Coccyx Dysfunction: A clinical profile for Coccydynia & Chronic Pelvic Pain
by
Chris Kemper, D.C., Jim Wooley, D.C.

Introduction

Chronic sacrococcygeal (SC) dysfunction, generally referred to as coccydynia, is a common disorder usually associated with Pratt falls, prolonged sitting or as a complication of childbirth. It lies within the larger category of chronic pelvic pain (CPP) that is estimated to affect nearly 40% of reproductive-aged women(1). Of the 65 or more known causes of CPP, coccyx dysfunction could play an important role. While a common condition, SC dysfunction remains poorly understood, due to its complex neuromusculoskeletal function within the pelvis, multifactor pathophysiology and complex natural history. Despite the many conservative and invasive interventions available, a lack of consensus persists regarding normal vs. abnormal coccygeal function.

Chris Kemper, D.C.

Treatments directed toward the coccyx remains almost exclusively pain-based with little or no objective assessment of function guiding the selection of interventions. The only objective clinical data found in the literature was that derived from imaging studies. A 2003 study, published in a pain journal(2) sums up a general sentiment among diagnosticians regarding coccyx pain that persists today; “In spite of advances in the treatment of other pain conditions, coccygodynia remains in a position for which therapeutic options are not clearly designed”.

The purpose of this paper is to offer a rationale for adding to the effectiveness of interventions already utilized in the treatment of coccydynia by introducing a group of objective clinical signs of impairment not previously associated with coccydynia or chronic pelvic pain (CPP). The term sacrococcygeal (SC) syndrome is offered by the authors, who in a 1998 paper(3) and a 2006 book(4) hypothesized that the coccyx could be a multifactoral source of pain consisting of three key objective clinical signs suggestive of coccygeal pathomechanics including: 1) coccygeal mobility <30 degrees 2) impaired lumbopelvic flexion or straight leg raise sign (SLR) and 3) impaired strength of muscles with S1-S5/C1’ levels.

This pathological profile, herein respectfully referred to as the SC syndrome, is both clearly objective and highly responsive to intervention, specifically manipulation where hypomobile coccyges are provoked back into dynamic motion > 30 degrees. The syndrome’s signature profile could also provide insight into other named conditions currently grouped into the large and general category of CPP.

Review of literature

Several articles and studies were found describing various treatments that were successful in reducing or eliminating coccygeal pain. Interestingly, interventions and conclusions drawn from their studies were vastly different, even opposite. Examples include: authors stating coccydynia is rare(5) versus authors referring to coccydynia as common(6); Cryotherapy versus radio-frequency abalation; anti-inflammatory versus inflammatory solutions(7); imaging indicating normal SC motion of 21-38 degrees(8) versus an imaging study indicating abnormal motion of 25 degrees(9); Nerve blocks(5) versus electrical nerve stimulation; traumatic coccydynia group with 48-degree intercoccygeal angles versus a group of asymptomatic patients in the same study with 52-degree intercoccygeal angles(10).

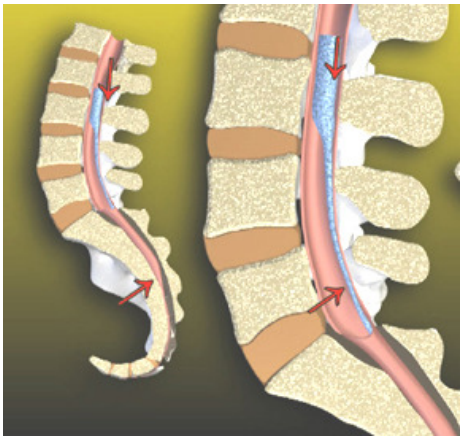


Fig. 1. Frame from an animation illustrating hypothesized affect a dysfunctional coccyx may have on the cord and thecal sac.

In defense of this last cited study was the fact that the more chronic idiopathic coccydynia group, averaging 72-degrees of intercoccygeal angulation, responded most favorably to conservative treatment, with 92% of subjects improving. This finding may support Kemper and Wooley’s downward “tug-affect” hypothesis where coccygeal angulation is suspected to exert a downward tension on the cord and thecum (Fig. 1.) possibly explaining how the SC syndrome may be an important etiology in both coccydynia and CPP.

Most studies indicated that conservative options were performed(5,6,10) yet only two could be found that included medicine-assisted manipulation of the coccyx as a conservative intervention in groups of 40 or more subjects(11,12). Both studies achieved statistically significant long-term results for chronic low back pain and coccydynia, respectively. Unfortunately, neither study published what objective clinical signs may have accompanied their outcomes.

