Annals of Clinical and Analytical Medicine
Original Research

The influence of coccyx morphology on ganglion impar block treatment results in chronic coccydynia

Samet Sancar Kaya[1], Şeref Çelik[2], Erkan Yavuz Akçaboy[2], Hamit Göksu[3], Müge Baran[4], Şaziye Şahin[2]
[1] Department of Pain Medicine, Adıyaman University Training and Research Hospital, Adıyaman
[2] Department of Pain Medicine, University of Health Sciences, Ankara City Hospital, Ankara
[3] Department of Pain Medicine, University of Health Sciences, Dr. Abdurrahman Yurtaslan Ankara Oncology Training and Research Hospital, Ankara
[4] Department of Pain Medicine, Ağrı Training and Research Hospital, Ağrı, Turkey

Abstract

Aim: Coccydynia is usually managed conservatively; however, ganglion impar block (GIB) can be performed in patients who do not respond to conservative treatments. In this study, we aimed to investigate the effect of coccyx morphology on outcomes of GIB in coccydynia.

Material and Methods: A retrospective study included 101 patients with coccydynia who failed to respond to conservative treatments and underwent GIB. Patients were categorized as normal (Type 1), or abnormal (Type 2, 3, 4, and 5) based on the modified Postacchini and Massobrio classification. Pain scores before and after the injection at 1 and 3 months were compared. A more than 50% reduction in visual analogue scale (VAS) scores was defined as significant pain relief.

Results: According to the Postacchini-Massobrio classification, 42 patients had a normal coccyx (Group I) and 59 had an abnormal coccyx (Group II). VAS scores in both groups had improved significantly from baseline at 1 and 3 months ($p < 0.05$). There were significantly greater decreases in VAS scores in the 1st and 3rd months in Group II than in Group I ($p < 0.001$). The 1st month VAS and 3rd month VAS scores were higher in the patient group without trauma history than in the patient group with trauma history ($p = 0.008$, and $p = 0.040$, respectively).

Discussion: GIB is safe and effective for the management of coccydynia. History of trauma and type of coccyx in patients with chronic coccydynia seem to affect treatment outcomes.

Keywords

Coccydynia, Ganglion Impar Block, Coccydynia Treatment, Coccyx Morphology, Postacchini-Massobrio Classification

DOI: 10.4328/ACAM.21734 Received: 2023-04-26 Accepted: 2023-06-05 Published Online: 2023-06-20 Printed: 2023-09-25 Ann Clin Anal Med 2023;14(Suppl 2):S130-134
Corresponding Author: Samet Sancar Kaya, Deparment of Pain Medicine, Adıyaman University Training and Research Hospital, 02100, Ziyaretpayamlı, Adıyaman, Turkey.
E-mail: sametsancarkaya@hotmail.com P: +90 505 753 60 59
Corresponding Author ORCID ID: https://orcid.org/0000-0003-4819-1128
This study was approved by the Ethics Committee of Ankara City Hospital (Date: 2022-01-26, No: E1-22-2338)

Introduction

Coccydynia is described as pain and tenderness around the sacrococcygeal region [1]. Although its true incidence is unknown, it is more common in women [2]. Diagnosis is confirmed by clinical examination and imaging techniques. The first line of treatment is conservative such as non-steroidal anti-inflammatory drugs, modification of sitting style, sitting cushions, exercises, and physiotherapy; however, these treatments are ineffective in 10% of patients. In non-responsive patients, ganglion impar block (GIB) can be applied [3].

Ganglion impar block is the most widely used interventional therapy for coccydynia because it is easy and minimally invasive, significantly reduces pain, and the incidence of complications is low for GIB. The success rate of GIB in coccydynia is > 85% [4]. There are several articles reporting that the morphological features of the coccyx are important in the development of coccydynia [5, 6]. However, there are not enough data in the literature about which factors affect the therapeutic success of GIB. Therefore, the aim of our study was to investigate the effect of the morphology of the coccyx according to the modified Postacchini-Massobrio classification on outcomes of GIB in patients with chronic coccydynia.

