Research Paper

Comparing Primal Reflex Release Technique and Stretching Exercises on Pain and Function in Coccydynia

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ABSTRACT

Objectives: This study aims to find and compare the effects of primal reflex release technique and stretching exercises on pain intensity, functional performance, and pain-free sitting duration in patients with coccydynia.

Methods: This is a randomized clinical trial. A total of 46 individuals were chosen for the sample based on the inclusion criteria, and they were divided into groups A and B. Pre-treatment values of patients for pain assessment were taken by the Numerical pain rating scale (NPRS), Dallas pain questionnaire (DPQ), and pain-free sitting duration (PFSD). Group A received treatment with a hot pack and primal reflex release technique. Group B received treatment with a hot pack and stretching exercises. Each patient received a total of 12 sessions over the course of 4 weeks, 3 sessions per week. After 4 weeks of therapy, both groups were evaluated again. The obtained data were analyzed using SPSS software, version 21.

Results: Findings revealed that within-group differences were statistically significant ($P<0.05$) for all variables. In the primal reflex release technique group, the average NPRS value reduced from 5.565±1.4086 to 1.7391±1.09617, the average DPQ value from 129.967±33.102 to 38.000±26.691 and the average PFSD duration increased from 43.043±20.323 to 368.478±160.464. In the stretching group, NPRS reduced from 6.087±1.345 to 3.695±1.490, DPQ from 116.032±35.054 to 60.608±22.186 and PFSD increased from 28.260±11.928 to 94.130±102.154. The between-group analysis also indicated statistically significant differences in NPRS, DPQ, and pain-free sitting duration with $P\leq0.001$, 0.003, and ≤0.001, respectively

Discussion: The study concluded that both the primal reflex release technique and stretching exercises were effective in reducing pain and improving functional status with a marked increase in pain-free sitting duration. However, the primal reflex release technique was found to be more useful than stretching exercises in terms of mentioned outcome measures on basis of their mean differences.

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Highlights

• Primal reflex release technique and stretching exercises are effective in improving the symptoms of pain, functional performance, and pain-free sitting duration in the treatment of coccydynia.

• More improvements are observed in patients treated with the primal reflex release technique compared to that of stretching exercises.

Plain Language Summary

Coccydynia is described as tailbone pain that results from trauma, muscle spasm, or pressure from prolonged sitting on hard surfaces. The classical symptom is midline pain located below the sacrum and above the anus, affecting the performance of daily activities. This study explores the effects of the primal reflex release technique and stretching exercises on pain, function, and pain-free sitting duration in patients having coccydynia. The result shows that the complaints of pain and functional limitation can be overcome with the help of these treatment strategies. The primal reflex release technique proved to be more effective for reducing pain, improving functional performance, and pain-free sitting duration compared to stretching exercises in coccydynia. This technique will help improve the quality of life for patients who suffer from coccyx pain.

1. Introduction

Coccydynia word was coined in 1859 to characterize coccyx-related pain sensations. The coccyx area is the most distal component of the spinal column. Coccydynia is also referred to as tailbone pain, coccygodynia, coccalgia, or coccygeal neuralgia. Age, sexuality, and body weight, are all factors that increase a person's risk of developing coccydynia [1]. Obese people experience coccydynia three times more than normal-weight people. Normal-weight patients have a normal or hypermobile coccyx, obese patients are more likely to experience posterior subluxation while skinny patients are more likely to experience anterior subluxation [2]. All ages and genders can be affected by this disorder, however, adults and adolescents are more prone than children [3]. This condition is five times more prevalent in women than in men, possibly as a result of the increased pressure that arises during childbirth and pregnancy [4].

