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Non-Surgical Interventional Pain Management Techniques for Coccydynia – A Narrative Review

Review Article

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Abstract

The term coccydynia refers to pain and tenderness around the sacrococcygeal region. It occurs more commonly in women, with an incidence ratio of 5:1 for females to males. Its etiology is multifactorial, where the traumatic cause is the most commonly seen. Patients usually report pain that intensifies with prolonged sitting and diminishes when pressure on the coccyx is relieved, such as by standing or walking. Approximately 90% of the cases are resolved with conservative treatments. In cases where conservative treatments are insufficient, invasive interventions may be required, including both surgical and non- surgical options. There are multiple non-surgical interventional techniques such as caudal epidural steroid injection (CESI), ganglion impar block (GIB) and radiofrequency (RF) of the ganglion impar (GI) that can be used in chronic and refractory coccydynia.

The aim of this study is to make a review of the non-surgical interventional pain management techniques available in the literature, as well as provide its evidence.

Introduction

The term coccydynia was introduced in 1859 by Simpson, referring to pain and tenderness around the sacrococcygeal region [1]. This term has different synonyms such as coccydynia and coccyx or tailbone pain [2].

The coccyx is the terminal segment of the spinal column, consisting of three to five vertebrae located below the sacrum [3,4]. It is connected to the sacrum by the sacrococcygeal joint, a fibrocartilaginous joint that allows limited coccygeal movement, typically involving slight forward bending when bearing weight in a seated position [3,4]. The anterior surface of the coccyx serves as an important attachment site for muscles such as levator ani, iliococcygeus, coccygeus, and pubococcygeus, while the posterior surface provides attachment for the gluteus maximus [3,4]. The coccyx also connects to the anterior and posterior sacrococcygeal ligaments, which extend from the anterior and posterior longitudinal ligaments. On each side, it connects to the sacrotuberous and sacrospinous ligaments. Besides serving as an attachment point for muscles and ligaments, the coccyx is also connected to the anococcygeal raphe, a structure extending from the anus to the distal coccyx that helps stabilize the anus within the pelvic floor. The innervation of the coccyx includes somatic nerve fibers and the ganglion impar, which represents the terminal end of the paravertebral chain of the sympathetic nervous system [3].

The etiology of coccyx pain is multifactorial and may include traumatic, idiopathic, or, more rarely, infectious or tumor-related causes [1]. The traumatic cause is the most commonly seen and may present in various forms, such as posterior luxation, hypermobility, and spicules of the coccyx [1]. Although the incidence of coccyx pain is not well established, it is more common in women due to variations in the shape and angles of the female pelvis, as well as the naturally higher risks associated with childbirth [2]. There is a strong association between coccydynia and female gender, with an incidence ratio of 5:1 for females to males. Also, a relationship exists between weight and the occurrence of coccydynia [5]. Diagnosis is typically based on a characteristic patient history, with symptoms often associated to trauma,

including childbirth. The likelihood of developing coccydynia may be heightened by repetitive microtrauma from prolonged sitting, particularly in females with a BMI over 27.4 and males with a BMI over 29.4 [5]. Typically, patients report pain that intensifies with prolonged sitting and subsides when pressure on the coccyx is relieved, such as by standing or walking. The patient's history should also help exclude psychological causes. Physical examination often reveals localized tenderness upon palpation of the coccyx. A digital rectal exam is recommended to rule out conditions such as hemorrhoids, prostate hypertrophy, or carcinoma. Radiological studies, including dynamic x-rays, are used to compare the coccyx in standing and sitting positions through lateral views [6].

