ORIGINAL ARTICLE

Fluoroscopy guided without contrast injection for ganglion impar blockade in traumatic coccydynia: Description a modified approach and 1-year results

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ABSTRACT

BACKGROUND: This study presents a new fluoroscopy-controlled approach in patients with chronic traumatic coccydynia by applying ganglion impar block using the needle-inside-needle technique from the intercoccygeal region without the administration of contrast material. With this approach, the cost and possible side effects of using contrast material can be prevented. In addition, we examined the long-term effect of this method.

METHODS: The study was designed retrospectively. The marked area was entered with a 21-gauge needle syringe, and 3 cc of 2% lidocaine was administered subcutaneously by local infiltration. A 25-gauge 90 mm spinal needle was inserted into the guide 21-gauge 50 mm needle tip. The location of the needle tip was controlled under fluoroscopy, and 2 mL of 0.5% bupivacaine and 1 mL of betamethasone acetate were mixed and administered.

RESULTS: A total of 26 patients with chronic traumatic coccydinia participated in the study between 2018 and 2020. The average procedure time was approximately 3.19 min. The mean time of pain relief of more than 50% was 1.25±1.22 (1st min–72 h) min. The mean Numerical pain rating scale scores were 2.38±2.26 at 1 h, 2.50±2.30 at 6 h, 2.50±2.21 at 24 h, 3.73±2.20 at 1 month, 4.46±2.14 at 6 months 1 and 5.23±2.52 at 1 year.

CONCLUSION: Our study shows that as an alternative in patients with chronic traumatic coccydynia, the long-term results of the needle-inside-needle method from the intercoccygeal region without contrast material are safe and feasible.

Keywords: Coccydynia; ganglion impar; ganglion of walther.

INTRODUCTION

The ganglion impar is a sympathetic ganglion located retroperitoneally at the end of the two lumbosacral sympathetic chains, approximately below the sacrococcygeal joint and rarely behind the rectum, in front of the midline of the coccyx. Also known as the ganglion of Walther, it provides nociception and sympathetic innervation of the perineal region.[1,2]

Coccydynia occurs when there is pain related to pathology at the distal-most segment of the spine, known as the coccyx or tailbone. The most common cause of coccydynia is trauma, especially recurrent microtraumas and falls, resulting in difficulty in sitting and short sitting times, with the contribution of the postpartum hypermobile coccyx, or chronic inflammatory diseases.[3]

It has been reported that some anatomical and morphological changes may cause pain when people with coccydynia are compared to the normal population.[4] According to Postacchini, the coccyx is classified in four types.[5] However, the literature studies suggest that intercoccygeal angle (ICA),

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sacrococcygeal angle (SCA), and coccyx length (CL) vary in the population and may contribute to the pathology.[6–8]

In the treatment, primarily NSAID, donut pillow, manual palpation, and transcutaneous electrical stimulation can be used.[9] Ganglion impar block, epidural injection, RF ablation therapy, and coccygectomy are among the treatments used for prolonged pain. Ganglion impar block was first described by Plancarte and has been a safe and effective method applied for the last two decades in patients with coccydynia.[10–12]

This study presents a new fluoroscopy-controlled approach in patients with chronic traumatic coccydynia by applying ganglion impar block using the needle-inside-needle technique from the intercoccygeal region without the administration of contrast material. With this approach, the cost and possible side effects of using contrast material can be prevented.

MATERIALS AND METHODS

Our study was designed retrospectively. Ethical approval for this study was obtained from the Ethics Committee of SANKO University (2022/04). The records of patients who were followed up in the orthopedics and traumatology department with the diagnosis of chronic traumatic coccydynia between 2018 and 2020, were older than 18 years, and had ganglion impar block after 6 months of non-invasive conservative treatment were obtained from the hospital digital archive. The study did not include the records of patients with chronic pain syndrome, pregnancy, lumbar disc disorder, local and systemic infection, coagulation disorder, local anesthetic allergy, and malignancy. In the digital archive records, routine 1-month, 6-month, and 1-year follow-up results of all patients were examined and their numerical pain rating scale (NPRS) scores and X-ray records were examined. Patients with missing archive and radiologic data and those out of follow-up were excluded from the study.