Coccydynia is commonly made worse by prolonged sitting, especially on hard surfaces, although it can also be brought on by intimacy or defecation. Standing for an extended period or sitting with poor posture can also cause secondary symptoms like pain in the lowest extremity or the back. Irrespective of trauma, referred pain sensations in the coccyx can often be evoked from the lumbar region, spurs of bone, infections, pelvic floor muscles, and degenerative vertebral disk and can also be idiopathic [5]. It is a very painful condition that restricts function due to excruciating pain or increased pressure sensitivity to sensations [6]. Pain is relieved by changing to a sitting position, using donut pillows, non-steroidal anti-inflammatory drugs, local injections [7], and various therapies such as massage, manipulation, and stretching [8]. Those who fail the conservative treatment are indicated for coccygectomy. Patients with subluxated or hypermobile coccyx usually get relief from coccygectomy [9]. For managing coccydynia, nonsurgical therapies are still the gold standard treatment.

There are several muscles and ligaments attached to the coccyx. Tightening or spasm in any of the muscles can cause postural irregularities creating unusual burdens on the coccyx. Stretching of the iliopsoas and piriformis helps in correcting irregular sacral loading and lumbopelvic posture. Findings of a previous study indicated an elevation of pain-free sitting and the pain pressure threshold, after being treated with stretching of iliopsoas and piriformis muscles and Maitland mobilizations. Treatment effects persisted even when therapy was discontinued, but no considerable improvement was observed in the conventional therapy group and effects did not last once therapy was stopped [10].

Coccydynia can also be treated by using the primal reflex release technique (PRRT). This technique treats both pains in the musculoskeletal system and guided possible upregulation or contraction of muscle by utilizing the relationship between agonist and antagonist muscles to increase the afferent action acquired from the mechanoreceptors and cause downregulation of autonomic ner-

vous system (ANS) [11]. It resets the hyperactive primal reflexes in the body. One of the previous studies showed that PRRT coccyx release techniques decreased the patient's extreme coccyx pain to 1/10 on the Numerical pain rating scale (NPRS) along with prolonged sitting after 1 hour versus 8/10 worst coccyx pain at initial examination. No pain and tenderness were reported when performing a 1-minute nociceptive exam with palpation of the coccyx and side bending mobilizations [12].

Although, the literature supports the effectiveness of stretching exercises for pain reduction and functional improvement in coccydynia. But there are very limited studies regarding the effectiveness of the primal reflex release technique for coccydynia. Moreover, no research paper indicated a comparison of these techniques. Therefore, the present study aims at investigating the effects of PRRT and stretching exercises on pain and function in individuals suffering from coccydynia, assuming that, PRRT and stretching exercises will decrease the pain intensity and enhance functional performance and the effects of PRRT on pain reduction and functional improvement will be more pronounced than the other group.

2. Materials and Methods

This study was a single-blind, randomized clinical trial. It was approved by Research Ethics Committee (No.: SIHS/21/160) and has registration number IRCT20200513047421N2 in the Iranian Registry of Clinical Trials (IRCT). From July 2021 to October 2021, the study was carried out in the District Head Quarter Hospital in Sargodha, Pakistan.

The inclusion criteria for participants were pain in or around the coccyx without radiation, tenderness on palpation over coccyx pain and tenderness [13], age group above 20 years [3], including both male and female genders [4], and difficulty in pain-free sitting for long duration [1]. It was based on a clinical diagnosis of coccydynia [10]. Participants with cysts or cancer in the pelvic area, any tumor, recent trauma, surgery, or fracture, coccyx pain referred from the lumbar spine, the pelvic floor muscles, a degenerative disk, cysts, infections, or bony spurs [5], pregnancy and coccyx dislocation and during the initial evaluation, any overt neurologic symptoms or disorders, such as sensory paresthesia or motor paresis, were disregarded [6].

A total of 46 subjects (36 females, 10 males) with coccydynia were included in the study. After fully describing the study's objectives, willing participants were asked for their signed, fully informed consent in both English and Urdu. The participants in the study were chosen using a non-probability convenient sampling technique. To ensure to meet the criteria, the participants' history, thorough assessment, and complete physical examination were done by the assessor physiotherapist. Participants were asked to complete NPRS, and Dallas Pain Questionnaire (DPQ) and mention duration of pain-free sitting. A sealed envelope method of randomization was used to divide the people into two groups. Participants in the study were blind about the information of the two groups. Treatment was provided to selected patients according to their allocated groups and evaluation was done before and after treatment

Interventions

Both groups received treatment for 4 weeks, 3 sessions per week. There were 12 sessions in total [10, 14].

