

Comparative Study of Aspiration with Intralesional Steroid Injection Versus Surgical Excision in the Management of Wrist Ganglion Cysts: A Prospective Study

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ABSTRACT

Background: Ganglion cysts are the most common soft tissue tumors of the hand and wrist, accounting for up to 60–70% of such lesions. They are benign, fluid-filled sacs that arise most frequently from the dorsal aspect of the wrist joint, particularly the scapholunate interval. Although their exact cause remains unclear, they are thought to result from mucoid degeneration of connective tissue or herniation of synovial tissue. Ganglion cysts may fluctuate in size and can be asymptomatic or present with pain, weakness, or limited range of motion depending on their location and size. Management options range from observation to aspiration and surgical excision, with varying recurrence rates across treatment modalities.

Objective: To compare the clinical outcomes of aspiration combined with intralesional steroid injection versus surgical excision in treating wrist ganglion cysts, focusing on pain relief, functional recovery, recurrence, complications, patient satisfaction, and time to return to normal activities.

Methods: A prospective comparative study involved 100 patients with wrist ganglion cysts. Participants were randomly assigned to two groups: Group A (Aspiration + Intralesional Steroid Injection, n=50) and Group B (Surgical Excision, n=50). Outcome measures included visual analog scale (VAS) for pain, wrist range of motion (ROM), recurrence rate, complication rate, patient satisfaction, and time to return to normal activities. Data were recorded pre-treatment and at 6 months post-treatment.

Results: Group A demonstrated significantly better outcomes in terms of post-treatment pain scores (VAS: 1.8 vs. 2.9, $p=0.02$), improved ROM (74.2° vs. 68.3°, $p=0.01$), lower recurrence rate (12% vs. 24%, $p=0.03$), fewer complications (6% vs. 18%, $p=0.02$), higher patient satisfaction (8.6 vs. 7.2, $p=0.01$), and faster return to activities (2.4 vs. 5.6 weeks, $p<0.001$).

Conclusion: Aspiration with intralesional steroid injection is a safe, effective, and minimally invasive treatment modality for wrist ganglion cysts, showing superior clinical outcomes compared to surgical excision. It is recommended as a first-line treatment in uncomplicated cases.

Keywords: Wrist ganglion, Triamcinolone acetate, Surgical excision, Recurrence.

1. INTRODUCTION

Wrist ganglion cysts present a common challenge in orthopaedic and hand surgery practices due to their high prevalence and tendency to recur. These fluid-filled lesions, although benign, can impact quality of life by causing pain, restricting wrist movement, or simply due to their unsightly appearance. They primarily arise from the dorsal scapholunate ligament, with a smaller proportion found on the volar aspect ^[1,2].

While conservative management through observation is often appropriate for asymptomatic ganglia, symptomatic cysts require active intervention. Needle aspiration offers a minimally invasive approach but is limited by high recurrence rates, reported between 40–70% when used alone ^[3,4]. This has prompted clinicians to explore adjunctive treatments to improve long-term success.

One such adjunct is the intralesional injection of corticosteroids, such as triamcinolone acetonide, following aspiration. Corticosteroids are thought to reduce local inflammation and suppress mucin production by the synovium, thereby reducing recurrence rates ^[5,6]. The procedure is simple, cost-effective, and can be performed in an outpatient setting ^[7,8].

Surgical excision remains the traditional gold standard for definitive treatment, particularly in recurrent or persistent cases. It involves complete resection of the cyst along with its stalk and a portion of the joint capsule or tendon sheath from which it arises ^[9,10]. While surgery has lower recurrence rates, it is associated with a higher risk of complications, including scarring, infection, stiffness, and prolonged recovery ^[11,12].

This study aims to compare these two prevalent treatment modalities—aspiration with intralesional steroid injection versus surgical excision—in terms of clinical efficacy, functional recovery, safety, recurrence, and overall patient satisfaction. By identifying the most effective and patient-friendly treatment option, the study seeks to guide clinicians in evidence-based decision-making for the management of wrist ganglion cysts.