Technique

All of the procedures were performed in the operating room with the patient lying prone on the operating table and under fluoroscopy. Pain intensity was measured with NPRS before intervention. In all routine procedures, an electrocardiogram image was taken, a pulse oximeter was inserted, and an IV catheter was provided. Starting below the sacral hiatus, the intergluteal crease was cleaned with 10% povidone-iodine. First, a lateral view was taken with fluoroscopy. Care was taken to ensure that both greater sciatic notches were superimposed to obtain the correct lateral position. After the segment to be entered was marked, the midpoint location was confirmed on AP view, and the fluoroscopy was used in lateral position again and continued in this way. The marked area was entered with a 21-gauge needle syringe, and 3 cc of 2% lidocaine was administered subcutaneously by local infiltration, and the needle was separated from the syringe and left under the skin. Then, it was aligned with fluoroscopy at the midpoint of the AP image, so that the needle tip was just in front of the intercoccygeal joint on the lateral radiograph (Fig. 1). When there was a loss of resistance while advancing after the introduction, it was seen under fluoroscopy that the retroperitoneal space was entered (Fig. 2). Then, a 25-gauge 90 mm spinal needle was inserted into the guide 21-gauge 50 mm needle tip. The location of the needle tip was controlled under fluoroscopy (Fig. 3), and 2 mL of 0.5% bupivacaine and 1 mL of betamethasone acetate were mixed and administered. Then, the dressing was done and the procedure was terminated, and all patients were taken into the sitting position immediately.

After 1 h of follow-up, pain intensity was measured in the post-treatment period using a 10-cm NPRS which was used in most previous studies.[13,14] On this scale, "0" indicates

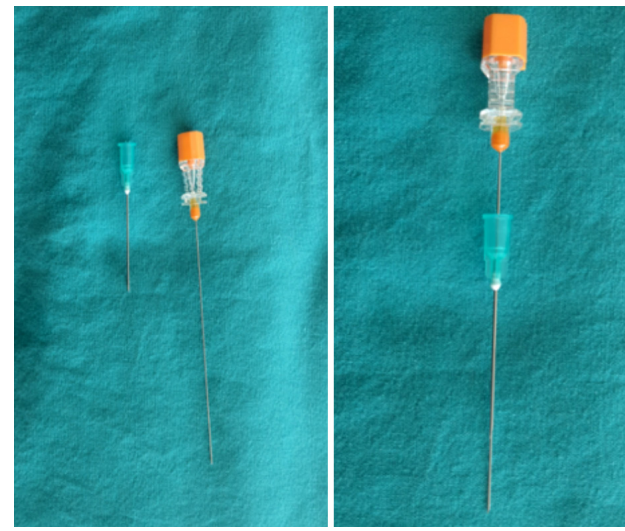

Figure 1. Green-colored 21-G 50 mm needle and 25-G 90 mm spinal needle used in the needle-inside-needle method.

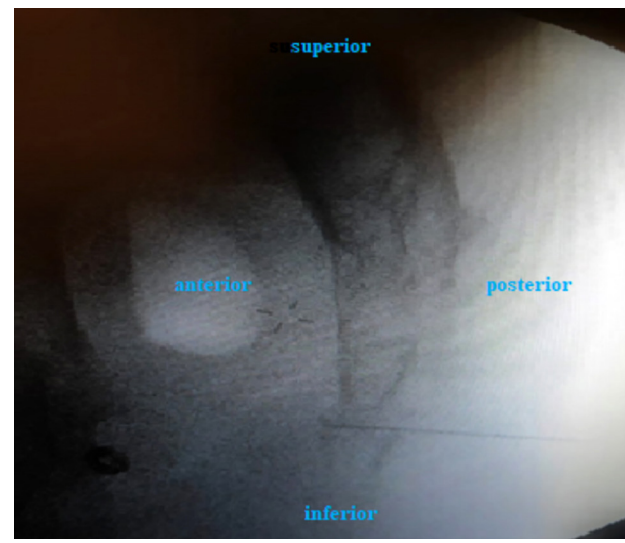

Figure 2. Passage of the needle through the intercoccygeal joint in the lateral fluoroscopic view.