Pertinent questions:

1. Is coccydynia usually accompanied by impaired coccygeal function?
2. What is normal coccygeal function?
3. What objective clinical signs are associated with coccyx dysfunction?
4. What interventions assess both coccygeal pain and coccygeal function?
5. Can coccygeal dysfunction contribute to chronic pelvic pain (CPP)?

Review of Anatomy

Spine physicians are familiar with regional pelvic anatomy enabling an abbreviated summary herein. The proximal or sacrococcygeal joint is usually comprised of a well-defined disc-like joint space with annular capsule(13). The 2nd coccygeal joint space can also include synovial joints and more or less well-developed disc spaces. More distal coccygeal joints may also have well-defined disc spaces or may have lesser developed fibrocartilaginous structures like that of syndesmoses. Regardless of a given individual morphology, most coccyges are comprised of several joints which explains why they are prone to displace, angulate, hook or dislocate as a result of trauma.

The anterior aspect of the coccyx serves as the attachment of the levator ani, coccygeus, iliococcygeus, and pubococcygeus. Through the anococcygeal raphé, the coccyx supports the position of the anus. Attached to the posterior side is gluteus maximus which extends the thigh during ambulation. The anterior and posterior sacrococcygeal ligaments are the continuations of the anterior and posterior longitudinal ligaments. These musculoligamentous structures are directly affected to varying degrees by coccygeal dysfunction, particularly when severe angulation affects the shape and function of the pelvic floor.

The pelvic floor is richly innervated with the pudendal nerve being comprised of the sacral 2-4 nerves with branches to the sphincters and external genitalia. The impar ganglion is formed by the union of sympathetic chain ganglia that unite below the sacral foramen. Both the pudendal nerve and the ganglion impar are sometimes effectively treated with various injection techniques. Gray describes the attachment of the filum terminale externum to the dorsal aspect of the first coccygeal segment(13). The proposed SC syndrome includes dural stretch signs not previously associated with coccyx dysfunction. (Fig. 1 Ana)

Normal sacrococcygeal function: A normal coccyx is capable of 30-90 degrees of combined flexion and extension in women and 30-50 degrees in men (Fig. 2). These estimates are based on the experience of the authors who collectively have performed an estimated 5,000 examinations and procedures over a 25-year period. In order to fully assess coccygeal motion a firm bi-digital prying motion is recommended, keeping individual morphology in mind. For example: a tall, slender female's coccyx can easily be provoked into 30-90 degrees of motion with just a few pounds of pressure. Whereas a short, muscular male will typically require a very firm degree of pressure to elicit 30-degrees of normal motion. When coccygeal range of motion is increased to >30 degrees, lumbopelvic flexion and SLR tend to return to 90-degrees in most patients. (Fig. 3a-b.) In addtion, motor strength of internal and external thigh rotators, hamstring and gluteal will be 5/5 scale bilaterally, absent nerve root compression syndrome.

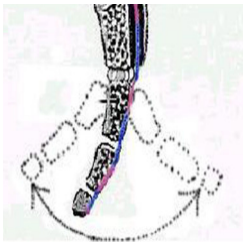


Fig. 2. 30-90 degrees of coccygeal motion thought to be normal for women of child bearing years.

Abnormal Sacrococcygeal function:

The vast majority of coccydynia seen by the authors was accompanied by coccygeal hypo-mobility resulting from trauma where coccygeal motion was lost secondary to displacement, angulation or ligament sprain. Generally, the longer the history of coccydynia, particularly when hypomobility is present, the more joint adhesions and fusing occurs, as is the case of any joint injury where motion is not gradually reintroduced during the healing process. The authors estimate that coccygeal hypomobility is about 50 times more common than coccygeal hypermobility. While cases of true hypermobility may require surgery, many have been successfully stabilized with proliferant solutions (6).

The SacroCoccygeal syndrome includes:

1. History or evidence of coccygeal trauma, with or without coccydynia
2. Coccygeal motion <30 degrees
3. Motor weakness of the internal and/or external thigh rotators.
4. Trunk flexion or SLR < 90 degrees

Fig. 3a. SLR prior to treatment of the dysfunctional coccyx.

Fig. 3b. SLR improved after a severely hypomobile coccyx was treated.

Clinical

Manipulation of the coccyx in treatment of the SC syndrome

Pre-Post procedure Therapy

This procedure is always preceded and followed by 6-12 deep, myofascial massage and stretching sessions, over at least a 2-week period or until a point of diminishing return in trunk flexion and SLR is achieved. We recommend targeting the lower spine, buttocks and hamstrings with a low-speed, high-amplitude vibrator, to patient tolerance. Patients are also always given abdominal strengthening exercises as well as lumbar and hamstring stretching routines, carefully designed to patient tolerance. Values in pre and post-therapy trunk flexion, SLR and motor strength are always recorded to establish a functional baseline before intervention.