Group A: Primal reflex release technique

A hot pack was applied for 10 minutes over the coccyx region. The first coccyx release technique required the patient to lie prone and perform a gluteal set while the physical therapist karate chops the gluteal musculature bilaterally from the sacrum to the coccyx (Figure 1). The first coccyx release technique was performed 10 times for a duration of 30 s for each treatment session.

The second coccyx release technique required the patient to lie supine with the hips and knees positioned at 90 degrees while moving the less involved left thigh across the body toward the right shoulder; the patient performed contract relax several times to fire the lowest gluteus maximus muscle fibers. The patient performed a maximal muscle contraction for 10 s against the manual force applied in a diagonal of hip flexion adduction. The patient relaxed for 30 s. Thus, the contract-relax ratio was 10:30 (Figure 1). The second coccyx release technique was performed at 1 set of 6 repetitions of contract-relax each treatment session [12].

Group B: Stretching exercises

A hot pack was applied for 10 minutes over the coccyx region. Stretching of the piriformis was applied in a crook lying position with the flexed thighs crossed (adduction at roughly 60 degrees of flexion) to cause discomfort in the supra-trochanteric region, and was maintained for 30 s on each hip, alternately (Figure 2). With a 10-s break in between each repetition, it was done 5 times on either side.

Figure 1. Karate chops and gluteal contractions

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Iliopsoas stretching was administered while side-lying with the thigh touching the abdomen. The therapist stood behind and fixed the pelvis by pushing it forward and stretching the hip by tugging the thigh backward until the pain was felt on the front of the thigh (Figure 2). It was administered 5 times, alternately for both sides for 30 s each, with 10 seconds of relaxation in between [10, 14].

Outcome measures

Outcome measures were pain, functional performance, and pain-free sitting duration. A respondent chooses a whole number (0–10) that best captures the severity of his or her suffering while using NPRS to measure pain. The reliability and validity of NPRS range from 0.96 to 0.95 and 0.86 to 0.95, respectively. This 11-point numerical scale has a 0 representing the least amount of pain (i.e., "no pain") and a 10 signifying the greatest amount of pain. (e.g. "pain as bad as you can imagine" or "worst pain imaginable") [15].

For functional status, the DPQ was used. It is a 16-item visual analog tool used to assess how well subjects understand how much chronic pain impacts four different parts of patients' lives. The reliability and validity of DPQ range from 0.94 to 0.98 and 0.89 to 0.91 respectively. For the percentage of pain impact on daily activities, items I through VII are added together and multiplied by 3 to arrive at the total. The effects of pain on work/leisure, anxiety/depression, and social activities are each determined by adding and multiplying items VIII through X, XI through XIII, and XIV through XVI by 5. Four areas covered measuring four aspects [16].

Observing pain-free sitting duration by measuring the time patient does not experience pain [17].

Figure 2. Stretching of piriformis and iliopsoas

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Statistical analysis

The G* Power software, version 3.1.9.4, was used to analyze power and sample size. In line with the prior study's use of the identical research design, an effect size d of 0.858 was established for variations in pain [18]. A sample size of 46 was determined using an effect size d of 1.687, 80% of power (type 1 error probability), and 0.05 of significance level, with a 5% margin of error and a 95% confidence interval. This sample size included a 10% attrition rate.

SPSS for Windows version 21.0 was used to do the statistical analysis. Frequency tables, pie charts, and bar charts were utilized to depict the data for descriptive statistics (mean ± standard deviation). The data's normality was assessed using the Shapiro-Wilk test. Parametric tests of analysis were utilized, and a P of 0.05 was regarded as statistically significant. To determine the difference between the two groups, the independent t test was used. The difference within each group was measured using the paired sample t test.