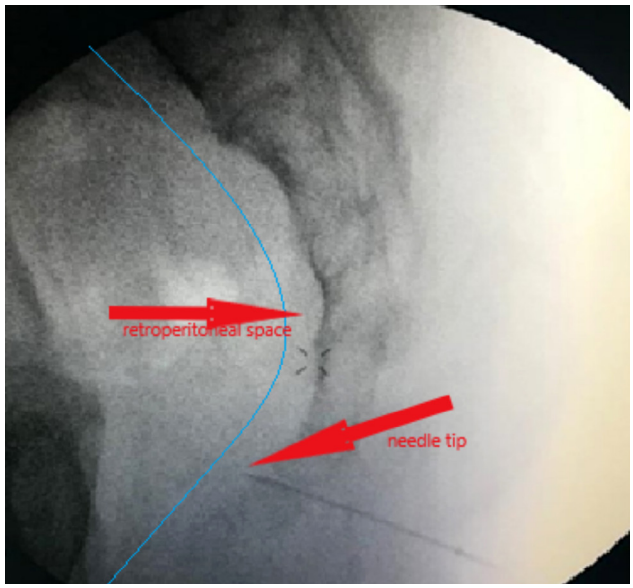

Figure 3. Position of the needle tip in the retroperitoneal space, just anterior to the coccyx in the lateral fluoroscopic view.

no pain, and "10" indicates the worst pain. After the 6th h, the patients were questioned about their NPRS score and discharged. All patients were questioned at the 24th h about their NPRS scores, and whether there were any side effects or not the next day. The patients were called for 1-month, 6-month, and 1-year controls. ICA, SCA, CL and coccyx type (Postacchini and Massobrio classification) were examined from the direct radiographs taken before the procedure in all patients (Fig. 4).

Statistical Analysis

Shapiro–Wilk (n<50) and skewness-kurtosis tests were performed to check whether the continuous measurements in the study were normally distributed, and since the measurements were normally distributed, parametric tests were applied. While descriptive statistics were used to define the continuous variables in the study, mean, standard deviation, number (n), and percentage (%) were used to define the categorical variables. Independent t-test and one-way analysis of variance (ANOVA) were performed in comparison of measurements according to categorical groups. Duncan's *post hoc* multiple comparison test was used to identify the difference between groups following ANOVA. One-sample t-test was used to compare ICA, SCA, and CL measurements according to reference test values. ANOVA for repeated measurements was used to compare NPRS scores by time, followed by Bonferroni post-hoc multiple comparison test to determine the times that made the difference. Chi-square test was calculated to determine the relationships between categorical variables. Pearson correlation coefficients were calculated to determine the relationships between measurements. The statistical significance level (a) was taken as 5% in the calculations and the SPSS (IBM SPSS for Windows, ver. 25) statistical software package was used for analysis.

RESULTS

A total of 26 patients with chronic traumatic coccydinia participated in the study between 2018 and 2020.

The mean age of the patients in the study was 42.8±14.85 (18–69) years, and 20 patients were female (76.9%), while 6 were male (23.1%). Patients' mean body mass ındex (BMI) was 27.23±4.24 (19.5–35.5) and their mean pain duration was 22.92±12.87 (12–62) months. Before the procedure, the mean NPRS score of the patients was 8 (6–10). The average procedure time was approximately 3.19 min.