Material and Methods

The medical records of patients with coccydynia who did not respond to conservative treatments, and then underwent GIB between June 2019 and June 2021 were retrospectively reviewed. The study was approved by the Ethics Committee of Ankara City Hospital (Date: 2022-01-26, No: E1-22-2338).

Inclusion criteria:

1. 18 years of age and over
2. Coccydynia patients unresponsive to conservative treatments for at least 3 months
3. Patients who underwent trans-sacrococcygeal GIB under fluoroscopy and had routine coccyx radiographs and MRI scans before the procedure.

Exclusion criteria:

1. Previous surgery to the lumbar or coccygeal region
2. Coccydynia associated with cancer metastasis.
3. Coexisting chronic painful diseases such as fibromyalgia or psychiatric disorders
4. Not optimal fluoroscopy images during injection
5. Failure to block with appropriate doses of drugs
6. Missing information in the patient's file

Imaging technique and analysis

The radiographs of all patients were classified according to the modified Postacchini and Massobrio classification [1, 7]. Coccyx curve was classified as follows: type 1: normal curve, type 2: coccyx more markedly curved and pointing anteriorly, type 3: very sharply angled anteriorly, type 4: anterior subluxation at the sacrococcygeal or intercoccygeal joint, type 5: coccygeal retroversion. The patients were categorized as normal (Type 1), or abnormal (Type 2, 3, 4, and 5) based on the modified Postacchini and Massobrio classification.

Fluoroscopic-guided ganglion impar block

The injections were performed in an operating room. The patient was monitored and vital signs were observed throughout the entire procedure (blood pressure, heart rate, SpO2). After the intergluteal area was prepared with sterile aseptic precautions, while the patient was lying prone, the sacrococcygeal area was identified in the lateral position under C-arm fluoroscopy. The area was infiltrated with 2-3 mL 1% lidocaine using a 25-G needle. A 22-G spinal needle was inserted from the midline at the sacrococcygeal junction. In the lateral fluoroscopic view, when the tip of the needle was anterior to the coccyx, needle tip was confirmed by 1 mL non-ionic contrast spread in the shape of a "comma" (Figure 1). After confirmation, 3 mL of 0.25% bupivacaine and 2 mL of 8 mg dexamethasone were injected.

Data Collection

Initially, 118 patients who underwent a fluoroscopic-guided GIB for coccydynia were included in the study. Thirteen of these patients were excluded from the study because their visual analogue scale (VAS) scores were not recorded, and 4 of them were excluded because the optimal block could not be performed.

Age, gender, body mass index (BMI), duration of pain, trauma history, and VAS scores before and after the procedure (1 month and 3 months) were obtained by retrospectively scanning of the medical records. Digital images of the coccyx were obtained with the picture archiving communication system.

The pain was assessed using the Visual Analogue Scale (VAS) (0 = "no pain" and 10 = "worst imaginable pain"), measured before the procedure, one and three months after the procedure. More than a 50% reduction in VAS scores was accepted as significant pain relief.

Statistical analysis

All analyses were carried out using IBM SPSS Statistics for Windows 25.0 (IBM Corp., Armonk, NY, USA). For analysis of normal distribution, the Kolmogorov-Smirnov test was used. Normally distributed quantitative data were presented as median ± standard deviation (SD), and quantitative data not normally distributed were expressed as the median and interquartile range (IQR). The chi-square test was used to analyze the relationship between the significant pain relief over time. The change in VAS scores and significant VAS reduction between groups according to time were demonstrated in graphics. $P < 0.05$ was accepted as statistically significant.

Ethical Approval

Ethics Committee approval for the study was obtained.

Results

The study included 101 patients, 42 of them had normal coccyx morphology (Group I) and 59 had abnormal coccyx morphology (Group II) based on the radiography of the coccyx. The average age of the subjects was 44.04 ± 13.73 years, and the average duration of pain was 22.52 ± 25.73 months. The groups were similar in terms of sex, age, BMI and duration of pain. However, trauma history was significantly higher in Group II than in Group I ($p = 0.004$) (Table 1).

According to the modified Postacchini-Massobrio classification, the most common type of coccyx among all patients was type 1 (41.6%), followed by type 2 (20.8%). Types 3, 4, and 5 frequencies were 10.9%, 14.9%, and 11.9%, respectively.

