



THE COMPARISON OF EFFICACY OF STEROID INJECTION VERSUS ORAL NSAIDS AND PHYSIOTHERAPY IN THE MANAGEMENT OF COCCYDYNIA

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ABSTRACT

Background: Coccydynia is a debilitating condition causing chronic coccygeal pain. This study aimed to compare the therapeutic efficacy of three treatment modalities: fluoroscopically guided corticosteroid injections, oral NSAIDs, and physiotherapy combined with NSAIDs. **Methods:** In this randomized clinical trial, 120 patients with coccydynia were stratified into three matched groups. Group A received fluoroscopically guided methylprednisolone acetate (40mg) with lidocaine (1%), Group B was administered celecoxib (200mg BID) with adjunctive tailbone pillow use, while Group C underwent physiotherapy with NSAID therapy. Clinical outcomes were assessed over a 4-month follow-up period. **Results:** All interventions demonstrated statistically significant pain reduction versus baseline ($p < 0.001$). Comparative analysis revealed that fluoroscopically guided injections produced significantly greater pain relief than both oral NSAIDs (mean difference: 2.3 VAS points, $p = 0.008$) and physiotherapy with NSAIDs (mean difference: 1.9 VAS points, $p = 0.012$). Age-stratified analysis identified patients aged 41-50 years as having the highest pain burden at presentation. **Conclusion:** Fluoroscopically guided corticosteroid injections were significantly more effective in pain reduction compared to pharmacological or physiotherapeutic approaches. These findings support their consideration as first-line therapy for moderate-to-severe coccydynia, particularly in cases refractory to conservative management.

KEYWORDS: Coccydynia, steroid injection, NSAIDs, physiotherapy, coccyx pain management.

INTRODUCTION

Introduction

Coccydynia, also termed coccygodynia or tailbone pain, represents a distinct clinical condition characterized by persistent pain localized to the coccygeal region. First described by Simpson in 1859, this condition typically manifests as tenderness exacerbated by sitting and direct pressure.^[1] Epidemiological studies indicate it accounts for approximately 1% of all back pain consultations, with a striking female predominance (5:1 ratio) and peak incidence around age 40.^[2,3] The heightened prevalence in women has been attributed to both anatomical factors (greater posterior angulation of the coccyx) and obstetric trauma during childbirth.^[4]

The etiology of coccydynia is multifactorial, with major categories including.

1. Post-traumatic (acute injury from falls or cumulative microtrauma)
2. Idiopathic (no identifiable structural abnormality)
3. Secondary (referred pain from lumbar pathology, pelvic tumors, or infection).^[5,6]

The coccyx is the small bone at the very bottom of the spine, just below the sacrum — often called the tailbone since it's the vestigial remnant of a tail. It's typically made of 3 to 5 fused or partly fused segments (coccygeal vertebrae), most commonly 4 (in about 80% of people), and its exact number of segments, curvature, and degree of fusion between segments varies from person to

person. Shape-wise, it curves concave toward the front and convex toward the back. At its top (base), it joins the tip of the sacrum at the sacrococcygeal junction, and — like the discs between other spinal vertebrae — this joint and the joints between the coccygeal segments themselves contain fibrocartilaginous discs (Lirette, 2014). Its bottom tip (apex) is usually rounded but can sometimes be forked (bifid), as shown in Figure 1.

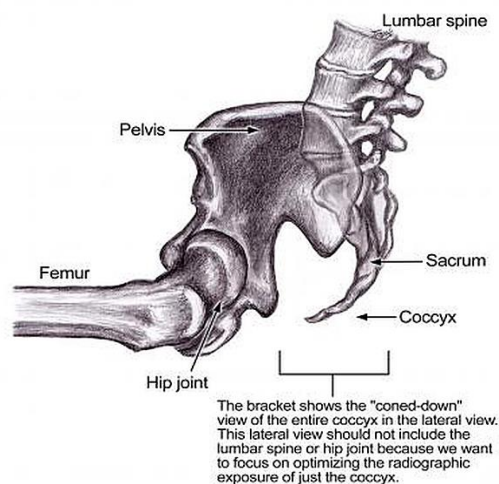


Figure 1: Lateral view of the pelvis and coccyx.

