed with osteoarthritis of the knee
- Patients with symptomatic knee pain not adequately controlled with conservative therapy
- Patients willing to receive intra-articular triamcinolone acetonide injection
- Patients providing informed consent

Exclusion Criteria

- Patients with inflammatory arthritis (e.g., rheumatoid arthritis, gout)
- Patients with septic arthritis or active joint infection
- Patients with recent knee trauma or surgery
- Patients with contraindications to corticosteroid injection
- Patients with incomplete follow-up data

Data Collection: After institutional approval, data were collected using a structured proforma. Baseline variables included age, gender, body mass index, duration of symptoms, and severity of osteoarthritis based on clinical and radiographic findings. All patients received a standardized intra-articular injection of triamcinolone acetonide under aseptic conditions. Outcomes were assessed using pain and functional scores such as the Visual Analog Scale (VAS) for pain and the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) at baseline and follow-up visits. Any adverse effects following injection were also recorded.

Statistical Analysis: Data were entered and analyzed using SPSS version 26.0. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequency and percentage. Pre- and post-injection outcomes were compared using paired t-test. A p-value of ≤0.05 was considered statistically significant.

RESULTS

The baseline characteristics show that most patients were older adults, with a mean age of 58.6 ± 9.4 years, and a higher proportion above 60 years (41.2%), which aligns with the typical age distribution of knee osteoarthritis. Females were slightly more affected (57.6%), reflecting the known higher prevalence in women. The mean BMI was 28.9 ± 3.8 kg/m², with the majority being overweight or obese, highlighting obesity as a key contributing factor. Most patients had symptoms for more than one year, and a large proportion had moderate to severe disease (Grade III–IV), indicating that the study population largely consisted of patients with established and clinically significant osteoarthritis.

Table No. 1. Baseline Demographic and Clinical Characteristics of Patients (N = 85)

Variable	Category	Overall (N=85)
Age (years)	Mean ± SD	58.6 ± 9.4
Age Group	40–50 years	18 (21.2%)
	51–60 years	32 (37.6%)
	>60 years	35 (41.2%)
Gender	Male	36 (42.4%)
	Female	49 (57.6%)
BMI (kg/m²)	Mean ± SD	28.9 ± 3.8
BMI Category	Normal	14 (16.5%)
	Overweight	38 (44.7%)
	Obese	33 (38.8%)
Duration of Symptoms	<1 year	26 (30.6%)
	1–3 years	34 (40.0%)
	>3 years	25 (29.4%)
Kellgren-Lawrence Grade	Grade II	28 (32.9%)
	Grade III	36 (42.4%)
	Grade IV	21 (24.7%)

Table No. 2. Pre- and Post-Injection Pain and Functional Outcomes (N = 85)

Variable	Pre-Injection Mean ± SD	Post-Injection Mean ± SD	Mean Difference	p-value
VAS Pain Score	7.8 ± 1.2	3.9 ± 1.5	-3.9 ± 1.3	<0.001
WOMAC Pain	14.6 ± 3.2	7.8 ± 2.9	-6.8 ± 2.4	<0.001
WOMAC Stiffness	6.2 ± 1.8	3.4 ± 1.5	-2.8 ± 1.2	<0.001
WOMAC Physical Function	42.5 ± 8.6	24.3 ± 7.9	-18.2 ± 6.7	<0.001
Total WOMAC Score	63.3 ± 11.4	35.5 ± 10.2	-27.8 ± 9.1	<0.001

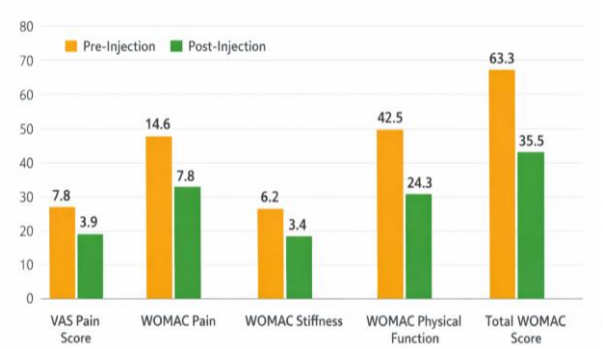

Figure No.1: Comparison of Pre- and Post-Injection Pain and Functional Outcomes in Patients with Knee Osteoarthritis (N = 85)

The mean VAS score significantly reduced from 7.8 ± 1.2 to 3.9 ± 1.5, indicating substantial pain relief. Similarly, all WOMAC domains showed significant improvement, with total WOMAC scores decreasing from 63.3 ± 11.4 to 35.5 ± 10.2 ($p < 0.001$). The largest improvement was observed in physical function, reflecting enhanced mobility and daily activity.