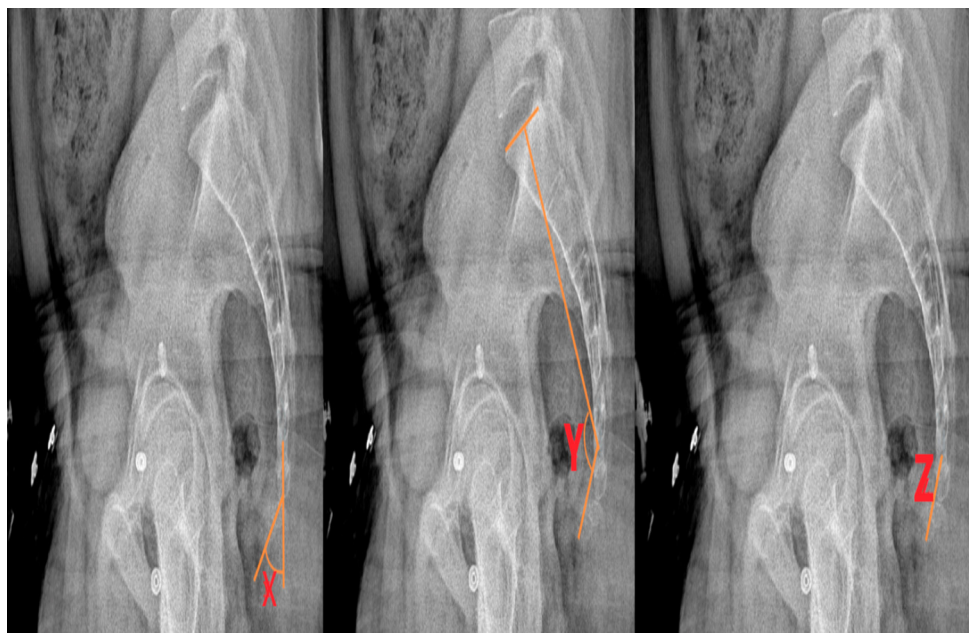

Figure 4. X angle: Intercoccygeal angle, Y angle: Sacrococcygeal angle, Z length: Coccyx length.

A statistically significant difference was observed in the NPRS scores of the patients according to time (Table 1) ($p<0.05$). The mean time of pain relief of more than 50% was 1.25±1.22 (1st min–72 h) min. The mean NPRS scores were 2.38±2.26 at 1 h, 2.50±2.30 at 6 h, 2.50±2.21 at 24 h, 3.73±2.20 at 1 month, 4.46±2.14 at 6 months, and 5.23±2.52 at 1 year (Table 2).

Table 1. General descriptive statistics of measurements

	Mean	SD
Age	42.77	14.85
BMI	27.23	4.24
Duration of pain (months)	22.92	12.87
Procedure time (min)	3.19	0.90
Time of pain relief of more than 50% (min)	1.25	1.22
NPRS score at 1 h	2.38	2.26
NPRS score at 6 h	2.50	2.30
NPRS score at 24 h	2.50	2.21
NPRS score at 1 month	3.73	2.20
NPRS score at 6 months	4.46	2.14
NPRS score at 1 year	5.23	2.52
ICA	47.83	23.65
SCA	117.53	24.27
CL	33.62	6.06
	n	**%**
Gender		
Male	6	23.1
Female	20	76.9
PM		
1	5	19.2
2	16	61.5
3	3	11.5
4	2	7.7

PM: Postacchini and Massobrio classification; BMI: Body Mass Index; NPRS: Numerical pain rating scale; ICA: Intercoccygeal angle; SCA: Sacrococcygeal angle; CL: Coccyx length; SD: Standard deviation.

Table 2. Variation in NPRS scores over time

	Mean	SD	*p-value
NPRS score at 1 h	2.38	2.26	0.001
NPRS score at 6 h	2.50	2.30	
NPRS score at 24 h	2.50	2.21	
NPRS score at 1 month	3.73	2.20	
NPRS score at 6 months	4.46	2.14	
NPRS score at 1 year	5.23	2.52	

NPRS: Numerical pain rating scale; SD: Standard deviation.

The radiological measurements in our study were compared statistically according to the reference test values and the results were given (Table 3). According to this, in the ICA measurement, no statistically significant difference was observed when ICA: 47.9° was taken as a reference in the study by Kim and Suk ($p>0.05$).[7]

In the measurement of SCA, no statistically significant difference was observed according to its value when SCA: 115° was taken as a reference in the study by Özkal et al.,[6] ($p>0.05$).

In the CL measurement, a statistically significant difference was observed when CL: 37.8° was taken as a reference in the study by Marwan et al.,[8] ($p<0.05$).Therefore, the CL measurement of our sample was found to be statistically significantly lower than the literature value.