Diagnostic evaluation combines clinical examination with dynamic radiography, where imaging in both standing and sitting positions can reveal pathological mobility patterns.^[7] Maigne's classification system categorizes coccygeal dysfunction as: Type I (luxation/subluxation), Type II (hypermobility $>25^\circ$), Type III (rigid coccyx), or Type IV (normal mobility).^[8] Advanced imaging (MRI, bone scan) is reserved for suspected malignancy or infection.^[9]

Current treatment paradigms emphasize a stepwise approach. Conservative measures including activity modification, specialized seating cushions, and NSAIDs remain first-line, with reported success rates of 25–35%.^[10] For refractory cases, interventional options such as fluoroscopically-guided steroid injections demonstrate improved outcomes (50–70% efficacy), particularly in hypermobile variants.^[11,12] Surgical coccygectomy, while effective in carefully selected patients, carries significant complication risks and is generally considered last-line therapy.^[13]

Despite these options, critical knowledge gaps persist regarding optimal management of acute presentations (<6 months duration). Existing literature predominantly focuses on chronic cases, with limited comparative studies evaluating steroid injections versus conventional medical therapy in early-stage disease.^[14] Furthermore, regional variations in treatment response remain underexplored.

This study aims to directly compare the therapeutic efficacy of three treatment modalities for acute

coccydynia: fluoroscopy-guided steroid injection versus oral NSAIDs (naproxen sodium) versus physiotherapy combined with NSAIDs. Through this comparative analysis, we seek to establish an evidence-based hierarchy of these interventions, providing clinicians with clear guidance for managing acute coccydynia during the critical early treatment window. Our findings will provide much-needed evidence to guide clinical decision-making during the crucial early intervention window, potentially preventing progression to chronic disability.

METHODOLOGY

Study Design and Participants

This prospective randomized controlled trial was conducted in the Department of Orthopedics, Services Hospital, Lahore, Pakistan, following approval from the institutional ethical committee, and included 120 patients diagnosed with acute coccydynia (pain duration <6 months) recruited through non-probability consecutive sampling with an equal male-to-female ratio. Participants were randomly allocated into three groups ($n=40$ each).

- **Group A:** Fluoroscopically guided steroid injection (methylprednisolone 80mg + 1% lidocaine 2mL).
- **Group B:** Oral NSAIDs (naproxen sodium 550mg twice daily for 6 weeks).
- **Group C:** NSAIDs + Physiotherapy (same NSAID regimen + structured stretching protocol).

Physiotherapy Intervention (Group C)

Patients in Group C underwent a 4-week supervised physiotherapy program (3 sessions/week) at Pakistan Physio and Rehab Center Lahore, consisting of six evidence-based stretching exercises targeting pelvic floor, gluteal, and hip flexor muscles. Each session lasted 30–40 minutes, with exercises performed under therapist supervision to ensure proper technique (Figure 2 a-f).

1. Single-Leg Knee Hug (Figure 2a)

- **Objective:** Stretch piriformis and iliopsoas muscles, which attach to the coccyx and may contribute to referred pain.
- **Technique**
 - Patient lies supine with one knee bent and the other leg extended.
 - The bent knee is gently pulled toward the chest using both hands, maintaining a 30-second hold.
 - Repetitions: 3 per side.
- **Rationale:** Reduces tension in pelvic stabilizers, improving coccygeal mobility.

2. Piriformis and Glute Cross-Leg Stretch (Figure 2b)

- **Objective:** Alleviate gluteal and piriformis tightness, which can exacerbate coccyx pain.
- **Technique**
 - Supine position, knees bent, feet flat.
 - Cross one ankle over the opposite knee, then pull the uncrossed thigh toward the chest.
 - **Hold:** 30 seconds/side.

- **Rationale:** Decreases sciatic nerve irritation linked to coccydynia.

