

A comparison of conservative interventions and their effectiveness for coccydynia: a systematic review

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Study design: Systematic literature review.

Objective: To investigate the various conservative interventions for coccydynia and determine their effectiveness.

Background: Coccydynia is the term used to describe 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 but to our knowledge no systematic review has been performed that compared the effectiveness of these interventions.

Methods: Searches were performed for research studies using electronic databases (Cochrane Library, CINAHL, Medline, PEDro, Scopus, and Sports Discus) from January 2002 through July 2012. The quality of the papers was assessed using the GRADE approach.

Results: Seven papers were located that satisfied the inclusion and exclusion criteria (2 RCTs, 5 observational studies). The level of evidence ranged from moderate to very low quality and recommendations for use ranged from weak recommendations for use to weak recommendations against use.

Conclusions: Due to the dearth of research available and the low levels of evidence in the published studies that were located we are unable to recommend the most effective conservative intervention for the treatment of coccydynia. Additional research is needed regarding the treatment for this painful condition.

Keywords: Coccydynia, Coccyx pain, Conservative treatment, Manipulation, Manual therapy

Introduction

Coccydynia, also known as coccygodynia, is defined as a painful condition of the coccyx.¹ The coccyx is the inferior region of the vertebral column, consisting of three to five rudimentary vertebrae articulating with the sacrum. It serves as the attachment for the anterior and posterior sacrococcygeal ligaments, the anococcygeal ligaments, as well as the levator ani muscle.² The coccyx also has a close anatomical relationship with the sacral nerve roots and the terminal end of the sympathetic chain³ called the ganglion impar.

Coccydynia is a rare condition of various etiologies. This condition affects females five times more than males² and is also associated with obesity.^{1,4,5} The most common cause of coccydynia is trauma as a result of falling on the buttocks, repetitive microtrauma, or

childbirth.^{1,4,6,7} Pain in the coccyx region can also be referred from the lumbar spine, pelvic floor muscles, degenerative discs, neoplasms, bony spurs, cysts, or infections, although some cases are reported to be idiopathic.^{1,2,6} Coccygeal configuration is another important etiologic consideration. Lateral radiographs reveal four coccygeal configurations defined as Type I, II, III, and IV. Type I is described as the coccyx gently curved forward, Type II as markedly curved forward with the apex directed anteriorly, Type III as sharply angulated, and Type IV as subluxed.^{2,3,5} Kerr *et al.*³ reports that patients with coccydynia are more likely to have a coccygeal configuration other than Type I but that no relationship has been established between coccyx type and outcome. Another important factor in coccydynia is coccygeal instability. The majority of cases occur with either subluxed or hypermobile configurations and this instability is proposed to cause chronic inflammatory changes.⁵ Patients who develop coccygeal pain within

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a month of a traumatic event are more likely to have coccygeal instability than those who develop pain more than one-month post the traumatic event or those with non-traumatic coccydynia.⁴

The diagnosis of coccydynia is based on patient history and clinical examination. Coccyx pain is typically provoked by sitting.¹ Palpation can identify coccygeal tenderness and hyper mobility. Pain may also be present on rectal examination.³ Radiological studies may also aid in making this diagnosis through examination of the shape and movement of the coccyx with lateral sacral radiographs and dynamic x-rays, respectively.⁸ Several interventions are currently used for the management of coccydynia including non-steroidal anti-inflammatory drugs (NSAIDs), hot baths, ring-shaped cushions, intrarectal massage and manipulation, injections, ganglion impar blocks, radiofrequency thermocoagulation (RFT), and psychotherapy.² For patients who do not respond to these forms of intervention, coccygectomy is often recommended.⁸ Due to the inconsistency and limited success in treating this condition, the purpose of this systematic review was to compare conservative interventions and examine their effectiveness in the management of coccydynia.

