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Coccydynia: A Literature Review of Its Anatomy, Etiology, Presentation, Diagnosis, and Treatment

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Abstract

Purpose: This literature review is intended to provide oversight on the anatomy, incidence, etiology, presentation, diagnosis, and treatment of coccydynia. Relevant articles were retrieved with PubMed using keywords such as "coccydynia", "coccyx", "coccyx pain", and "coccygectomy".

Methods: Literature accumulated for this study was accumulated from PubMed using sources dating back to 1859. All sources were read thoroughly, compared, and combined to form this study. Images were also added from three separate sources to aid in the understanding of the coccyx and coccydynia. Focal points of this study included the anatomy of the coccyx, etiology and presentation of coccydynia, how to properly diagnose coccydynia, and possible treatments for the variety of etiologies.

Results: The coccyx morphology is defined using different methods by different authors as presented in this study. There is no conclusive quantitative data on the incidence of coccydynia; however, there are important factors that lead to increased risk of coccydynia such as obesity, age, and female gender. Injury to the coccyx or coccygeal joints with surrounding tissue inflammation and contraction of the muscles attached to the coccyx causes coccydynia. Diagnosis is made predominantly in clinical examinations with static standard radiographs, CT, and routine blood tests. Treatment options include conservative care, physical therapy, intrarectal massage and manipulation, sacrococcygeal injections (including ganglion impar block), and coccygectomy.

Conclusions: Many cases are resolved with conservative treatments, despite the wide array of etiologies for the diagnosis. In more extreme cases, physician intervention requires a multidisciplinary approach. Surgical treatment is used as a last resort.

Introduction

Coccydynia, or coccygodynia, is pain and discomfort arising from the most inferior part of the vertebral column [1]. The vertebral column is divided into five parts; cervical, thoracic, lumbar, sacral, and coccygeal (in descending order). Coccygeal pain can be due to many different etiologies. Variability in etiology of coccydynia also correlates to the amount of treatments available, from conservative supportive treatments to advanced treatments involving surgery [1]. This literature review is intended to provide oversight on the anatomy, incidence, etiology, presentation, diagnosis, and treatment of coccydynia. Relevant articles were retrieved with PubMed using keywords such as "coccydynia", "coccyx", "coccyx pain", and "coccygectomy".

Anatomy and Function of the Coccyx

The coccyx is a fractional percentage of the vertebral column in relation to total surface area and total weight [2]. It is made of three to five horizontal segments, with the overall shape resembling a triangle that is facing downward [3]. The most superior segment articulates with the inferior part of the sacral vertebrae [3]. The lateral surfaces of the coccyx serve as attachment points for many tendons and ligaments, notably the coccygeal muscles, parts of the gluteus maximus muscle tendon, and the sacrospinous ligament [1,2]. Ventrally, the coccyx is bordered by muscles and ligaments of the pelvic floor [1]. A prominent muscle of the pelvic floor, the levator ani, inserts into the inferior tip of the coccyx as the

iliococcygeus tendon [1,2]. This aids in pelvic floor support, which contributes to voluntary bowel control [1].

The first coccygeal segment is the largest and has transverse processes which may articulate or fuse with the sacrum. It is often separate from the progressively smaller caudal coccygeal vertebrae. Dorsally, the coccygeal cornua, which are vestigial articular processes, mark the inferior boundary of the sacral hiatus as they articulate with the sacral cornua [1-2]. It has very little movement, and the normal range of motion is approximately 13 degrees [1,5] (Figure 1).

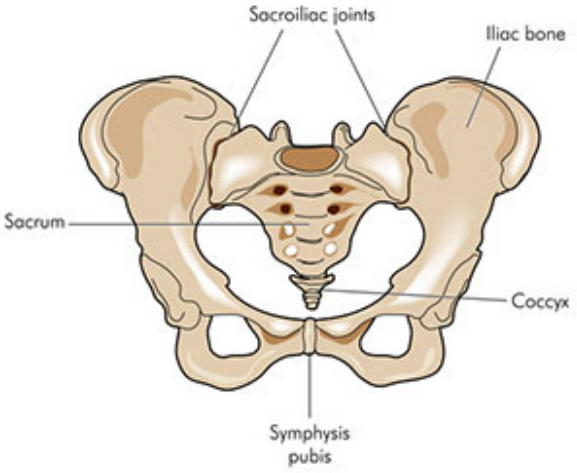

Figure 1: Image of the Coccyx [4].