3. Results

The results of the study indicate that PRRT is more effective than stretching exercises in treating coccydynia in terms of mentioned outcome measures based on their mean differences. The progress of participants was reported by using CONSORT (Consolidated Standards of Reporting Trials) guidelines. A total of 52 participants were assessed according to the eligibility criteria. Six of them were excluded: 4 did not meet the inclusion criteria and 2 refused to participate. Also, 46 subjects were included in the study and randomized into two groups to receive their respective treatments. The evaluation was done before treatment and 4 weeks after treatment. No dropout was reported (Figure 3).

Table 1 summarizes the comparison of demographic variables like age, gender, height, weight, and BMI of participants across both groups. There were 18 females (78.3%) and 5 males (21.7%) in each group. In the PRRT group, the mean age of participants was 33.5217±11.36130 and in the stretching group, the mean age was 33.0870±12.08272. In the PRRT group, the mean height of the participant was 2.1992±1.20006

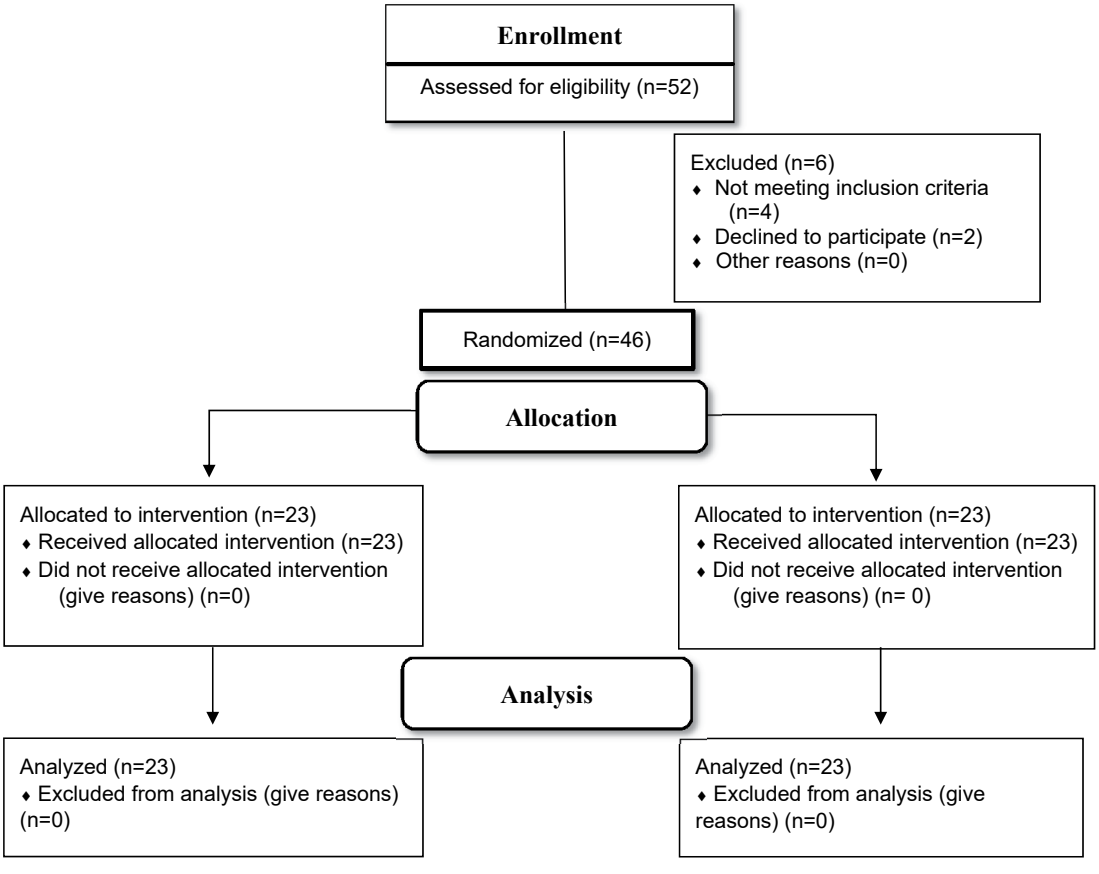

Figure 3. CONSORT (Consolidated standards of reporting trials) flow diagram

Table 1. Comparing demographic variables of the two groups

Variables		Mean±SD/No. (%)	
		Primal Reflex Release Technique	Stretching Exercises
Age (y) (n=23)		33.5217±11.36130	33.0870±12.08272
Gender	Male	5(21.7)	5(21.7)
	Female	18(78.3)	18(78.3)
Height (m) (n=23)		2.1992±1.20006	2.0927±1.26623
Weight (kg) (n=23)		68.8261±14.26901	67.3043±12.26390
BMI (kg/m^2) (n=23)		25.4788±5.29454	23.9426±4.33539