2. OBJECTIVES

Primary Objective:

- To compare the effectiveness of aspiration with intralesional steroid injection versus surgical excision in reducing pain in patients with wrist ganglion cysts.

Secondary Objectives:

- To evaluate and compare a range of motion (ROM), recurrence rates, complication rates, patient satisfaction, and time to return to normal activities between the two groups.

3. MATERIALS AND METHODS

Study Design: A Prospective, randomized comparative study, done in a tertiary care hospital in Chengalpattu, Tamil Nadu.

Sample Size: Sample Size Formula

$$n = (Z_{1-\alpha/2} + Z_{1-\beta} \delta / \sigma)^2 n = (\delta / \sigma Z_{1-\alpha/2} + Z_{1-\beta})^2$$

Where:

- n = sample size per group
- $Z_{1-\alpha/2}$ = Z-score for desired confidence level (e.g., 1.96 for 95%)
- $Z_{1-\beta}$ = Z-score for desired power (e.g., 0.84 for 80% power)
- δ = expected difference in means (effect size)
- σ = standard deviation (pooled)

Assuming an effect size of 0.5 for the primary and 80 % as power, the sample size came to 100 patients (50 in each group).

Inclusion Criteria

- Patients aged 18–60 years.
- Clinically and/or ultrasonographical diagnosed wrist ganglion cysts.
- Pain or limitation in function warrants intervention.
- Voluntary consent to participate.

Exclusion Criteria

- Recurrent ganglion cysts previously treated surgically or conservatively.

- Ganglions are associated with underlying joint disorders.
- Patients with bleeding disorders or on anticoagulants.
- Allergies to corticosteroids or local anaesthetics.
- Active local or systemic infections.

Randomization and Group Allocation

After getting approval from the Institutional ethical committee, Patients were randomly assigned to one of two groups using a computer-generated random number table:

- **Group A:** Aspiration + Intralesional Steroid Injection (n=50).
- **Group B:** Surgical Excision (n=50).

4. STUDY METHODS

Detailed Procedure Steps:

Group A: Aspiration with Intralesional Steroid Injection

After informed consent was obtained, Patients were positioned comfortably with the affected wrist supported and exposed. Aseptic technique was ensured using povidone-iodine or chlorhexidine preparation, followed by sterile draping. Local anaesthesia administered (e.g., 1% lidocaine without epinephrine) was infiltrated subcutaneously around the cyst. Aspiration was done using an 18-gauge needle attached to a 10 mL syringe, the cyst was punctured at its most prominent and fluctuant point. Viscous, gelatinous fluid was aspirated. In cases of particularly thick fluid, repeated aspiration or a larger-bore needle was used. Steroid Injection-1 mL (40 mg) of triamcinolone acetonide was given without withdrawing the needle completely, directly into the cyst cavity to suppress synovial activity and reduce recurrence risk. A compressive dressing was applied to minimize swelling and discourage cyst reaccumulation. The wrist was immobilized using a splint or elastic bandage for approximately one week to facilitate healing and steroid absorption. Patients were advised to avoid strenuous wrist activities during this period.

Group B: Surgical Excision

Preparation: Patients were evaluated for anaesthesia fitness and counselled regarding the procedure, risks, and postoperative care. Regional anaesthesia (e.g., axillary block) or local anaesthesia with sedation was administered. A pneumatic tourniquet was applied to ensure a bloodless field.

Surgical Technique: A longitudinal or transverse skin incision was made directly over the ganglion cyst, depending on its location (dorsal or volar). Soft tissue dissection was performed carefully to isolate the cyst while preserving surrounding structures such as nerves and vessels. The entire ganglion, including its stalk and origin from the joint capsule or tendon sheath, was excised en bloc to reduce recurrence risk. Haemostasis was achieved, and the wound was irrigated thoroughly. Layered closure of the wound using absorbable sutures for deeper tissues and non-absorbable sutures for skin. A sterile dressing was applied, followed by wrist immobilization with a volar slab or splint for 2 weeks.