Anesthesia/Sedation

Treatment of the SC syndrome usually requires an anesthetic in one form or another. The choice of anesthetic is based on the patient's level of pain, anxiety, severity of coccygeal hypomobility and the profile of symptoms. Intra-articular and peri-coccygeal infusion of steroid and anesthetic is used in most cases, as it helps break up coccygeal adhesions while providing a measure of comfort. The next
most common anesthetics used targets patients where anxiety and loss of lumbopelvic and thigh flexion is prominent. In these cases I.V. Fentanyl or Demerol and Versed is the cocktail of choice. Patients with concomitant, non-surgical, broad-based lumbar disc bulging, with bilateral hip or leg pain, receive caudal anesthetic, combined with a local. Similarly, patients with non-surgical nerve root compression and SC syndrome-related symptoms receive level-specific epidurals, also combined with local anesthetic as logically dictated.

Fig. 6. Painful limited trunk flexion (left) before coccyx motion was increased. 45-degree increase (right) immediately following treatment.

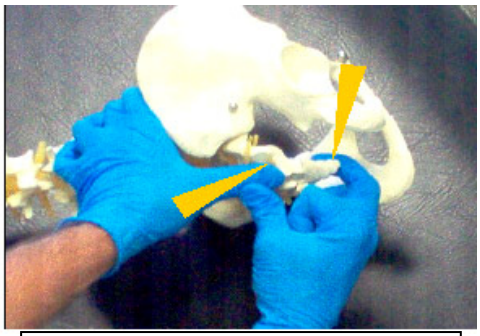


Fig. 5. Bi-digital pressure-counter pressure Kemper & Wooley use to provoke 30-90 degrees of coccygeal motion.

Once the patient is comfortably prepared, a firm internal rectal grip upon the anterior surface of the coccyx is made with a gloved 3rd digit. The internal contact digit must be adequately padded with cloth tape such that each joint of the physician's treating finger is securely stabilized into a hooked

position (Fig. 4) to create a semi-rigid "tool" with which to overcome the displaced and/or motion-limited coccyx. In larger or heavier individuals, the hand and wrist may also be strapped to further increase stability. While tapping is important for effectiveness, it

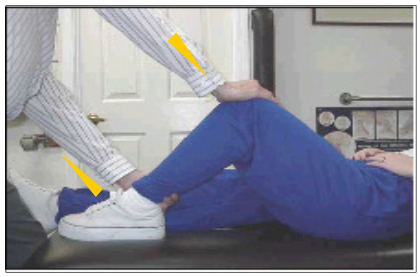
Fig. 4. One inch cloth tape enabling safe and effective internal contact with the dysfunctional coccyx.

is critical for safety. The 1" cloth tape creates a non-skid layer that also rounds off any boney protuberances of the palmar surface of the physician's phalanx, effectively protecting the patient and physician from a rectal lining or glove tear, respectively. An external contact is made with the thumb of the opposite hand just above the coccygeal joint being manipulated (Fig. 5). This creates a pivot point and increases leverage necessary to overcome the most stubborn coccyx.

With the patient laying on their side a firm, slow, repetitive, prying-like motion is applied with a specific anterior to posterior and superior to inferior traction. This specific treatment is applied emphasizing extension of the coccygeal joints, not flexion. The procedure, generally referred to as a "manipulation", is decidedly not a "thrust" like that necessary for safe and effective chiropractic manipulations of other spinal levels. The reason for the slow prying-like maneuver is two fold: the first is to reduce the chances of a rectal lining tear and the second is to insure that coccygeal extension is fully restored to an optimal degree.

While the physician manipulates the displaced or otherwise restricted coccyx the patient is guided through three lateral decubitus positions with the aid of two assistants; neutral, full fetal flexion and full extension. The patient is first manipulated while in the neutral, then while flexed and finally while extended. Considerable care should be taken to achieve full head, neck, spine and thigh range of motion during manipulation to aid in release of adhesions at the coccyx and possibly within the spinal canal itself. The patient is firmly flexed or extended, as a collective effort, in unison with and as directed by the physician.

Fig. 7. (Above) Testing strength of the left external thigh rotator.
(Below) Testing strength of the left hamstring.



Key clinical indicators of improvement when SC syndrome is relieved

1. Palpable increase in pelvic floor distention
2. Progressive increase in lumbopelvic flexion and SLR above 90 degrees (Fig. 6.)
3. Immediate increase in motor strength of internal & external thigh rotators(14) (Fig. 7.).