Methods

Search strategy

A literature search was performed in July of 2012 using the Cochrane Library, CINAHL, Medline, PEDro, Scopus, and Sports Discus databases. The search strategy used to identify relevant studies was based on the PICO model: population, intervention, comparison, and outcome measures. The population search terms included were coccydynia, coccyx pain, and coccygodynia. The intervention search terms included were intervention, treatment, physical therapy, physiotherapy, therapeutics, manipulation, manual therapy, injection, medication, electrophysical modalities, surgery, and radiofrequency. No search terms were used in the comparison group. For the outcome group, search terms consisted of pain improvement, outcome, and function. Terms for population, intervention, and outcomes were combined with 'OR'. Inter-group terms were combined using the search term 'AND'. Citations were stored and organized using RefWorks.⁹

Selection criteria

Studies were selected using specific inclusion criteria. Research studies published between January 2002 and July 2012 available in English that described treatments for patients of age 18 or older, with a primary diagnosis of coccydynia, were included. Publications were excluded if they described surgical interventions involving the lumbar spine or pelvis,

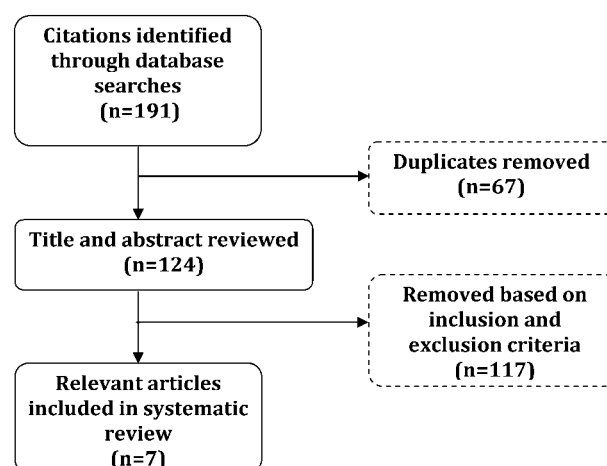


Figure 1 Flow diagram for article identification, screening, and selection.

included patients with cancer and/or cysts in the pelvic area, or were case reports.

The results of the literature search are presented in Fig. 1. The initial search of six databases yielded a total of 191 papers. After eliminating duplicates 124 papers remained. These remaining papers were assessed based on title, abstract, and inclusion and exclusion criteria. Following this assessment, seven papers remained that examined the effectiveness of conservative interventions for coccydynia.

Article assessment

Six reviewers discussed and evaluated the seven papers that met the selection criteria. Each manuscript evaluation was led by one of the authors and supported by a second author. The roles of primary and secondary reviewers rotated within the group for each paper. The primary and secondary reviewers met prior to each group meeting for a preliminary discussion of the paper and its probable grade. These discussions were guided by the GRADE [grading of recommendations, assessment, development, and evaluation] approach, which provides measures of the quality of evidence, as well as the strength of a recommendation for utilizing that intervention in clinical practice.^{10,11,12,13} Any grading disagreements among reviewers were discussed and a consensus was reached.

Results

The seven selected papers included two randomized controlled trials (RCTs) and five observational studies. Evidence to support the various interventions ranged from moderate to very low quality. Recommendations for use of a particular intervention ranged from weak recommendations for use to weak recommendations against use. Individual grades and relevant assessment criteria are presented in Table 1. The authors uniformly agreed upon the article assessments with only minor disagreement