At baseline, there was no significant statistical difference between baseline mean VAS scores between groups ($p = 0.787$). Post-injection VAS scores were significantly decreased

compared to baseline VAS scores in both groups ($p < 0.05$). VAS scores in Group II were significantly lower than in Group I in the 1st and 3rd months ($p < 0.001$) (Table 2).

Significant pain relief, which was accepted as ≥ 50% pain reduction on VAS scores had a lower prevalence in Group I than in Group II at 1and 3 months (respectively, $p < 0.001$ and $p = 0.004$) (Figure 2).

We assigned all patients into two groups according to a history of trauma: 46 patients with a history of trauma and 55 patients without a history of trauma and compared their preprocedural and postprocedural VAS scores. The mean age was significantly higher in patients without trauma history ($p = 0.009$). Duration of pain and VAS baseline were similar between groups with or without history ($p > 0.05$). The 1st-month VAS and 3rd-month VAS scores were higher in the patient group without trauma history ($p = 0.008$, and $p = 0.040$, respectively) (Table 3).

No complications were observed during or after the procedure in any of the patients.

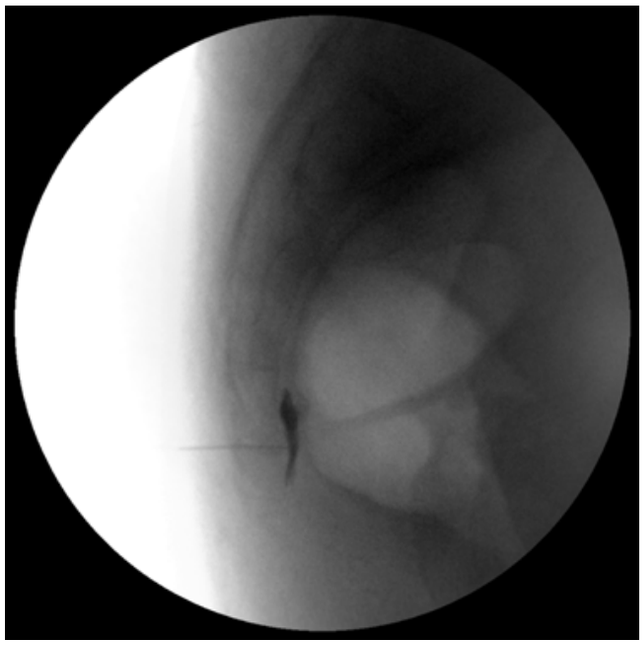

Figure 1. Fluoroscopic view of ganglion impar block.

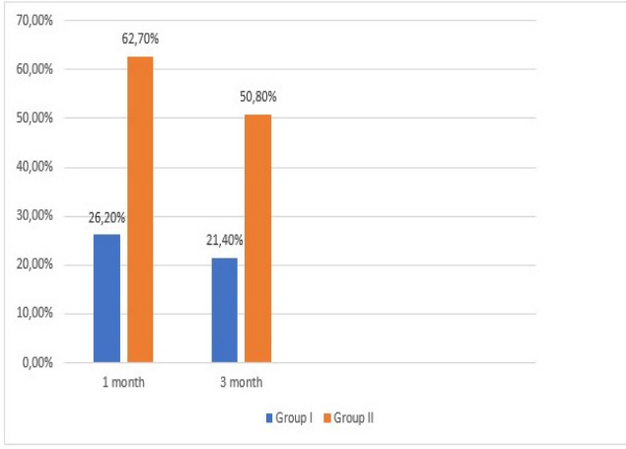

Figure 2. Significant pain relief in the groups at 1 and 3 months.

Table 1. Demographic data of patients with chronic coccydynia treated with ganglion impar block.