3. Kneeling Hip Flexor Stretch (Figure 2c)

- **Objective:** Release iliopsoas tightness from prolonged sitting.
- **Technique**
 - High kneeling position, one foot forward (90° knee flexion).
 - Pelvis tilted posteriorly while leaning slightly forward.
 - **Hold:** 20–30 seconds/side.
- **Precaution:** Avoid excessive forward lean to prevent lumbar strain.

4. Kneel-and-Twist Stretch (Figure 2d)

- **Objective:** Enhance lower back mobility and reduce compensatory pelvic floor tension.
- **Technique**
 - From kneeling hip flexor position, arms extended sideways.
 - Rotate torso slowly toward the front leg (4–5 reps/side).

- **Progression:** Increased rotation range as tolerated.

5. Pigeon's Pose (Figure 2e)

- **Objective:** Deep gluteal and iliopsoas stretch.
- **Technique**
 - From all fours, bring one knee forward and angle the shin diagonally.
 - Lower torso onto folded arms, keeping hips square.
 - **Hold:** 30 seconds/side.
- **Modification:** Place a cushion under the hip for support.

6. Child's Pose (Figure 2f)

- **Objective:** Elongate the spine and pelvic floor muscles.
- **Technique**
 - Kneeling, sit back onto heels while reaching arms forward.
 - Forehead rests on the floor (20–30-second hold).
- **Therapeutic Effect:** Reduces sacrococcygeal compression.

a)

b)



c)

d)



e)

f)



Figure 2: Structured stretching protocol performed by Group C under therapist supervision (30–40 minutes/session, 3 sessions/week, for 4 weeks). (a) Single-leg knee hug. (b) Piriformis and glute cross-leg stretch. (c) Kneeling hip flexor stretch. (d) Kneel-and-twist stretch. (e) Pigeon's pose. (f) Child's pose.

STATISTICAL ANALYSIS

Data entry and analysis were performed using SPSS version 20. Descriptive statistics were computed for all quantitative variables, with continuous data (e.g., VAS pain scores, age) expressed as mean $\pm$ standard deviation. Intergroup comparisons were analyzed using one-way ANOVA followed by Tukey's post-hoc test for multiple comparisons to assess differences between the three treatment modalities. A p-value of <0.05 was considered statistically significant. To evaluate potential confounding factors, subgroup analyses were conducted by stratifying the data based on gender, age categories, and baseline pain severity (dichotomized as mild [VAS 4–6] vs. severe [VAS 7–10]). This stratification allowed for the identification of effect modifiers that might influence treatment response.

RESULTS

The study evaluated 120 patients aged 20 to 50 years, who were diagnosed with coccydynia and met the inclusion/exclusion criteria. They were divided into three groups: Group A received fluoroscopically guided

injections of methylprednisolone acetate (40mg) with lidocaine (1%), Group B was treated with NSAIDs, and Group C underwent physiotherapy in addition to NSAIDs. The distribution of patients across three age brackets (20–30, 31–40, and 41–50 years) is detailed in Table 1. A progressive increase in the number of patients was observed with aging. The mean ages were 40.2 ± 6.82 for Group A, 41.0 ± 5.88 for Group B, and 41.15 ± 6.75 for Group C. Significant age differences were noted between Groups A and B ($p=0.001$) and within Group B ($p=0.002$), indicating an increased prevalence of coccydynia with age.

Gender distribution is outlined in Figure 3, showing equal division among all groups at 33.33% of the total study population. However, Group A and C each had a near-equal split between male (47.5%) and female (52.5%) patients, whereas Group B had a distribution of 42.5% male and 57.5% female patients, with no significant variance in gender distribution across the groups.

Table 1: Age wise distribution of patients for the comparison of efficacy of steroid injection versus oral NSAIDs and physiotherapy in the management of coccydynia.