Most cases of coccydynia can be effectively managed with conservative treatments, including nonsteroidal anti-inflammatory drugs (NSAIDs), adjustments in sitting posture, coccygeal cushions (such as donut or U-shaped cushions) to reduce pressure on the coccyx, pelvic floor rehabilitation, transcutaneous electrical nerve stimulation (TENS), extracorporeal shock wave therapy (ESWT), and physical therapy. These approaches can lead to symptoms resolution in up to 90% of cases [1,6]

In cases where conservative treatments are insufficient, invasive interventions may be required, including both surgical and non-surgical options [1] There are multiple non- surgical interventional techniques such as caudal epidural steroid injection (CESI), ganglion impar block (GIB) and radiofrequency (RF) of the ganglion impar (GI) that can be used in chronic and refractory coccydynia. The surgical treatment, coccygectomy, is rarely used and is only considered as a final option [1].

Fluoroscopically guided GIB has recently become a commonly used method for treating chronic coccydynia [7].

The purpose of this study is to review the non-surgical interventional pain management techniques documented in the literature and to present the evidence supporting their efficacy.

Ganglion Impar Block (GIB)

The ganglion impar, also known as the Walther ganglion, is a sympathetic ganglion located in the retroperitoneal space behind the rectum, near the sacrococcygeal joint or directly in front of the coccyx [8]. The ganglion impar serve as the relay point for the coccygeal nociception, transmitting pain signals from the pelvic and perineal regions. Chronic irritation of the coccygeal nerve leads to increased sensitization of the ganglion impar and somatosensory system. Blocking the ganglion impar inhibits pain transmission, providing an analgesic effect and reducing sensitization [1]. The GIB was first described by Plancarte et al. in 1990 for treating sympathetic pain associated with malignant conditions. Since then, it has also been utilized for alleviating other types of severe perineal pain and coccydynia. The specific innervation patterns of the GI remain unclear. Initially, the approach to access the GI involved passing through the anococcygeal ligament until the needle reached the anterior side of the sacrococcygeal joint. Later, a transsacrococcygeal approach was introduced, as it required less expertise, offered a shorter needle path, and provided a more direct route [9].

The block of this ganglion can be performed using fluoroscopy, which is considered the gold standard, computerized tomography (CT) scanning, or ultrasound guidance [8,10]. The effectiveness of the blockade relies on the precise identification of the ganglion's location [1] The GIB has become the most common technique for treating coccydynia due to its simplicity, quick application, substantial pain relief, and low rate of complications. There are different techniques to perform GIB under fluoroscopic guidance: transcoccygeal and transsacrococcygeal. The transcoccygeal technique has shown

clinically better outcomes because of some proposed reasonsn [11] Regarding the approach, the injectate typically flows more towards cephalad than caudad. With the transsacrococcygeal approach, most of the injectate may flow too far above the ganglion impar, while the transcoccygeal approach is more likely to provide effective coverage of the ganglion impar; Injections using the transcoccygeal approach are closer to the targeted structure; The transcoccygeal technique is generally easier than the transsacrococcygeal approach, as the sacrococcygeal junction is fused in 51% of patients, whereas the first intracoccygeal joint is fused in only 12%; In the transcoccygeal approach, a lateral fluoroscopic view is obtained, which is the optimal perspective for visualizing the target site during a GIB [11]. Gonnade et al., performed a prospective study with 35 patients with chronic coccydynia to do fluoroscopy-guided transsacrococcygeal GIB, with follow-up period of 6 months. Pain levels, measured by the Numeric Rating Scale (NRS) score decreased drastically immediately after the procedure, showing significant relief for patients, and the difference in scores remained statistically significant until the end of the study [8]. Celenlioglu et al., conducted a retrospective study that demonstrated a high treatment success of GIB for coccydynia. They also found that a longer duration of symptoms before the procedure and the presence of permanent subluxation were associated with a reduced likelihood of treatment success [12].

Sencan et al. [8] evaluated the effectiveness of GIB in improving neuropathic pain and demonstrated a reduction in the neuropathic component of chronic coccydynia, along with an improvement in pain while sitting [10].