	Group I (n=42)	Group II (n=59)	p
Age (year)	45.72 ± 9.66	42.95 ± 10.09	0.166[a]
Gender (n/ %)			
Female	30 (71.4)	43 (72.9)	0.872[b]
Male	12 (28.6)	16 (27.1)	
BMI	23.55 ± 2.05	23.92 ± 1.95	0.374[a]
Duration of pain (months)	19.71 ± 14,36	15.88 ± 14.98	0.198[a]
History of trauma			
Yes	12 (28.6)	34 (57.6)	0.004[b]
No	30 (71.4)	25 (42.4)	

Values are presented as mean ± SD. BMI: Body mass index; [a]t-test; [b]Chi-square test

Table 2. VAS scores of the patients before and after the treatment.

	Group I (n=42)	Group II (n=59)	p
VAS baseline	7.48 ± 0.80	7.53 ± 1.02	0.787
VAS 1st month	5.26 ± 2.60*	3.03 ± 2.46*	<0.001
VAS 3rd month	6.10 ± 2.16*	4.01 ± 2.37*	<0.001

Values are presented as mean ± SD. VAS: Visual analog scale

Table 3. Demographic features, pain duration, and visual analog scale scores in the patient groups with and without trauma.

		Trauma history (n=46)	No trauma history (n=55)	p
Age (mean ± SD)		40.72 ± 12.30	47.60 ± 13.53	0.009
Sex	Female	34 (73.9)	39 (70.9)	0.825
	Male	12 (26.1)	16 (29.1)	
Duration of pain (months)*		12.0 (6.0 - 23.3)	12.0 (8.0 - 35.0)	0.140
VAS baseline*		8.0 (7.0 - 8.0)	7.0 (7.0 - 8.0)	0.070
VAS 1st month*		2.5 (1.0 - 5.8)	5.0 (3.0 - 7.0)	0.008
VAS 3rd month*		5.0 (2.0 - 6.8)	6.0 (4.0 - 7.0)	0.040

*Values are presented as median, IQR: 25-75th. VAS: Visual analog scale, BMI: Body mass index

Discussion

Although the etiology of coccydynia is not clearly known, it is accepted as having multifactorial origin, which can also be idiopathic [8]. Postacchini and Massobrio [7] suggested that coccyx morphology may have an important role in the etiology of coccydynia. They described a radiological classification system in which they identified 4 types of the coccyx and reported the relationship of these types with coccydynia. According to this classification, type II, III and IV patients have a higher risk of developing coccydynia. Later, a fifth type was described as retroverted angulation of the coccyx [1, 9]. Later studies generally focused on coccyx mobility and it was suggested that the majority of coccydynia cases had subluxation or hypermobile coccyx and chronic changes occurred because of this pathological instability [1, 8, 10]. However, no findings other

than BMI, initiating trauma history and spicule are strongly associated with coccydynia, including instability [8, 11].

The only study in the literature on the effect of coccygeal morphology on GIB in patients with chronic coccydynia belonged to Sencan et al. [10] They assigned the coccydynia patients who had undergone GIB into two groups: those with normal and an immobile coccyx by performing dynamic radiographs. They did not find significant differences between the treatment outcomes of the normal and immobile groups. This result may support the claim that the role of instability in the etiology of coccydynia is weak. However, they did not evaluate the effect of subluxation and hypermobility on GIB outcomes. Postacchini and Massobrio [7] did not observe any relationship between the coccygeal morphology and treatment results in patients treated with coccygectomy. Ozkal [12] reported successful results in all 29 patients (13 type 1, 14 type 2, 2 type 3) who underwent coccyx excision resistant to conservative treatment. Kodumuri et al. [11] figured out that patients with coccydynia with a BMI below 30 and those with coccyx trauma responded better to treatment modalities such as manipulation, coccygectomy, and local steroid injections.

In most cases, there is a history of underlying trauma, and the decrease in pain with steroid injections around this area together with common trauma history is evidence that supports inflammation in the pericoccygeal region [13, 14]. It is thought that the overactivity or sensitivity of the ganglion impar also plays a role in the pain mechanism of coccydynia [15-17]. GIB seems reasonable in the treatment of chronic coccydynia, both in terms of inhibiting the excessive activity of the impar ganglion and suppressing possible inflammation in the pericoccygeal region. We found significant pain relief in 47.5% of patients at 1 month and 38.6% at 3 months in our study. This improvement was significantly lower in Group I than in Group II. There may be some reasons for this result. The severe angulation seen in patients with abnormal coccyx type may indicate that inflammation is more active in these patients than in patients with a coccyx without angulation. The fact that the history of trauma in patients with abnormal coccyx morphology is significantly higher than in patients with normal coccyx morphology, and the post-treatment VAS scores of patients with a history of trauma are significantly lower than those without a history of trauma supports our idea. Also, these advanced morphological disorders and inflammation may have led to overactivity of the ganglion impar in patients with abnormal coccyx type. The lack of difference between Group I and Group II in terms of significant improvement at 3 months can be attributed to the termination of the dominant effect of the steroid on inflammation.