Flexion of the coccyx is usually produced by the contractions of the levator ani muscles, while extension is mostly passive [2]. It is important to note that if excessive movement occurs, that is a sign of abnormality within the coccyx. The primary function of the coccyx is to act as a shock absorber when sitting, providing weight bearing support [1]. The coccyx bears more weight when a person is sitting or leaning backwards versus leaning forward [1].

The coccygeal ligament, also referred to as the filum terminal extremum, is the continuation of the spinal dura beyond the termination of the dural sac at the second sacral vertebrae [2]. Distally, it fuses with the periosteum of the dorsal aspect of the coccyx [2]. Its termination may be marked by a post anal pit and it inserts into the first coccygeal segment [2].

The coccyx has been classified before by different groups of authors based on its radiographic appearance, as shown in the table below [3-8] (Figures 2 and 3).

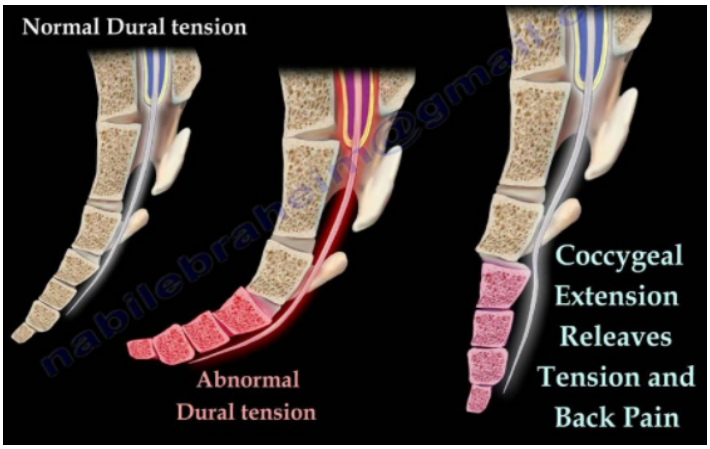

Figure 2: Movement of the Coccyx [6].

Authors and classifications	
Postacchini and Massobrio	
Type	Coccygeal morphology
Type 1	Coccyx is moderately curved forward
Type 2	Coccyx is markedly curved with the apex curved forward
Type 3	Coccyx is sharply angulated forward at the level of the sacrococcygeal joint
Type 4	Coccyx is subluxated at the sacrococcygeal/intercoccygeal joint
Type 5	Coccygeal retroversion with spicule
Type 6	Scoliotic deformity
Maigne	
Type	Coccygeal morphology
Type 1	Coccyx is curving more than 25 degrees
Type 2	Coccyx is displaced or subluxed posteriorly
Type 3	Coccyx is immobile with a spicule on the dorsal surface of the last coccygeal segment

Figure 3: Radiographic Classifications of the Coccyx.

Incidence and Etiology of Coccydynia

There is no conclusive quantitative data on the incidence of coccydynia; however, there are important factors that lead to increased risk of coccydynia such as obesity [1-5]. Obesity is defined as a BMI over 27.4 in women and 29.4 in men; people that are obese are more likely to have unstable movement of the coccyx due to lesser degrees of pelvic rotation (<30°), which leads to steeper angles between the coccyx and the seat in which the person is sitting [5]. Pelvic rotation is defined as the clockwise or counter clockwise movement of the pelvis on an axial plane. When obese individuals attempt to sit down, the coccyx tends to jut out posteriorly because of inadequate sagittal pelvic rotation [3-5]. This results in increased exposure to the intrapelvic pressure that develops during the act of sitting or during a fall, resulting in subluxation of the coccyx [3,5]. In other words, obesity leads to hypermobility of the coccyx, which can lead to coccydynia [5-9].

Additionally, age is another risk factor as adults are more likely to present with coccydynia than adolescents [1-10]. This is because adolescents have reduced abnormal mobility and more commonly have spicules than adults [10]. Spicules are small bony outgrowths on the dorsal aspect of the tip of the coccyx and most commonly seen in patients with immobile coccyges [5]. Being female gender were also found to be a risk factor for coccydynia, as they have specific sex-related anatomic features [11]. This includes slender females having little subcutaneous fat and coccyx is not as protected; the greater sciatic notch in females is wider and this contributes to backward inclination of the coccyx leaving it more susceptible to injury; females have a greater inter-ischial tuberosity distance which increases the pressure to the coccyx [11]. The most frequent causes of coccyx pain include falling backward or on the buttocks, fracture or dislocation due to trauma, pregnancy, infection, chordoma (a rare form of malignant cancer), and idiopathic causes [7-9].