Radiofrequency (RF) of the GI

Another option is the destruction of the GI using radiofrequency lesioning [13]. Dermicay et al. [14] evaluated the efficacy of radiofrequency thermocoagulation (RFT) of GI in patients with chronic coccydynia [13]. The RF lesioning was performed at 80°C for 120 seconds [13]. The They had a significantly lower post-RFT pain scores [13]. Another study conducted by Adas et al., assessed the effect of ganglion impar RF treatment in patients with chronic coccydynia. The procedure was performed at 80°C for 90 seconds, which is a conventional method for nerve ganglion ablation. There was a statistically significant difference between Visual Analog Scale (VAS) scores of the pre- and post-procedure, with 90,2% patients having successful outcome after six months of treatment [14]. While the blockade of GI is an established procedure for refractory coccydynia, the use of ganglion impar pulsed radiofrequency (GIPRF) is a relatively new approach, with results primarily derived from case reports and small series [15]. Sír et al. [16] compared the block and PRF of the GI in coccydynia [15]. In the GIPRF group, it was performed PRF at 42°C for 120 seconds for 3 cycles with standard clinical PRF parameters (voltage, 45 V; pulse rate, 2 Hz/s; pulse width, 1 ms) and no medication was injected during the procedure [15]. However, while pain in the GIB group began returning to baseline levels after three months, the GIPRF group continued to maintain reduced pain levels. The underlying mechanisms of the neuromodulatory effects of PRF are not fully understood. It generates an electrical field around the active tip of the needle that penetrates into the axons. Although the target tissue temperature is maintained at 42 °C, which is below the destruction threshold of 45 °C to 50 °C, ultrastructural changes in the nociceptive axons, particularly in the pain-conducting A-delta and C-fibers, have been observed [15].

Caudal Epidural Steroid Injection (CESI)

A caudal epidural steroid injection (CESI) is another treatment option that, while less frequently highlighted in the literature, is commonly used in clinical practice. As the exact mechanism of action remains unclear, limited evidence suggests that CESI can be effective [7]. Sencan et al. [8] in a prospective randomized comparison study, compared the clinical outcomes of GIB and CESI in patients with chronic coccydynia unresponsive to conservative treatment [7] In the CESI procedure, the patients are placed in a prone position, and

the caudal epidural space is visualized using fluoroscopic guidance. A mixture of local anesthetic and steroids can be used, or a local anesthetic alone. Steroids were included in this case, as a prior comparative study indicated that adding steroids resulted in a greater reduction in pain. The GIB, is made with the patients in the same position, with the purpose of visualizing the sacrococcygeal joint, achieved with a lateral fluoroscopic view. In this study, GIB led to a more substantial reduction in pain by the third week when compared with CESI, since GIB has a more precise target [7]. In other study, Türkyılmaz et al., evaluated the effectiveness of CESI as an adjuvant to (GIPRF) therapy in chronic coccydynia [16]. In this study, adding CESI to GIPRF therapy improved pain reduction at the 6-month follow-up, but the difference was not statistically significant. However, patient satisfaction was notably higher at 6 months in the group that received CESI. This may be due to the corticosteroid's effect on the sacral and coccygeal plexuses, which include the pudendal and cutaneous nerves of the lower gluteal area, as well as its anti-inflammatory effects in the region [16].

Conclusions

GIB can be utilized to manage both acute and chronic perineal pain [14] There are several methods to perform this block, including the use of local anesthetics, the combined administration of local anesthetics and steroids, alcohol or phenol injections, and neurolysis via RF treatment techniques [14]. GIB and RF serve as intermediate treatment options between conservative medical management and radical surgical excision. These minimally invasive procedures can help avoid unnecessary surgery for the majority of patients who do not respond to conservative treatments [1]. Complications from a GIB can be avoided by using fluoroscopic guidance for accurate needle placement. Fluoroscopic guided GIB with contrast dye is the most widely used and preferred technique, considered the gold standard for GIBs [11]. It is considered a safe and effective technique and seems useful in the treatment of intractable coccyx and perineal pain [9]. The decision between GIB and RF should be based on the availability of resources, the expertise of the treating physician, and the preferences of the patient [1].

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