In our study, a significant reduction in pain lasting up to 3 months was achieved in 38.6% of our patients. Similar to our study, Buttacı et al. [18] reported a 50-75% reduction in pain lasting weeks to months with GIB in patients. Malhotra et al. [13] observed that all patients reported pain relief that usually lasted for at least three months following GIB. Gunduz et al. [19] reported a success rate of 82% with a median duration of 6 months in patients with chronic coccydynia who had undergone GIB. Sir and Eksert [20] reported a significant improvement in pain scores at 3weeks and 3 months in patients with chronic coccydynia who underwent GIB. However, at 6 months, the pain levels were almost back to the baseline levels. Our success rates were lower than those reported by Malhotraet al. [13] and Gunduz et al [19]. The high success rates reported by Malhotra et al. [13] may be due to the use of 8 mL of 0.5% bupivacaine in contrast to other studies that have generally used lower volumes of 0.25% bupivacaine. Also the anatomical variability of the location of the ganglion impar may result in different success rates.

Similar to the literature, type I coccyx was most common, followed by type II in our study [2, 7]. However, in two studies, type 2 coccyx was reported to be more common [9, 21]. The majority of the patients in our study were female, and middle-aged, which was similar to other studies [10, 13, 20].

Malhotra et al. [13] observed the efficacy of both trans-sacrococcygeal and transcoccygeal approaches of GIB, but they did not report a significant difference between the two groups in terms of efficacy. Because of the demonstration that the sacrococcygeal joint can be a source of pain (secondary to inflammation or degenerative process) and its close proximity to the impar ganglion, we performed GIB with the trans-sacrococcygeal approach [16, 17, 22].

The major limitations of our study are the limited follow-up period of 3 months, retrospective nature, absence of dynamic radiography and functional parameters such as painless sitting time and Oswestry disability index. Nevertheless, we think that our study is valuable as the second study in the literature investigating the effect of coccygeal morphology on GIB in patients with chronic coccydynia.

Conclusion

GIB is an effective treatment procedure with a low complication rate for pain relief in coccydynia. In patients with chronic coccydynia, radiologically detected abnormal coccyx morphology and history of trauma appear to affect the treatment outcomes of GIB. Prospectively designed, controlled studies with a larger patient population are needed to determine the factors affecting the success of GIB in the treatment of chronic coccydynia.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

Funding: *None*

Conflict of interest

None of the authors received any type of financial support that could be considered potential conflict of interest regarding the manuscript or its submission.

References

1. Nathan S, Fisher B, Roberts C. A review of pathoanatomy, aetiology, treatment and outcome: Coccydynia. J Bone Joint Surg Br. 2010;92(12):1622-7.

2. Karadimas EJ, Trypsiannis G, Giannoudis PV. Surgical treatment of coccygodynia: an analytic review of the literature. Eur Spine J. 2011;20(5):698-705.

3. Lirette LS, Chaiban G, Tolba R, Eissa H. Coccydynia: an overview of the anatomy, etiology, and treatment of coccyx pain. Ochsner J. 2014;14(1):84-7.

4. Choudhary R, Kunal K, Kumar D, Nagaraju V, Verma S. Improvement in Pain Following Ganglion Impar Blocks and Radiofrequency Ablation in Coccygodynia Patients: A Systematic Review. Rev Bras Ortop. 2021;56(5):558-66.