Injury to the coccyx or coccygeal joints with surrounding tissue inflammation and contraction of the muscles attached to the coccyx causes coccydynia [3-12]. The pain can either arises from the coccyx itself, is referred to the coccyx, or is neurogenic in origin [13]. Direct trauma can include falling on the buttocks or falling backwards, prolonged sitting on a hard or narrow surface, or sexual intercourse [1-9]. Indirect trauma includes vaginal childbirth, recent lumbar spinal surgery, rectal surgery, or epidural injections [8]. In 1950, Schapiro described this disorder as "television disease", because of poor postural adaption due to sitting awkwardly [3-14]. Internally, irritation of the sacral sympathetic chain called the ganglion impar, which is located in between the sacrum and the posterior wall of the rectum, can cause sacrococcygeal dysfunctional pain [15]. Compressions of the ganglion impar have also been reported in patients with anterior dislocation of the coccyx [15].

In studies found, Maigne, et al. reported that 36 of 51 patients had a history of direct trauma [16]. Pennekamp et al. reported 8 out of 16 patients with pain due to direct trauma, with the other 8 patients having idiopathic coccydynia [17]. Awwad et al. reported 34 out of 70 patients (16 female and 18 males) with coccydynia because of direct trauma, 14 female patients with indirect trauma due to childbirth, and 22 female patients with idiopathic trauma [9].

Presentation and Diagnosis of Coccydynia

Classical presentation of coccydynia is associated with pain, tenderness, or an ache localized in the region of the lower sacrum, the coccyx, or in adjacent muscles and soft tissues [1-18]. The pain becomes sharp during periods of sitting, when getting up from a sitting position, during sexual intercourse, defecation, and menstruation in females [1-3]. The severity of the pain is dependent on various predisposing factors, such as the duration of time spent sitting [3-18]. The character of the pain appears to be more related to spasms of the levator muscle, coccygeus muscle, and in the medial fibers of the gluteus maximus muscle [18].

Diagnosis is made predominantly in clinical examinations with static standard radiographs, CT, and routine blood tests [3]. Blood tests showed no abnormalities except in the presence of tumors or infection [3]. Causes of coccyx pain such as infections, masses, and tumors should be ruled out in every case [1]. Maigne et al. described a method of assessing coccygeal mobility based on comparisons of dynamic and static lateral radiographs with the patients hips flexed and extension of the spine while they sat on a hard surface [3-16]. The films were superimposed and the angles of sagittal pelvic rotation (measured based on the pivot angle made when the radiographs were superimposed), angle of mobility (difference between the tips of the coccygeal segments in the two radiographs), and the angle of incidence (measured angle at which the coccyx stuck the seat surface) were calculated [3-16].

Certain types of MRI are useful is determining coccydynia. Static MRI failed to identify the cause of coccydynia as this is a dynamic disorder [3]. However, dynamic MRI showed the coccyx is mobile during defecation and it is possible to demonstrate coccygeal excursions by determining the changes in position from maximum contraction and straining-evacuation (Figure 4) [3-20].

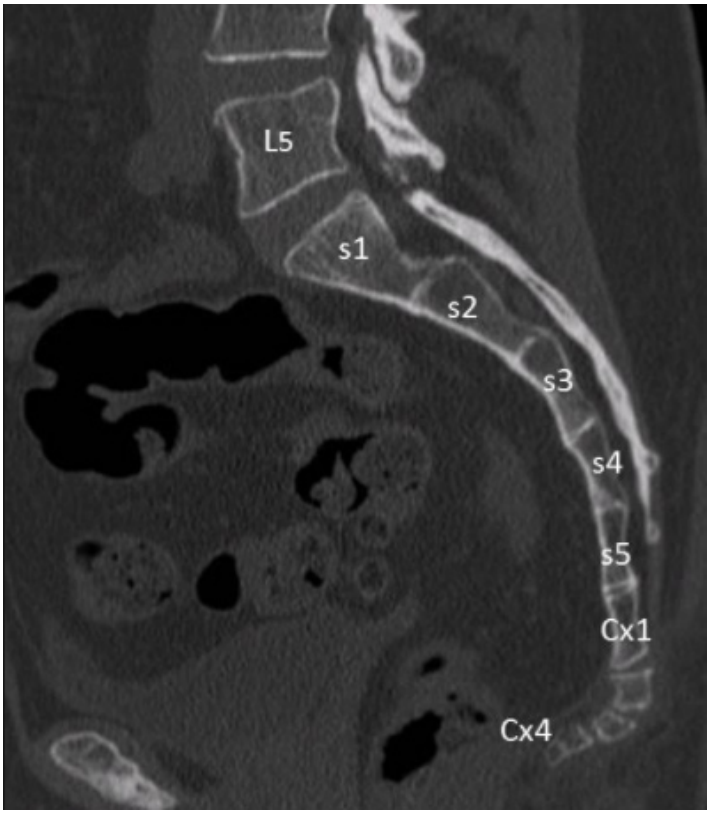

Figure 4: CT of the sacrum and coccyx in a sagittal view [19].