Table 3. Average values of radiologically measured angles

	n	Mean	SD	Test value	*p-value
ICA	26	47.8285	23.64681	47.9	0.988
SCA	26	117.5338	24.27212	115.0	0.599
CL	26	33.6196	6.06491	37.8	0.002

ICA: Intercoccygeal angle; SCA: Sacrococcygeal angle; CL: Coccyx length; SD: Standard deviation.

Table 4. Comparison results of measurements by gender

	Male		Female		
	Mean	SD	Mean	SD	*p-value
Age	43.33	9.83	42.60	16.27	0.927
BMI	29.07	5.01	26.69	3.96	0.330
Duration of pain (months)	33.50	17.82	19.75	9.41	0.027
Procedure time (min)	3.33	1.03	3.15	0.88	0.747
Time of pain relief of more than 50% (min)	1.00	0.00	1.32	1.38	0.608
NPRS score at 1 h	1.83	3.25	2.55	1.96	0.121
NPRS score at 6 h	2.00	3.16	2.65	2.06	0.183
NPRS score at 24 h	2.00	3.16	2.65	1.93	0.172
NPRS score at 1 month	2.67	3.20	4.05	1.79	0.167
NPRS score at 6 months	3.67	2.94	4.70	1.87	0.389
NPRS score at 1 year	4.50	3.83	5.45	2.06	0.538
ICA	57.61	14.79	44.89	25.28	0.201
SCA	107.17	22.96	120.64	24.34	0.301
CL	39.18	5.12	31.95	5.37	0.013

BMI: Body Mass Index; NPRS: Numerical pain rating scale; ICA: Intercoccygeal angle; SCA: Sacrococcygeal angle; CL: Coccyx length; min: Minute.

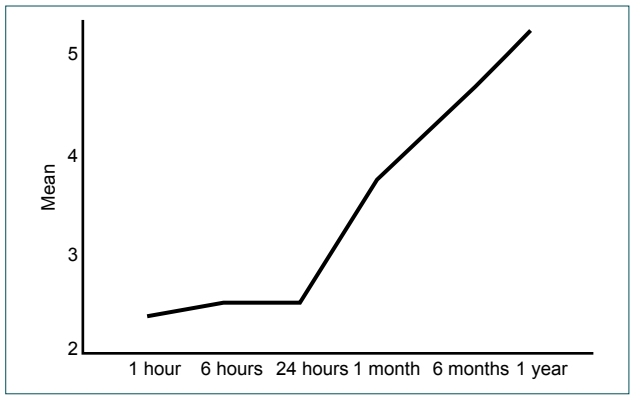

Figure 5. Change in NPRS scores over time.

The duration of pain varied according to gender and was found to be higher in male patients ($p<0.05$). There was no gender variability between the ICA and SCA measurements of the patients participating in the study. A statistically significant difference was observed in the CL measurement according to gender ($p<0.05$). According to this, the CL measurement varied according to gender and was higher in male patients (Table 4). According to the Postacchini and Massobrio classification of the treated patients, 16 were Type 2, five were Type 1, three were Type 3, and two were Type 4. There was an increase in NPRS scores according to the time since the procedure, but there was no significant difference between male and female genders (Fig. 5).

DISCUSSION

Coccydynia is a common disorder that many physicians encounter in their daily clinical practice and affects patients for a long time in their daily and social lives. In some studies, it has been observed that coccydynia is 5 times more common in women.[15] We found that the majority of the patients included in our study were women (76.9%).

In the treatment, primarily NSAID, donut pillow, manual palpation techniques, and transcutaneous electrical stimulation can be used.[9] In prolonged pain, ganglion impar block, epidural injection, radiofrequency ablation therapy, and coccygectomy are among the treatments applied.[16] In our study, we treated patients with chronic traumatic coccydynia who did not benefit from non-invasive conservative treatment methods for at least 6 months, using the ganglion impar block method.