5. Woon JT, Maigne J-Y, Perumal V, Stringer MD. Magnetic resonance imaging morphology and morphometry of the coccyx in coccydynia. Spine. 2013;38(23):E1437-45.
6. Hekimoglu A, Ergun O. Morphological evaluation of the coccyx with multidetector computed tomography. Surg Radiol Anat. 2019;41(12):1519-24.
7. Postacchini F, Massobrio M. Idiopathic coccygodynia. Analysis of fifty-one operative cases and a radiographic study of the normal coccyx. J Bone Joint Surg Am. 1983;65(8):1116-24.
8. Maigne J-Y, Doursounian L, Chatellier G. Causes and mechanisms of common coccydynia: role of body mass index and coccygeal trauma. Spine. 2000;25(23):3072-9.
9. Yoon MG, Moon M-S, Park BK, Lee H, Kim D-H. Analysis of sacrococcygeal morphology in Koreans using computed tomography. Clin Orthop Surg. 2016;8(4):412-9.
10. Sencan S, Cuce I, Karabiyik O, Demir FU, Ercalik T, Gunduz OH. The influence of coccygeal dynamic patterns on ganglion impar block treatment results in chronic coccygodynia. Interv Neuroradiol. 2018;24(5):580-5.
11. Kodumuri P, Raghuvanshi S, Bommireddy R, Klezl Z. Coccydynia–could age, trauma and body mass index be independent prognostic factors for outcomes of intervention? Ann R Coll Surg Engl. 2017;100(1):12-5.
12. Özkal B. Surgical Treatment Outcomes in Patients with Coccydynia. Bozok Tıp Derg. 2018;8(1):103-8.
13. Malhotra N, Goyal S, Kumar A. Comparative evaluation of transsacrococcygeal and transcoccygeal approach of ganglion impar block for management of coccygodynia. J Anaesthesiol Clin Pharmacol. 2021;37(1):90-6.
14. Maigne J-Y, Pigeau I, Roger B. Magnetic resonance imaging findings in the painful adult coccyx. Eur Spine J. 2012;21(10):2097-104.
15. Foye PM. New approaches to ganglion impar blocks via coccygeal joints. Reg Anesth Pain Med. 2007;32(3):269.
16. Foye PM. Ganglion impar blocks via coccygeal versus sacrococcygeal joints. Reg Anesth Pain Med. 2008;33(3):279-80.
17. Kaya SS, Akcaboy EY, Celik S, Goksu H, Baran M, Yildiz G, et al. A comparative and retrospective study on the efficacy of caudal epidural steroid injection plus ganglion impar block versus ganglion impar block in patients with coccydynia. Ann Med Res. 2022;29(12):1413-7
18. Buttaci CJ, Foye PM, Stitik TP. Poster board 56: Coccydynia successfully treated with ganglion impar blocks: a case series. Am J Phys Med Rehabil. 2005;84(3):218.
19. Gunduz OH, Sencan S, Kenis-Coskun O. Pain relief due to transsacrococcygeal ganglion impar block in chronic coccygodynia: a pilot study. Pain Med. 2015;16(7):1278-81.
20. Sir E, Eksert S. Comparison of block and pulsed radiofrequency of the ganglion impar in coccygodynia. Turk J Med Sci. 2019;49(5):1555-9.
21. Przybylski P, Pankowicz M, Boćkowska A, Czekajska-Chehab E, Staśkiewicz G, Korzec M, et al. Evaluation of coccygeal bone variability, intercoccygeal and lumbo-sacral angles in asymptomatic patients in multislice computed tomography. Anat Sci Int. 2013;88(4):204-11.
22. Trollegaard A, Aarby N, Hellberg S. Coccygectomy: an effective treatment option for chronic coccydynia: retrospective results in 41 consecutive patients. J Bone Joint Surg Br. 2010;92(2):242-5.

How to cite this article:
Samet Sancar Kaya, Şeref Çelik, Erkan Yavuz Akçaboy, Hamit Göksu, Müge Baran, Şaziye Şahin. *The ınfluence of coccyx morphology on ganglion ımpar block treatment results in chronic coccydynia. Ann Clin Anal Med 2023;14(Suppl 2):S130-134*

This study was approved by the Ethics Committee of Ankara City Hospital (Date: 2022-01-26, No: E1-22-2338)