Table 1 GRADE evidence profile: conservative interventions for coccydynia

Quality assessment										Summary of findings		
A	B	C	D	E	F	G	H	I		J	K	L
Maigne <i>et al.</i> : intrarectal manipulation, massage												
1	RT	Yes(-1) ^a	No	No	No	No (U)	51	51		At 6 months, 22% improvement in experimental group vs 12% in control group; 95% CI: 6.5–22.2%; $P=0.18$	M	(+)
Khatri <i>et al.</i> : intrarectal manipulation, phonophoresis, transcutaneous electrical nerve stimulation (TENS), analgesics												
1	RT	Yes(-1) ^{a,b}	No	No	No	No (U)	18	18		Mean visual analog scale (VAS) decrease by 5.3 experimental vs 1.4 control ($P=0.0001$). Mean pain-free sitting time: 47 minutes experimental vs 23 minutes control ($P=0.0002$)	M	(+)
Wu <i>et al.</i> : intrarectal manipulation, massage, diathermy												
1	O	No	No	No	No	No (U)	53	0		At 12 weeks, mean numeric pain rating scale (NPRS) decreased from 6.15 to 2.7 ($P<0.05$) and mean pericoccygeal surface temperature decreased from 30.16°C to 28.7°C ($P<0.05$). Significantly marked level of correlation between NPRS improvement and temperature decrease ($r=0.67$, $P<0.01$)	L	(+)
Mitra <i>et al.</i> : steroid injection												
1	O	Yes ^a	No	No	Yes	No (U)	14	0		Combined group VAS improvement ($P=0.64$)	VL	(-)
Khan <i>et al.</i> : dextrose prolotherapy												
1	O	Yes ^a	No	No	No	No (U)	37	0		Mean VAS decreased 8.5–3.4 (first injection) to 2.5 (second injection). Minimal or no improvement was noted in seven patients.	L	(+)
Dahir and Connell: chemical neurolysis												
1	O	Yes ^b	Yes	No	Yes	No (U)	8	0		At 6 months, three patients with complete pain relief, three with partial relief, and two with no relief. Mean VAS decreased 8–2 in six of the eight patients.	VL	(+)
Demircay <i>et al.</i> : radiofrequency thermocoagulation (RFT)												
1	O	No	No	No	Yes	No (U)	10	0		Mean visual numeric scale (VNS) 8.7 (± 0.67) to 2.1 (± 0.87) at 1 month to 2.9 (± 1.28) at 6 months. EQ-5D 4.4 (± 0.51) to 7.5 (± 1.08) at 1 month to 6.6 (± 1.26) at 6 months.	VL	(+)

A. Number of studies.

B. Design – RT: Randomized trial; O: Observational.

C. Limitations – No: No serious limitations; Yes: Serious. ^a Patients not blinded, short follow-up. ^b Cannot generalize due to patient population inclusions/exclusions.

D. Inconsistency – No: No serious inconsistency; Yes.

E. Indirectness – No: No serious indirectness; Yes.

F. Imprecision – No: No serious imprecision; Yes: small sample size.

G. Publication bias.

U: Undetected.

H. Number of treated patients.

I. Number of controls.

J. Absolute effect and 95% confidence interval.

K. Quality – H: High; M: Moderate; L: Low; VL: Very low.

L. Recommendation – (+): Weak for; (-): Weak against.

before reaching consensus. A summary of the combined patient demographics can be found in Table 2. Follow-up with patients occurred between 10 days to 9 months. Outcome measures used included: the visual analog scale (VAS),^{14,15,16,17,18} visual numeric scale (VNS),¹⁹ numeric pain rating scale (NPRS),²⁰ EQ-5D,¹⁹ McGill pain questionnaire,¹⁴ Nirschl pain phase scale,¹⁷ pain-free sitting time,¹⁵ infrared thermography (IRT),²⁰ Paris questionnaire,¹⁴ and Dallas pain questionnaire.¹⁴

Interventions presented in the studies included: intrarectal manipulation with massage,¹⁴ intrarectal manipulation with phonophoresis, transcutaneous electrical nerve stimulation (TENS), and analgesics,¹⁵ intrarectal manipulation with massage and diathermy,²⁰ steroid injection,¹⁸ dextrose prolotherapy,¹⁷ chemical neurolysis,¹⁶ and RFT of the ganglion impar.¹⁹

Manual interventions

Three studies examined manual interventions. Khatri *et al.*¹⁵ evaluated the use of intrarectal manipulation combined with phonophoresis and TENS versus

phonophoresis and TENS alone and found statistically significant improvement in VAS scores and pain-free sitting time for patients receiving intrarectal manipulation (Table 1). Maigne *et al.*¹⁴ evaluated the efficacy of intrarectal manipulation combined with levator ani massage compared to short-wave diathermy for chronic coccydynia using an individual global score. The global score summated the VAS, McGill pain questionnaire, Paris questionnaire, and the modified Dallas pain questionnaire. At the six-month follow-up they found that 22% of the patients in the manual therapy group versus 12% of patients in the control group experienced a good outcome, which was defined as decreased individual global score $\geq 50\%$ at 1 month and $\geq 60\%$ at 6 months. The authors identified several factors as being predictive of a good outcome following manual therapy including short duration of time between onset of pain and initiation of treatment, patients with post-traumatic coccydynia versus insidious onset, and patients with a stable coccyx. They stated that