Outcome stratification revealed that the majority of patients achieved favorable results, with 32.9% showing excellent and 40.0% showing good improvement. Only a small proportion had moderate (17.6%) or poor (9.4%) outcomes, indicating that most patients benefited significantly from the intervention.

Table No.3: Outcome Stratification Based on Clinical Improvement (N = 85)

Outcome Category	Criteria (VAS Reduction)	n (%)
Excellent	≥70% reduction	28 (32.9%)
Good	40–69% reduction	34 (40.0%)
Moderate	20–39% reduction	15 (17.6%)
Poor	<20% reduction	8 (9.4%)

Clinical factors such as younger age, lower BMI, shorter duration of symptoms, and less severe radiographic disease were associated with better outcomes. Patients with good or excellent outcomes had a lower mean age (57.1 ± 8.9 vs 62.3 ± 10.1 years) and BMI (28.1 ± 3.5 vs 30.7 ± 4.1 kg/m²). Higher disease severity (KL Grade III–IV) and longer symptom duration were more common in those with poorer outcomes.

Table No. 4. Association of Clinical Factors with Treatment Outcome (N = 85)

Variable	Good/Excellent Outcome (n=62)	Moderate/Poor Outcome (n=23)	p-value
Age (years) Mean ± SD	57.1 ± 8.9	62.3 ± 10.1	0.021
Gender (Female)	34 (54.8%)	15 (65.2%)	0.381
BMI (kg/m²) Mean ± SD	28.1 ± 3.5	30.7 ± 4.1	0.008
KL Grade III–IV	38 (61.3%)	19 (82.6%)	0.049
Duration >3 years	14 (22.6%)	11 (47.8%)	0.018
Baseline VAS	7.6 ± 1.1	8.2 ± 1.3	0.047

DISCUSSION

This paper assessed the efficacy of intra-articular injection of triamcinolone acetonide on patients with knee osteoarthritis and reported a significant reduction in the level of pain and functional status. The population of the study was primarily older adults with a mean age of 58.6 ± 9.4 years with a greater percentage of females, which is aligned to the known epidemiology of osteoarthritis. Mechanical and metabolic factors in the development of the disease are also emphasized by the high prevalence of overweight and obesity (mean BMI 28.9 ± 3.8 kg/m 2). The same tendencies have been mentioned in the past studies, with age, female gender, and BMI increasing among the significant factors of knee osteoarthritis[17,18]. The major conclusion of the research was that there was a substantial post-injection of triamcinolone reduction of pain and enhancement of function. The VAS score decreased from 7.8 ± 1.2 to 3.9 ± 1.5, while the total WOMAC score improved from 63.3 ± 11.4 to 35.5 ± 10.2 ($p < 0.001$), indicating substantial symptomatic relief. All domains of WOMAC were reported to have improved, especially physical functioning, indicating a better mobility and activity. These effects of pain and functional outcomes are similar to those of the intra-articular corticosteroid injections reported as having a consistent positive effect (particularly in the short-term) in previous studies[19].

Outcome stratification was further used to support the efficacy of the intervention where most patients recorded good (40.0) or excellent (32.9) improvement. The percentage of moderate and poor results was also low, which means that intra-articular triamcinolone is useful to most patients. Similar results have been noted in other studies where a large percentage of patients have shown meaningful clinical improvement following corticosteroid injections. The analysis of related factors showed that the positive results were noted in younger patients, patients with lower BMI, shorter symptoms, and less intensive radiographic disease. Patients who had worse outcomes tended to be older and have advanced osteoarthritis, and had longer periods with the symptoms, indicating that severity of the disease determines response to treatment. These are similar to other studies done previously, which have demonstrated

that early disease and reduced mechanical load correlate with improved response to intra-articular treatments[20]. On the whole, the results of this research indicate that intra-articular triamcinolone acetonide injection is a well-founded short-term management tool that can be used to alleviate pain and improve the functionality of knee osteoarthritis. The findings correlate with the past studies and underline the role of the patient selection since the results can be different in case of the variation of the baseline features and the severity of the disease.

CONCLUSION

It is concluded that intra-articular triamcinolone acetonide injection is an effective treatment modality for providing significant short-term relief of pain and improvement in functional outcomes in patients with osteoarthritis of the knee. The majority of patients achieved good to excellent clinical improvement following the intervention.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Lavinia Kamla Lincoln, M.A Wajid
Drafting or Revising Critically:	Lavinia Kamla Lincoln, M.A Wajid
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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