Treatment

Coccydynia can usually be treated conservatively as it usually resolves on its own within a few weeks or months. Conservative treatment is successful in 90% of coccyx pain cases, with many resolving without medical treatment [1-21]. This conservative treatment includes use of laxatives, non-steroidal anti-inflammatory medications, hot baths, use of ring shaped cushions, massage, corticosteroid injections, radiotherapy, and psychotherapy [21]. Other treatment options for coccydynia if conservative methods do not relieve pain include physical therapy, intrarectal massage and manipulation, sacrococcygeal injections (including ganglion impart block), and coccygectomy [3].

There are many modalities involved in physical therapy treatment for coccydynia. Shortwave Diathermy (SWD) is used to relieve pain and muscles spasms in inflammatory tissue by providing heat to deep muscle tissue [22]. It has been shown to help patients with coccydynia [23]. Interferential Current (IFC) is another form of therapy that has shown to reduce inflammation and low back pain [22]. More Recently, Extracorporeal Shock Wave Therapy (ESWT) has been suggested for non-invasive treatment of musculoskeletal conditions [22]. Its effectiveness can be attributed to stimulation analgesia and increased tissue regeneration [22]. It has been shown relieve pain from coccydynia and is recommended as an alternative method for patients with the ailment [22].

Bimanual coccyx manipulation would include massaging the muscles attached to the coccyx to help ease the pain [1]. This is done under anesthesia or heavy sedation with local injection of anesthesia and a steroid such as bupivacaine 0.5% and 40 mg of methylprednisone, respectively) [9]. This method allows surgeons to identify the source of coccygeal instability [9]. Coccyx manipulation provides good outcomes to as high as 85% of cases [11].

Ganglion impar injections can be a safe and effective for treating coccydynia [24]. It is performed via a transsacrococcygeal approach using a 22-gauge spinal needle along with fluoroscopy [25,26]. Either the prone or lateral decubitus position can be chosen for this approach [26]. Blood pressure, heart rate, and pulse oximetry are monitored throughout the procedure [26]. The site of needle insertion is located by palpating the sacral cornua [27]. The needle is then advanced through the vertebral disc until the tip is placed anterior to the ventral sacrococcygeal ligament, felt using a loss in resistance [27]. Its position is confirmed via a "reverse comma" appearance when seen in lateral radiograph views after injection of a radio opaque dye into the retroperitoneal space [27]. In clinical studies done by Toshniwal et al. and Sagir et al. a total of 24 patients with coccydynia that were given ganglion impar injections showed adequate pain relief without any complications in the proceeding short term [25-27].

Removal of the coccyx via surgical intervention is used when all other treatment options have not provided the patient adequate relief [1-3].

There are two common types of coccygectomy procedures: Key's and Gardner's [11]. Key's method for coccygectomy has relatively provided better results for patients, and is more commonly used [11]. This method utilizes general anesthesia and better minimizes wound complications via preoperative bowel preparations and intravenous antibiotics [8]. During the procedure, the patient is positioned to lay on their stomach and their buttock is laterally retracted [8]. Using fluoroscopy to properly identify the coccyx, a midline vertical incision is made over the bone and it is circumferentially separated from surrounding tissue using unipolar electrocautery [8]. The procedure is completed via surgical resection of the coccyx in a rostral-caudal manner [8].

Current literature shows that coccygectomy yields high percentage of success with complications such as rectal injury, sphincter injury, and incontinence rarely reported [3]. Kwon et al. accumulated 28 case series from 1980 to 2012 totaling 742 patients that underwent coccygectomy [8]. 592 of the patients were females, and only 64 of the patients (10%), had an occurrence of infection after the procedure [8]. 84% of the patients reported good to excellent outcomes after coccygectomy [8].

Conclusion

Coccydynia is a mildly debilitating condition. Most cases can be can be resolved with supportive treatments. However, If the condition progresses than physician intervention is suggested. This

intervention can rely on a multitude of approaches, ranging from medications manual therapy. Surgical treatment, while proven to have high success rates, should be used as a last resort after all other options have been considered.