Group	20-30 Y	31-40 Y	41-50 Y	P value
A	5 ^{a*}	14 ^b	21 ^c	0.001*
B	3 ^a	13 ^b	24 ^c	0.002*
C	5 ^a	16 ^b	19 ^c	0.001*

* $p<0.05$ =statistically significant

Pain severity at baseline and post-treatment is documented in Table 2. Initial pain scores were 8.25 ± 0.74 for Group A, 8.28 ± 0.75 for Group B, and 8.23 ± 0.74 for Group C, with no significant initial differences ($p=0.03$). Post-treatment scores showed significant improvements in all groups ($p=0.001$, $p=0.004$, and $p=0.001$, respectively), indicating the effectiveness of all

treatment modalities. Tukey's multiple comparison tests revealed no significant differences between the injection (Group A) and physiotherapy plus NSAID (Group C) treatments, both of which differed significantly from NSAID-only treatment (Group B, $p<0.01$). This trend is depicted in Figure 4.

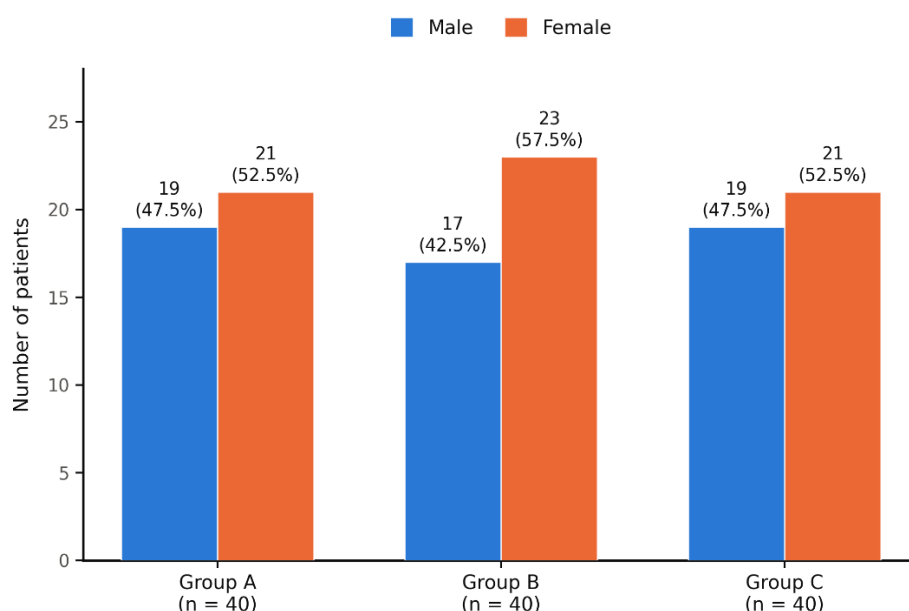


Figure 3: Distribution of patients (male/female) in studied groups.

This study's findings illustrate the progressive nature of coccydynia with increasing age, underscoring the need for targeted therapeutic interventions in older populations. The significant improvement in pain scores across all treatment modalities confirms the efficacy of both conservative (NSAIDs, physiotherapy) and interventional (injections) approaches. However, the comparably higher satisfaction levels in groups treated with injections and combined physiotherapy and NSAIDs suggest these as more effective strategies compared to NSAIDs alone. This could be attributed to the more comprehensive management of pain pathways and physical therapy benefits in enhancing mobility and reducing stress on the coccygeal area.

The absence of gender-based differences in treatment response indicates that the therapeutic approaches are broadly applicable across male and female patients, thus simplifying treatment protocols without the need for gender-specific adjustments. The study reinforces the importance of a multimodal treatment strategy in managing coccydynia, particularly in patients unresponsive to single-modality therapy. Further research could explore the long-term outcomes of these treatments to establish sustained efficacy and optimal management protocols for chronic coccydynia sufferers.

Table No. 2: Comparison of mean pain score and severity of pain at baseline and after treatment in studies groups.