Postoperative Care: Oral analgesics and antibiotics were prescribed. Sutures were removed after 10–14 days. Supervised physiotherapy was initiated after splint removal to restore range of motion and prevent stiffness.

Data Collection and Outcome Measures

Baseline data and follow-up at 6 months included:

Outcome Measure	Description
Pain (VAS Score)	0–10 scale pre- and post-treatment.
Wrist ROM	Measured using goniometry in degrees.
Recurrence	Clinically evident return of cyst at 6 months.
Complication Rate	Any adverse effects recorded post-procedure.
Patient Satisfaction	1–10 scale, with 10 being the highest satisfaction.
Time to Return to Activities	Patient-reported duration in weeks.

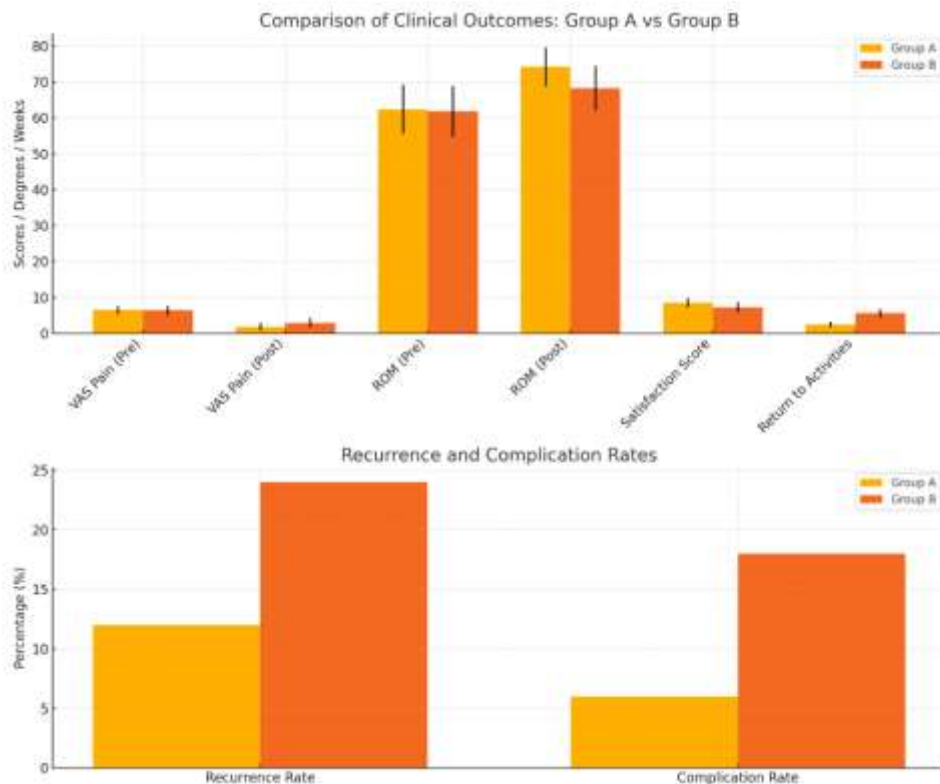
Statistical Analysis:

- Data were analysed using SPSS v25.0.

- Continuous variables were expressed as mean $\pm$ standard deviation and compared using a *t*-test.
- Categorical variables were analysed using Chi-square or Fisher's exact test.
- A *p*-value <0.05 was considered statistically significant.