Table 2 Patient characteristics, methods of diagnosis, and techniques to determine coccygeal mobility

Authors, year	Number of patients (% Females)	Age range	Mean age (\pm SD)	Cause of coccydynia (%)	Pain duration	Diagnosis technique	Mobility of coccyx
Maigne <i>et al.</i> , 2006	102 (45.1%)	25–70	45.2 (12.2)	Trauma (18%) unspecified (82%)	>2 months	Patient reported pain in or around coccyx without radiation. Pain present on sitting or going from sit to stand	Determined by intrarectal palpation and stress radiographs
Khatri <i>et al.</i> , 2011	36 (unclear)	20–55	31.06 (8.8)	Idiopathic (100%)	15 days–2 years	Not stated	Not determined
Wu <i>et al.</i> , 2009	53 (88.7%)	18–71	39.42 (12.8)	Trauma (79%) unspecified (21%)	>1 month	Patient reported pain and/or tenderness over coccyx, pain with manipulation	Determined by dynamic radiographs
Mitra <i>et al.</i> , 2007	14 (50%)	34–64	43	Trauma (58%) unspecified (42%)	<6 months in three subjects; >6 months in 11 subjects	Not stated	Not determined
Khan <i>et al.</i> , 2008	37 (62.2%)	Unknown	36	Idiopathic (100%)	>6 months	Not stated	Determined by dynamic standing and seated radiographs
Datir and Connell, 2010	8 (37.5%)	22–44	33.1 (7.7)	Trauma (100%)	>1 year	Clinical history, tenderness of coccyx and sacrococcygeal joint	Not determined
Demircay <i>et al.</i> , 2010	10 (80%)	22–77	49.2 (14.4)	Trauma (40%) Unspecified (60%)	>6 months	Tenderness over coccyx	Determined by lumbosacral radiographs and MRI

instability of the coccyx is present if stress radiographs show that the coccyx moved greater than 25° of flexion or 20° of extension when a patient is seated compared to a standing position. Wu *et al.*²⁰ assessed the patients' physiologic response before and after manual treatment combined with short-wave diathermy for coccydynia. They found significant differences in both the NPRS and surface temperature obtained by IRT at 12 weeks. There was a significant correlation between NPRS improvement and the surface temperature decrease. All three studies reported significant decreases in pain.

Injections

Three studies examined the efficacy of injections for the treatment of coccydynia. These studies focused on patients who had failed to respond to the use of donut cushions, NSAIDs, or other oral analgesics. Datir and Connell¹⁶ studied the effectiveness of a CT guided steroid injection to block the ganglion impar. They reported that 75% of patients had complete or partial pain relief at the six-month follow-up without needing additional pain management. Mitra *et al.*¹⁸ examined the use of fluoroscopic guided steroid injection for the treatment of coccyx pain. They reported that patients within the first 6 months from the onset of coccydynia responded better to the injection when compared to patients with longer duration of coccydynia, although their results were not significant. Khan *et al.*¹⁷ observed the effects of

dextrose prolotherapy for patients not responding to conservative interventions for greater than 6 months. The mean VAS score decreased from 8.5 to 2.5 after two injections. Two of these studies reported significant pain decreases with some form of injection.

Radiofrequency interventions

One study analyzed the use of RFT for coccydynia. Demircay *et al.*¹⁹ used RFT of the ganglion impar and had significant improvement in the VNS measures and EQ-5D scores at 6 months.

Discussion

The purpose of this systematic review was to compare and determine the effectiveness of various conservative intervention options in the management of coccydynia. To our knowledge, this review is the first of its kind to present and assess the conservative care of coccydynia. The evidence presented in this systematic review included seven papers that utilized the following treatment modalities: manual therapy,^{14,15,20} steroid injection,¹⁸ dextrose prolotherapy,¹⁷ chemical neurolysis of the ganglion impar,¹⁶ and RFT of the ganglion impar.¹⁹ The dearth of papers and their overall low levels of evidence did not allow us to determine the best conservative intervention option for coccydynia.