The ganglion impar block was first defined by Plancarte and was performed using 22-gauge pre-bent spinal needles with fluoroscopy and entering through the anococcygeal ligament and palpating the rectum and coccyx with the index finger of the other hand.[10] However, it was observed that this method could cause needle breakage and rectal and vascular injuries, and some authors had 30% failure in their experience.[17] Based on these experiences, Wemm[18] and his colleagues described a transcoccygeal approach that is easier and safer to implement. In 2003, Grabow et al.[19] described the paramedian approach and Huang. described a lateral approach by inserting the needle underneath the transverse process of the coccyx.[20]

Various methods have been described for ganglion impar blockade. Mainly used methods include neural blockade, neurolysis, and radiofrequency ablation treatments. There is no consensus as to which method is the best.[21]

In a study conducted by Sencan et al.[22] in 2019, corticosteroid and local anesthetic injection was given to one group, while only local anesthetic was administered to the other group. At the end of 3 months, the results of injections with the addition of corticosteroid injection were found to be significantly more satisfactory. In 2018, the results of ganglion impar block performed by Nalini et al.,[23] with 100% alcohol in five patients with perineal pain caused by cancer were followed up for 3 months and they achieved a significant decrease in VAS scores.

Kircelli et al.[24] have a study of 19 patients in which they performed ganglion impar radiofrequency thermocoagulation in 2018. Only eight of the patients in this study were treated for posttraumatic coccidynia. However, they emphasized that their patients had a significant reduction in pain during their follow-up.

In a study by Sencan et al.,[25] in 2022, caudal injection and ganglion impar block were applied to patients with chronic coccyx pain and were followed up for 3 months. It was observed that the results of patients who underwent ganglion impar block in the short-term were better, and it was emphasized that the caudal block method could be preferred in patients with low back pain accompanying coccyx pain. While the sacrococcygeal disc is rich in glycoprotein in the 1st years of life, it ossifies later.[26] This may complicate needle entry from the sacrococcygeal region. Considering this difficulty, Munir et al.[27] published their study in 2004 in which they applied the modified needle-inside-needle technique. In this study, a 25-gauge needle was passed through a 22-gauge needle. In 2006, Foye et al.[28] described the injection made between the 1st and 2nd coccygeal segments with the intercoccygeal approach. In this study, we used the needle-inside-needle technique from the intercoccygeal region.

The superiority of the transsacrococcygeal or intercoccygeal method is not clear in the literature, while the use of these methods also varies according to the experience of the physician performing it.[29]

The development of the ganglion impar block, which started from the anococcygeal region, progressed with a process that continued with transsacrococcygeal, intercoccygeal, and paramedial approaches.[11]

Fluoroscopy, USG, CT, and MRI are used for performing ganglion impar block in various studies. Fluoroscopy is one

of the most frequently used methods to determine the insertion site and orientation of the needle, as well as to determine the distance from the rectal and vascular structures.[2] There is no clear information about the superiority of imaging methods in the literature and it usually changes depending on the experience of the person applying it.[9] Fluoroscopy was used in all patients in this study. In this method, radiation exposure, the inexperience of the performing physician, and the need for a radiolucent table can be counted among the disadvantages.

The presacral space is defined as the area between the posterior wall of the rectum and the anterior wall of the sacrum. In studies, when midsagittal MR was examined, it was observed that the gap decreased going down from S1, with an average of 10.6 mm–16.2 mm.[30] In most studies, patients were given contrast material to determine the right place before injection. We saw that we were in the presacral space by moving forward until a loss of resistance was felt in the midline and posterior of the coccyx under fluoroscopy control, and therefore, we did not administer contrast material to any of our patients. There were no complications during or after the procedure in any of the patients.

According to the Postacchini classification, the coccyx is classified in four ways. Type 1: The coccyx is slightly inclined forward. Type 2: The coccyx is clearly sloping and angled anteriorly. Type 3: The coccyx is sharply angled forward. Type 4: Subluxation of the sacrococcygeal joint or intercoccygeal joint. Postacchini found the most common type to be Type 1 in his study on patients with idiopathic coccydynia, while Yoon et al.[31] found Type 2 most frequently in their study on asymptomatic patients.[5] In our study, we found Type 2 in 16 patients (61.5%) as the most common type.

Although both X-rays and MRI are used in patients with coccydynia, X-rays are more often preferred in terms of being both cheap and fast.[6] In all patients in this study, direct X-rays were used.

The ICA is the angle between the first segment and the last segment of the coccyx, and in their study Kim et al.[7] showed that this angle is a useful angle in the evaluation of coccyx deformity and that there is no significant difference between asymptomatic individuals and patients with traumatic coccydynia. In this study, ICA values were found to be similar to those in the studies by Kim et al. and Yoon et al.