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m and in stretching was 2.0927±1.26623 m. The mean weight of participants in the PRRT group was 68.8261±14.26901 kg and in the stretching group, it was 67.3043±12.26390 kg. The mean BMI of the PRRT group was 25.4788±5.29454 kg/m^2 and in the stretching group, it was 23.9426±4. 33539 kg/m^2. Both groups were homogenous at baselines with no statistically significant difference in all parameters, including NPRS, DPQ, and pain-free sitting duration with a P>0.05.

After the intervention, statistically significant (P<0.001) improvements were observed in all outcome measures including NPRS, DPQ, and pain-free sitting duration for within-group analysis over a period of 4 weeks in both PRRT and stretching group. In the PRRT group, NPRS reduced from 5.565±1.4086 to 1.7391±1.09617, DPQ from 129.967±33.102 to 38.000±26.691 and pain-free sitting duration (PFSD) increased from 43.043±20.323 to 368.478±160.464. In the stretching group, NPRS reduced from 6.087±1.345 to 3.695±1.490, DPQ from 116.032±35.054 to 60.608±22.186 and PFSD increased from 28.260±11.928 to 94.130±102.154 (Table 2). The between-group analysis also indicated statistically significant differences in NPRS, DPQ, and pain-free sitting duration with P≤0.001, 0.003, and ≤0.001, respectively (Table 3).

4. Discussion

Coccydynia is a painful condition of the coccyx which may result from repeated or extended sitting on narrow, hard, or uncomfortable surfaces. This study aimed to compare the results of stretching and the primal reflex release technique to increase the amount of time that patients with coccydynia could sit without experiencing discomfort and to improve their NPRS and DPS scores. In terms of all end measures, the results showed a considerable improvement in both groups receiving the intervention.

Table 2. Within-group comparison of NPRS, DPQ, and PFSD among groups

Outcome Variable		Mean±SD		P
		Pre-Treatment	Post-Treatment	
NPRS	A	5.5652±1.40861	1.7391±1.09617	≤0.001
	B	6.0870±1.34547	3.6957±1.49042	≤0.001
DPQ	A	129.9674±33.10257	38.0000±26.69110	≤0.001
	B	116.0326±35.05461	60.6087±22.18630	≤0.001
PFSD	A	43.0435±20.32347	368.4783±160.4641	≤0.000
	B	28.2609±11.92864	94.1304±102.1547	≤0.006

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Abbreviations: NPRS, the numerical pain rating scale; DPQ, Dallas pain questionnaire; PFSD, pain-free sitting duration

Table 3. Between-group comparison of NPRS, DPQ, and PFSD among the groups

Variable		Mean±SD		P
		Primal Reflex Release Technique	Stretching Exercises	
NPRS	Pre-test	5.5652±1.40861	6.0870±1.34547	0.206
	Post-test	1.7391±1.09617	3.6957±1.49042	0.001
DPQ	Pre-test	129.9674±33.10257	116.0326±35.05461	0.173
	Post-test	38.0000±26.69110	60.6087±22.18630	0.003
PFSD	Pre-test	20.3478±13.24801	20.5217±10.30829	0.961
	Post-test	368.4783±160.4641	94.1304±102.1547	0.001

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Abbreviations: NPRS, the numerical pain rating scale; DPQ, Dallas pain questionnaire; PFSD, pain-free sitting duration

The current study's findings for within-group analysis utilizing paired t test showed statistically significant changes with a $P < 0.05$ in each group over a period of 4 weeks following the administration of their respective therapies. The results of this study are consistent with a previous study in which the primal reflex release technique was used to treat coccyx pain through stimulation of either the ipsilateral antagonistic or contralateral agonist muscle groups to accomplish reciprocal inhibition of selected muscle groups for reducing pain and spasm. This result indicated a reduction in pain after treatment on NPRS with prolonged sitting after 1 hour. The DPQ scores also reduced after the application of PRRT, and the functional status of subjects improved significantly. There was remarkable improvement in pain-free sitting duration which is a major concern among people suffering from coccydynia [12].