Three articles discussed in this review utilized manual therapy as part of their intervention for

coccydynia. Maigne *et al.*¹⁴ reported intrarectal manipulation had only mild effectiveness in the treatment of chronic coccydynia and tended to be more successful in patients with post-traumatic etiology, a stable coccyx, and shorter duration of symptoms (GRADE: moderate, weak recommendation for use). The investigators suggested that psychosocial factors might play a role in chronic coccydynia. Khatri *et al.*¹⁵ reported that intrarectal manipulation was effective for treating idiopathic coccydynia (GRADE: Moderate, weak recommendation for use). However, in their methods they did not adequately control for the use of analgesics, which threatens the validity of their conclusion. Wu *et al.*²⁰ used a combination of diathermy and manual therapy to treat coccydynia in the sub-acute and chronic stages (GRADE: low, weak recommendation for use). The lack of a control group and the combination of the treatment techniques in this study prevented an interpretation of the effectiveness of manual therapy alone for coccydynia. More research is necessary to determine the effectiveness and applicability of manual therapy in the treatment of coccydynia.

Three studies investigated the use of injections to treat coccydynia. Injections included in this systematic review utilized the following mechanisms of pain relief: anti-inflammatory effects,¹⁸ formation of scar tissue,¹⁷ and inhibition of the ganglion impar.¹⁶ Mitra *et al.*¹⁸ failed to obtain significant results in their study investigating steroid injection for coccydynia (GRADE: Very Low, weak recommendation against use). Owing to the lack of significance, small sample size, and short follow-up period, this paper was downgraded to a weak recommendation against use. Khan *et al.*¹⁷ studied dextrose prolotherapy, which was shown to be effective in patients with idiopathic coccydynia in cases when home programs had failed (GRADE: low, weak recommendation for use). This study demonstrated a large treatment effect (mean VAS improved from 8.5 to 2.5), however was limited by excluding the most common etiology, post-traumatic coccydynia. Datir and Connell¹⁶ showed decreased pain in chronic coccydynia with chemical neurolysis of the ganglion impar (GRADE: very low, weak recommendation for use). Failure to use standard interventions across patients and small sample size led to the evidence being downgraded. Etiology and duration of symptoms appear to be important indicators when determining the appropriate injection for the treatment of coccydynia.

Radiofrequency thermocoagulation is another option available for the treatment of coccydynia. Demircay *et al.*¹⁹ used RFT of the ganglion impar and had significant pain relief between pre-treatment and post-treatment VNS measures over an average

follow-up of 9.1 ± 1.2 months (GRADE: very low, weak recommendation for use). Owing to the small sample size, this paper was downgraded. Further research is required to determine if radiofrequency is a viable option for treating coccydynia.

It is important to note that in two studies the main objective was not to assess the treatment of coccydynia. Datir and Connell¹⁶ focused on the accuracy of CT guided steroid injection. Wu *et al.*²⁰ looked at the efficacy of IRT as an objective tool to measure improvement of coccydynia. However, both studies included coccygeal pain as an adjunct to their main objectives so their results were included in this systematic review. In both studies, the patients reported considerable pain relief.

When analyzing the demographics of the patients included in this review, detailed information was lacking. Only two studies collected data on body mass index (BMI).^{14,15} Maigne *et al.*⁴ stated that a high BMI is correlated with coccydynia. In addition, none of the studies included data on comorbidities of the patients, such as diabetes, which may affect the healing process.²¹ Including more specific patient demographics would help clinicians to determine if these interventions would be appropriate for their patients. It has been reported that coccydynia occurs in females five times more than in males,² however, this ratio was not present in the studies we reviewed. Due to the large number of males included in these studies, the generalizability of the results to a predominantly female population may be limited. Two studies^{15,17} only included patients whose coccydynia was of idiopathic origin. However, this inclusion criterion excluded the most common etiologies of coccydynia, which are reported to be post-traumatic and post-delivery.^{1,4}

We were particularly interested in the effects of manual therapy on coccydynia. Each paper that investigated manual therapy in this review utilized a different technique limiting our ability to compare results (Table 3). Two investigators performed manipulation in the sagittal plane^{14,20} while one chose to manipulate the coccyx in the coronal plane.¹⁵ Inconsistencies were also noted in frequency and duration of treatment highlighting the need for further research to determine the optimal treatment approach. Two studies included massage to the levator ani as part of the manual therapy provided,^{14,20} however, the role of the levator ani muscle in coccydynia is an area for further research. In only one study was intrarectal manipulation performed by a physiotherapist¹⁷, demonstrating a need for further research to be conducted by physical therapists in the treatment of coccydynia. The role of manual therapy in treating coccydynia is unknown at this time due to a lack of evidence.