The angle between the line lying between the midpoint of the S1 upper endplate and the midpoint of the C1 upper endplate and the line between the midpoint of the C1 upper endplate and the coccyx tip was evaluated as the SCA. In our study, the mean SCA was found to be 117.53°. This appeared to be similar to the measurement previously made in patients with coccydynia.[6] Furthermore, Yoon et al.[31] found the mean SCA value of 110° in 606 patients.

The CL is the distance from the upper midpoint of the first coccygeal segment to the coccyx tip. The mean CL was found to be 37.8 mm in the literature, and it was found to be 26 mm in our study.[8]

Since this study was planned retrospectively, the evidence value is low compared to randomized controlled studies. Since the number of patients is small and the study is a single-center study, it is weak in reflecting the general population. In addition, no comparison was made with other methods using a single method.

Conclusion

According to the data obtained from this study, the long-term results of ganglion impar block in patients with coccydynia are effective. Our study shows that as an alternative in patients with chronic traumatic coccydynia, the long-term results of the needle-inside-needle method from the intercoccygeal region without contrast material are safe and reliable.

Ethics Committee Approval: This study was approved by the SANKO University Clinical Research Ethics Committee (Date: 13.04.2022, Decision No: 2022/04).

Peer-review: Externally peer-reviewed.

Authorship Contributions: Concept: O.K.; Design: O.K., M.G.; Supervision: O.K.; Data: O.K., M.G., B.B., E.İ.; Analysis: O.K., M.G., B.B., E.İ.; Literature search: O.K., M.G., B.B., E.İ.; Writing: O.K., M.G., B.B., E.İ.; Critical revision: O.K., M.G., B.B., E.İ.

Conflict of Interest: None declared.

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ORİJİNAL ÇALIŞMA - *ÖZ*

Travmatik koksidinide floroskopi eşliğinde kontrast madde verilmeden yapılan ganglion impar blokajı: Değiştrilmiş bir yöntem ve bir yıllık sonuçları

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AMAÇ: Bu çalışmada kronik travmatik koksidinili hastalara floroskopi yardımlı interkoksigeal bölgeden kontrast madde verilmeden needle-inside-needle tekniği ile ganglion impar blok uygulanarak yeni bir yaklaşım sunulmaktadır. Bu yaklaşımla kontrast madde kullanımının maliyeti ve olası yan etkileri önlenebilir. Ayrıca bu yöntemin uzun dönemdeki etkisini de incelemiş olduk.
GEREÇ VE YÖNTEM: Çalışma geriye dönük olarak tasarlandı. Belirlenmiş alana 21 gauge enjektör ile girildi ve lokal infiltrasyon ile 3 cc %2 lidokain subkutan uygulandı. Kılavuz 21 gauge 50 mm iğne ucuna 25 gauge 90 mm spinal iğne yerleştirildi. İğne ucunun yeri floroskopi altında kontrol edilerek 2 ml %0.5 bupivakain ve 1 ml betametazon asetat karıştırılarak uygulandı.
BULGULAR: Çalışmaya 2018–2020 yılları arasında toplam 26 kronik travmatik koksidini hastası katılmıştır. Ortalama işlem süresi yaklaşık 3.19 dakikadır. Ağrının %50'den fazla azalma süresi ortalama 1.25±1.22 (1.dk-72 saat) dakika idi. Ortalama NPRS puanları birinci saatte 2.38±2.26, altıncı saatte 2.50±2.30, 24 saatte 2.50±2.21, birinci ayda 3.73±2.20, altıncı ayda 4.46±2.14 ve birinci yılda 5.23±2.52 idi.
TARTIŞMA: Çalışmamız kronik travmatik koksidinili hastalarda alternatif olarak interkoksigeal bölgeden needle-inside -needle yönteminin kontrast madde verilmeden yapılan uygulamanın uzun dönem sonuçlarının güvenli ve uygulanabilir olduğunu göstermektedir.
Anahtar sözcükler: Ganglion impar; koksidini; Walther ganglionu.

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