Piriformis and iliopsoas play a vital role in the stability and movement of the pelvis. However, spasms of these muscles can cause abnormal loads and sacral rotations resulting in coccydynia. In contrast to traditional physiotherapy methods, stretching the piriformis and iliopsoas muscles has been shown to reduce the pain threshold under pressure and increase the amount of time that a person may sit without experiencing pain [10]. This finding supports the effectiveness of stretching exercises as indicated in current study results.

Statistically significant differences were observed between the two groups with $P<0.05$ in terms of all outcome measures using the independent t test. But more improvement was seen in people being treated with the primal reflex release technique compared to the stretching exercises. The use of PRRT for physical and cognitive/emotional symptoms of anxiety has also been investigated previously. Psychological stress affects the normal body mechanism that eventually results in delaying and prolonging the pain and spasm in muscles. PRRT provided immediate relief from anxiety and decreased patients' heart rates providing a relaxing effect [19]. The relaxation effect greatly aids the treatment procedure and has a significant impact on how pain is managed in coccydynia. This finding is congruent with the results of the current study in which there was a marked improvement in the psychological aspects of DPQ of patients.

Any contraction of the coccyx-related muscles would result in the well-known coccygodynia pain if the coccygeal joints, the coccyx, or the surrounding tissues had been injured. Most patients with coccydynia had tonic spasms and tenderness of the piriformis. Results of another study came into agreement with our findings that showed improvement in functional status and pain reduction by treating the piriformis muscle [20].

According to the above-mentioned cases, it can be asserted that complaints of pain and functional limitation can be overcome with the help of the primal reflex release technique and stretching exercises in patients with coccydynia.

5. Conclusion

In conclusion, both the primal reflex release technique and stretching exercises were effective in improving function and reducing pain with a marked increase in pain-free sitting duration. The results were statistically significant for both groups. However, the primal reflex release technique group was found more effective than

the stretching exercise group in terms of mentioned outcome measure on basis of the mean difference.

Limitations and recommendations

The immediate effects of both interventions were not documented, and they were not categorized according to the chronicity of the condition. Further research is advocated to check the long-term effect of intervention by proceeding with follow-up sessions and applying interventions to another group of muscles to see favorable outcomes.

Ethical Considerations

Compliance with ethical guidelines

This study was a single-blind, randomized clinical trial. It was approved by Research Ethics Committee (No.: SIHS/21/160) and has registration number IRCT20200513047421N2 in the Iranian Registry of Clinical Trials (IRCT). From July 2021 to October 2021, the study was carried out in the District Head Quarter Hospital in Sargodha, Pakistan.

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Authors' contributions

Concept: Pakeeza Seemal, Tooba Sameen, and M Shais Khan; Design: Pakeeza Seemal, Ayesha Awan, and Arooba Nawaz; Supervision: Pakeeza Seemal; Resources and materials: Arooba Nawaz, Tooba Sameen, and M Shais Khan; Data collection and processing, analysis and interpretation, and literature search: Aroma Ayub, Maria Dilshad, and Ayesha Awan; Writing manuscript and critical review: Pakeeza Seemal, Aroma Ayub, Maria Dilshad, Ayesha Awan, Arooba Nawaz, Tooba Sameeen, and M Shais Khan; Access to the data, contribution to the study, approval of the final version for publication, and take responsibility for its accuracy and integrity: All authors.

Conflict of interest

All authors have declared no conflict of interest with respect to the authorship and publication of this article.

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All authors have been informed of their inclusion and have approved this.

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