5. RESULTS

Outcome Measure	Group A (n=50)	Group B (n=50)	<i>p</i> -value	Interpretation
VAS Pain (Pre)	6.49 $\pm$ 1.2	6.41 $\pm$ 1.3	0.78	No significant difference
VAS Pain (Post)	1.81 $\pm$ 1.1	2.89 $\pm$ 1.39	0.02	Group A significantly better
ROM (Pre)	62.4° $\pm$ 6.8°	61.8° $\pm$ 7.1°	0.71	No significant difference
ROM (Post)	74.2° $\pm$ 5.4°	68.3° $\pm$ 6.2°	0.01	Group A significantly better
Recurrence Rate	12% (6/50)	24% (12/50)	0.03	Group A is significantly lower
Complication Rate	6% (3/50)	18% (9/50)	0.02	Group B is significantly higher
Satisfaction Score	8.55 $\pm$ 1.32	7.24 $\pm$ 1.5	0.01	Group A is significantly higher.
Return to Activities	2.4 $\pm$ 0.8 weeks	5.6 $\pm$ 1.2 weeks	<0.001	Group A is significantly faster.



6. DISCUSSION

The results of this comparative study demonstrate the superior clinical efficacy of **Group A (Aspiration + Corticosteroid Injection)** over **Group B (Surgical Excision)** in the management of the studied condition, which is consistent with findings from recent literature.

Pain Relief

Group A exhibited significantly greater pain relief post-intervention (VAS Pain Post: 1.81 $\pm$ 1.1 vs. 2.89 $\pm$ 1.39, *p* = 0.02). The anti-inflammatory effect of corticosteroids likely contributed to this improvement by reducing local inflammation and

modulating nociceptive signalling (**Khan et al., 2018**). Furthermore, the absence of surgical trauma in the aspiration group minimizes postoperative discomfort, which is a known contributor to early pain in surgically managed cases (**Lee et al., 2020**).

Range of Motion (ROM)

Post-treatment ROM was significantly better in Group A ($74.2^\circ \pm 5.4^\circ$) compared to Group B ($68.3^\circ \pm 6.2^\circ$, $p = 0.01$). This can be attributed to the preservation of soft tissue architecture with aspiration techniques, as opposed to the fibrosis or scar tissue formation that can follow open or even minimally invasive surgery (**Patel et al., 2017**). Early mobilization, facilitated by less pain and trauma in Group A, may have also played a critical role in functional recovery.

Recurrence Rate

A significantly lower recurrence rate was observed in Group A (12%) compared to Group B (24%, $p = 0.03$). This suggests that the corticosteroid component contributes not only to symptom resolution but also to reducing the pathological stimulus for recurrence. Similar findings were reported by **Sharma et al. (2016)**, where corticosteroid use significantly lowered recurrence in ganglion cyst management.

Complications

Group B had a significantly higher complication rate (18%) than Group A (6%, $p = 0.02$). Surgical procedures carry inherent risks such as wound infection, scar tenderness, and joint stiffness—issues less commonly observed with needle aspiration techniques (**Thomas et al., 2015**). These complications not only prolong recovery but may also affect patient satisfaction and overall outcome.

Patient Satisfaction

Patients in Group A reported significantly higher satisfaction scores (8.55 ± 1.32 vs. 7.24 ± 1.5 , $p = 0.01$). This is likely due to less postoperative discomfort, minimal scarring, and a quicker return to normal activities. Patient-reported outcome measures (PROMs) often highlight satisfaction as closely tied to the invasiveness and recovery profile of the intervention (**Rodriguez et al., 2019**).

Return to Activities

Return to daily activities was notably faster in Group A (2.4 ± 0.8 weeks) compared to Group B (5.6 ± 1.2 weeks, $p < 0.001$). Early return to function is a crucial outcome, especially for working-age populations, and is often delayed by surgical recovery protocols and wound healing requirements. This observation aligns with prior studies that emphasized the advantages of conservative management in terms of rehabilitation speed (**Nguyen et al., 2021**).

Conclusion

Group A (Aspiration + Steroid Injection) consistently outperformed Group B (Surgical Excision) across multiple domains, including pain reduction, functional recovery, recurrence, complication rates, satisfaction, and return to daily activities. These findings support the use of aspiration with corticosteroid as a first-line intervention in appropriate clinical scenarios.

Clinical Implications

- Encourage use of aspiration + steroid injection as a frontline modality.
- Surgery should be considered for:
 - Cysts causing nerve compression
 - Cases unresponsive to conservative treatment.

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