Table 3 Manual techniques utilized in the accepted studies

Author	Description of manual technique	Healthcare provider	Frequency and duration
Maigne <i>et al.</i>	Coccyges non-mobile/displaced in flexion: strong levator ani stretching and mobilization into extension OR. Coccyges displaced into extension: slight levator ani stretching without mobilization AND Tender levator ani musculature upon palpation: additional massage	Physician (MD)	Three five-minute sessions over a 10-day period with gradual increase in intensity
Khatri <i>et al.</i>	Index finger of the right hand inserted into the anal passage on the anterior surface of the coccyx Left thumb placed on dorsum of coccyx to provide a good grasp Coccyx distracted along its long axis for initial treatments Attempt to correct alignment of coccyx using force in the coronal plane in subsequent treatments	Physiotherapist	10 successive days, treatment length unspecified
Wu <i>et al.</i>	Patient placed in prone Massage performed in lateroposterior direction of the levator ani Palmar surface of right index finger placed against the inferior aspect of the anterior sacral surface to maintain coccyx hyperextension Left hand placed on the superior aspect of the posterior sacrum and used to apply a firm progressive pressure for 20–30 seconds	Physician (MD)	Massage 3 minutes per session; manipulation performed with increasing intensity 2 × weekly for 2 weeks 1 × weekly for 2 weeks 1 × biweekly if pain persisted until eighth week.

Future research to determine the source(s) of pain in patients with coccydynia more specifically would be helpful. If more accurate diagnostic and clinical tools existed to determine the source of pain, then more specific interventions could possibly be used to remedy the condition. The literature in this review revealed varied methods of arriving at a diagnosis of coccydynia. This finding further reinforces the need for future research to establish clinical decision-making guidelines in making this diagnosis. Future research should also focus on the role of the physical therapist as a health care provider in making the diagnosis and rendering treatment for this condition. Another area for research may be to gain a better understanding of the type of coccyx³ and stability of the coccyx,⁴ as this may help guide the clinician in choosing the most appropriate intervention. Treatments utilized for coccydynia make double blinding difficult, however future studies should include well designed RCTs and cohort-controlled studies to better elucidate the best treatment options for coccydynia. Furthermore, future studies should include more detailed patient demographics (BMI, balance ability, activity level, comorbidities, acute versus chronic), larger sample sizes, standardized outcome measures including function, and longer follow-up periods.

Limitations

This review was limited to articles in English and published from 2002–2012. Papers may have been missed due to these search criteria. In addition, papers related to conservative care may have been overlooked if surgery was included as an intervention since this also was an exclusion criterion.

Furthermore, our review of conservative care for coccydynia was limited by the dearth of evidence available. Only two RCTs were located in our search. In some of the studies suboptimal methods were utilized that made the results questionable. The relative small sample sizes used in most studies do not allow the results to be generalized to other populations. It was also not possible to compare results between studies due to the heterogeneity of the outcome measures used. In general, there was a lack of functional outcomes utilized in the reviewed papers. Another concern was the lack of a standardized method for making the diagnosis of coccydynia.

Conclusion

This systematic review of the literature revealed a lack of evidence supporting conservative interventions for coccydynia. We were unable to determine the most effective conservative interventions due to the low quality of evidence and the lack of studies in general on this topic. Based on the seven papers reviewed, there are various conservative interventions that may be helpful in reducing pain experienced with coccydynia but more research is needed. Future research should include RCTs to clarify diagnostic criteria, determine the effect of coccydynia on function, and the effectiveness of conservative interventions for coccydynia.

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