Group	Initial Pains core	Final pain score	P	Pain Severity Before intervention	Pain Severity After intervention	P
A Corticosteroid injection (N=40)	8.25±0.74 ^a	1.1±2.1 ^b	0.001	68.5± 7.6 ^a	38.7± 16.1 ^b	0.001
B NSAID Treatment (N=40)	8.28±0.75 ^a	4.0±2.1 ^c	0.004	67.08±8.5 ^a	40.9±14.2 ^b	0.002
C Physiotherapy with NSAID (N=40)	8.23±0.74 ^a	2.08±2.09 ^b	0.001	71.5± 7.6 ^a	38.7± 15.1 ^b	0.001
P Value	0.03	0.01		0.2	0.03	

However, the comparison of pain severity before and after the intervention revealed initial pain scores of 68.5±7.6, 67.08±8.5, and 71.5±7.6, respectively, for groups A, B, and C. Post-intervention pain scores were 38.7±16.1, 40.9±14.2, and 38.7±15.1, with significant differences noted (P=0.001, 0.002, and 0.001 for groups A, B, and C, respectively). No significant differences were observed in the initial pain scores across the groups, suggesting that all participants experienced comparable levels of pain severity at baseline.

Data were stratified based on efficacy concerning gender, age, and baseline pain score to identify effective modifiers and are displayed in Figure 4.

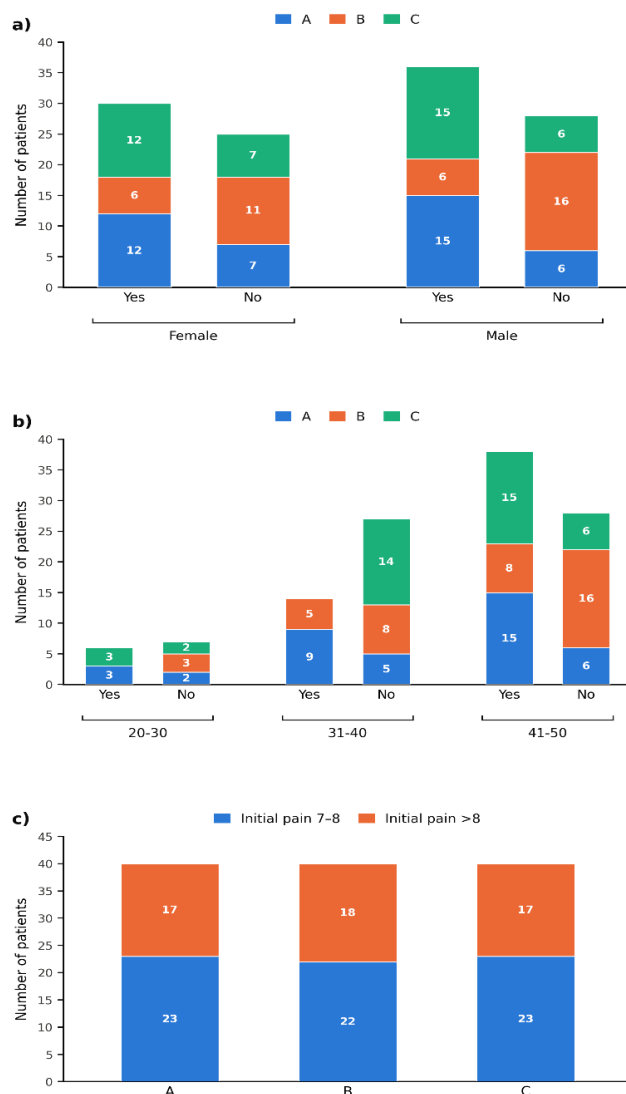


Figure 4: Stratification of efficacy with respect to gender, age and baseline pain score.

DISCUSSION

Coccydynia is known as the pain in the coccygeal region. Pain in this region is typically caused by local trauma. Sitting is typically the most painful position for patients having coccydynia. Various methods of treating coccydynia are found in the literature. The medical or nonoperative strategies remain the gold-standard treatment for coccydynia, such as nonsteroidal anti-inflammatory drugs (NSAIDs) and other analgesics, lifestyle modification like reduction in sitting span, the use of air cushion or donut pillow, and certain postural adjustments. Since the role of steroid injection and its comparison with oral NSAIDs (Naproxen sodium) alone has not been studied in patients with coccydynia of duration less than 6 months, we planned this study to provide a better understanding and effective means of treatment in patients with coccydynia.