References

1. Lirette LS, Chaliban G, Tolda R, Eissa H (2014) Coccydynia: An Overview of the Anatomy, Etiology, and Treatment of Coccyx Pain. The Ochsner Journal 1: 84-87.
2. Woon JT, Stringer MD (2012) Clinical anatomy of the coccyx: A systematic review. Clinical Anatomy 2:158-167.
3. Nathan ST, Fisher E, Roberts CS (2010) Coccydynia: a review of pathoanatomy, aetiology, treatment and outcome. The Bone and Joint Journal 12:1622-1627.
4. Hicks R (2017) Picture of the coccyx.
5. Maigne JY, Doursounian L, Gilles C (2000) Causes and Mechanisms of Common Coccydynia: Role of Body Mass Index and Coccygeal Trauma. Spine 23: 3072-3079.
6. Ebraheim N (2017) Pain in The Butt - Coccydynia Means Coccyx Pain.
7. Postacchini F, Massobrio M (1983) Idiopathic coccygodynia. Analysis of fifty-one operative cases and a radiographic study of the normal coccyx. Journal of Bone and Joint Surgery 8: 1116-1124.
8. Kwon KD, Schrot RJ, Kerr EE, Kim KD (2012) Coccygodynia and Coccygectomy. Korean Journal of Spine 4: 326-333.
9. Awwad WM, Saadeddin M, Alsager JN, Al Rashed FM (2017) Coccygodynia review: coccygectomy case series. European Journal of Orthopaedic Surgery Traumatology 27: 1947-1953.
10. Maigne JY, Pigeau I, Aguer N, Doursounian L, Chatellier G, et al. (2011) Chronic coccydynia in adolescents. A series of 53 patients. European Journal of Physical and Rehabilitation Medicine 47: 245-251.
11. Efthimios JK, Trypsiannis G, Giannoudis P (2011) Surgical treatment of coccygodynia: an analytic review of the literature. European Spine Journal 5: 698-705.
12. Simpson J (1859) Clincal lectures on the diseases on women Lecture XVII: coccydynia and diseases and deformities of the coccyx. Medical Times Gazette 40: 1-7.
13. Traycoff RB, Crayton H, Dodson R (1989) Sacrococcygeal pain syndromes: diagnosis and treatment. Orthopedics 10: 1373-1377.
14. Schapiro S (1950) Low back and rectal pain from an orthopedic and protological view-point: with a review of 180 cases. The American Journal of Surgery 117-128.
15. Tejon P, Belomonte MA, Lerma JJ, Antonio Lozano (2015) Coccydynia Related to the Use of a Contraceptive Vaginal Ring. Reumatologia Clinica 1:42-43.
16. Maigne JY, Doursounian L, Chatellier G (2000) Idiopathic coccygodynia. Lateral roentgenograms in the sitting position and coccygeal discography. Spine 8:930-934.
17. Pennekamp PH, Kraft CN, Stutz A, et al (2005) Coccygectomy for coccygodynia: does pathogenesis matter? Journal of Trauma and Acute Care Surgery 6:1414-1419.
18. Thiele GH (1963) Coccygodynia: cause and treatment. Diseases of the Colon and Rectum 6: 422-436.
19. Joseph N (2017) Imaging the Sacrum and Coccyx. CE Essentials.
20. Grassi R, Lombardi G, Reginelli A, Capasso F, Romano F, et al. (2007) Coccygeal movement: assessment with dynamic MRI. European Journal of Radiology 61: 473-479.
21. Trollegaard AM, Aarby NS, Hellberg S (2010) Coccygectomy: an effective treatment option for chronic coccydynia: retrospective results in 41 consecutive patients. Journal of Bone and Joint Surgery 2: 242-245.
22. Lin SF, Chen YJ, Tu HP, Lee CL, Hsieh CL, et al. (2015) The Effects of Extracorporeal Shock Wave Therapy in Patients with Coccydynia: A Randomized Controlled Trial. PLos One 11.
23. Wray CC, Easom S, Koskinson J (1991) Coccydynia. Aetiology and treatment. Journal of Bone and Joint Surgery 2: 335-338.
24. Foye PM (2007) Ganglion impar blocks for chronic pelvic and coccyx pain. Pain Physician 6: 780-781.
25. Sagir O, Ozaslan S, Koroglu A (2011) Application of ganglion impar block in patient with coccyx dislocation. Agri 3:129-133.
26. Cha YD, Yang CW, Han JU, Song JH, Na W, et al. (2016) Transsacrococcygeal approach to ganglion impar block for treatment of chronic coccygodynia after spinal arachnoid cyst removal: A case report. Medicine (Baltimore) 39.
27. Toshniwal GR, Dureja GP, Prashanth SM (2007) Transsacrococcygeal approach to ganglion impar block for management of chronic perineal pain: a prospective observational study. Pain Physician 5: 661-666.