Intervention Priority, listed conservative to invasive

1. Physical therapy, Pelvic manipulation, deep tissue massage, myofascial stretching, therapeutic exercise, weight loss, ergonomics counseling.
2. Therapeutic injections of peri and intra-coccygeal structures, coupled with manipulation of the hypomobile coccyx per Wooley-Kemper procedural guidelines (intact hypermobile coccyges may be stabilized with Prolotherapy)
3. Pudendal nerve and Ganglion blocks.
4. Continuous or pulsed radiofrequency (CRF), (PRF), Cryotherapy.
5. Surgery, in true cases of coccygeal fragmentation or exostotic spicules.

Ethical considerations:

1. Since hypomobile, anteverted coccyges require an internal-rectal contact, and very firm manipulation, colorectal health must be assessed prior to intervention.
2. While initially counterintuitive, most occurrences of "SacroCoccygeal" syndrome involve little, if any, coccydynia. For this reason, the authors recommend that any intervention upon the coccyx, to address the syndrome's clear clinical components (loss of coccygeal motion, impaired lumbopelvic flexion & internal and/or external thigh rotation), be preceded by full disclosure and patient education. Even with these precautions, until further research confirms the author's hypothesis regarding coccyx-induced dural tension and its proposed symptomatology, each physician carefully consider the patient's determination to cooperate and psychological profile.
3. Pursuant to #2, perhaps the most important feature of the S/C syndrome, according to the authors, is its neurological (motor weakness) affects. And while pathological loss of lumbopelvic range of motion, in cases of full-blown SacroCoccygeal syndromes is impressive, an international consensus of "normal range of motion" has not been reached.
4. Lastly, to be safe, if not conservative, the above aforementioned treatment protocol should not be performed unless the patient is well-informed and each of the syndrome's features are documented clearly.

Summary

The term "Coccydynia" is literally a named condition without a clear objective diagnostic profile. Many interventions claim good to excellent outcomes based on subjective instruments such as visual analogue scales (VAS) or numeric pain scale (NPS). However, most of the published studies lack regional objective clinical data. Perhaps if subjects with coccydynia were assessed objectively the efficacy of the various standard-of-care interventions could many interventions could be better assessed, not just for relief of localized pain, but for a wider group of pelvic neuromusculoskeletal conditions, diseases and syndromes.

More research is needed to observe each of the SC syndrome's components, the cited intervention and its claimed effectiveness.

References

1. Mathias SD, Kuppermann M, Liberman RF, et al. Chronic pelvic pain: prevalence, health-related quality of life, and economic correlates. Obstet Gynecol 1996;87(3):321-7.
2. Andres J, Chaves S. Coccygodynia: a proposal for an algorithm for treatment. The Journal of Pain. June 2003; Vol. 4. Issue 5:pp257-66.
3. Wooley J, Kemper C. Hypothesis: Is sacrococcygeal hypomobility related to chronic low back pain and stiffness. J orthopaedic medicine 1998; 20:17-20.
4. Kemper C. Tailbone Pain 911: The most under diagnosed cause of chronic low back pain. CreateBooks, Calgary. 2006.
5. Mitra R, Cheung L, Perry P. Efficacy of fluoroscopically guided steroid injections in the management of coccydynia. Pain Physician 2007; 10(6):775-8 (ISSN: 1533-3159).
6. Maigne JY, Tamalet B. Standardized Radiographic Protocol for the study of common coccygodynia and characteristics of lesions observed in the sitting position. Spine 1996;vol.21 No22:pp 2588-93.
7. Kahn S, Kumar a, Varshney V. Dextrose prolotherapy for recalcitrant coccygodynia. J of Orthopaedic Surgery 2008;16(1):27-9.
8. Grassi R, Lombardi G et al. Coccygeal movement: Assessment with dynamic MRI. European J of Radiology. 2007. Vol.61;Issue 3:pp473-79.
9. Maigne J, Guedj S, Straus C. Idiopathic coccygodynia. Spine 1994;vol 19 No8:pp930-34.
10. Kim N, Suk K. Clinical and radiological differences between traumatic and idiopathic coccygodynia. Yonsei Med J, 1999 Jun, 40:3, 215-20.
11. Kohlbeck FJ, Haldeman S, Hurwitz E, Dagenais S. Supplemental Care with Medicine-Assisted Manipulation Versus Spinal Manipulation With Chronic Low Back Pain. J Manipulative Physiol Ther 2005: 245-52.
12. Wray C, Easom S, Hoskinson. Coccydynia: Aetiology and Treatment. J Bone and Joint Surgery (Br) 1991; 73-B:335-8.
13. Grays Anatomy. Williams and Warwick, 36th Ed: 1980 P.864-65.
14. Kemper C. Testing for optimal motor output: Can an examiner identify normal versus a graded deficit if the subject's "normal" exceeds the examiner's resistance? Under final review prior to submission for publication consideration.