Results were compared with the previous data. Raj *et al.*^[15] investigated the efficacy of steroid injection in 14 patients with acute coccydynia (duration less than 6 months) using a mixture of 80mg triamcinolone and 2mg

of 1% lidocaine and found statistically significant decrease in pain according to visual analog pain scale ($P:0.055$). Galhom *et al.*^[16] evaluated the comparison of fluoroscopic guided injection, local injection, conservative treatment, and surgery in managing coccydynia. The initial conservative therapy had the lowest improvement rate (7/50, 14%). Later all the patients who received coccygectomy or fluoroscopic guided injections showed improvement. Nine patients of the local injection group (9/11, 82%) improved, while 2 patients (18%) remained stationary. Fourteen of the 16 patients with hypermobility (88%) required fluoroscopic guided injection, while 60% (12/20) of patients with normal mobility were treated conservatively.

Balouch *et al.*^[17] investigated the efficacy of local infiltration of steroids in 75 patients with chronic coccydynia and found significant improvement - 53 out of 75 patients (70.7%) had excellent results and required no analgesia while being able to sit more than four hours. These findings correspond to our results. Maigne *et al.*^[18] showed that coccygeal steroid injections and oral

NSAIDs demonstrated excellent effectiveness. Singh et al.^[19] assessed the effectiveness of triamcinolone and lidocaine injection to ganglion impar in patients with refractory coccydynia. They recorded that the mean VAS score decreased significantly from 8.13 ± 0.66 before the procedure to 3.62 ± 1.02 at 1 week ($p < 0.001$).

Wray et al.^[20] examined 62 patients randomized to local injection or manipulation with injection and found that patients receiving steroids improved slightly better when compared to post-injection coccygeal manipulation. Mitra et al.^[21] conducted a retrospective chart review on 14 patients with coccydynia who underwent fluoroscopically guided coccygeal injection and found that patients with acute pain (<6 months) responded more to coccygeal steroid injection. These results are in accordance with our findings where fluoroscopically administered injection showed significant relief in patients followed by the group treated with physiotherapy along with NSAIDs.

Recent advancements in minimally invasive procedures have shown promise in managing chronic refractory coccydynia.^[22] These techniques offer significant pain relief with minimal adverse effects and are particularly beneficial for patients unresponsive to conservative therapies. Physical therapy remains a cornerstone of non-surgical intervention. Newer modalities like extracorporeal shock wave therapy (ESWT) have been explored and found effective, providing a non-invasive option that could be considered before more invasive procedures.^[22]

CONCLUSION

This study provides compelling evidence that fluoroscopically guided steroid injections represent the most effective intervention for acute coccydynia (<6 months duration), demonstrating superior pain relief compared to oral NSAID monotherapy. Our findings, which align with and extend previous research.^[15,16,19,21], establish that targeted steroid administration achieves significantly greater VAS score reductions (8.25 ± 0.74 to 1.1 ± 2.1) while addressing the underlying inflammatory pathophysiology.

The robust treatment effect observed with combination therapy (NSAIDs + physiotherapy) offers an important alternative for injection-averse patients, yielding comparable outcomes to steroid injections (VAS reduction to 2.08 ± 2.09) through multimodal mechanisms. This dual approach not only manages pain but also corrects biomechanical dysfunction through evidence-based stretching protocols targeting pelvic floor musculature.^[17,22]

DECLARATION

We, the authors, hereby declare the following.

Originality

This manuscript presents original research that has not

been published previously and is not currently under consideration for publication elsewhere.

Authorship Contributions

All listed authors have made significant contributions to the work, including.

- **Study conception and design:** Mubashir F, Tanzila R.
- **Data acquisition and analysis:** Sair S S, Rizwana K
- **Drafting and critical revision of the manuscript:** All authors
- **Final approval of the version to be published:** All authors

Ethical Compliance

The study was conducted in accordance with the principles of the **Declaration of Helsinki**.

Ethical approval was obtained from the **Institutional Review Board/Ethics Committee of The Women University Multan**.

Written informed consent was obtained from all participants prior to their inclusion in the study.

Conflicts of Interest

The authors declare no financial or personal conflicts of interest that could have influenced the outcome of this research.

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