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ORIGINAL ARTICLE

Providing Satisfactory Improvement in Patients with Persistent Coxadydinia via Ganglion Impar Block

Ganglion İmpar Bloğu İle Dirençli Koksadinisi Olan Hastalarda Tatmin Edici İyileşme Sağlanması

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ABSTRACT

Aim: Coccydynia is a painful condition of the end of the spine, the most common etiological cause of which is direct-indirect trauma. In acute cases, healing is usually achieved by conservative treatment, while in more persistent cases, interventional treatment methods come to the fore. The injections, which usually consist of combinations of local anesthetics and corticosteroids, can be administered directly into the posterior coccygeal area as well as into the pre-coccygeal area under fluoroscopic control. The preferred pre-coccygeal block is the impar ganglion block. There are many different technical variations of this block technique. The current study aims to present the 1-year results of patients undergoing trans-coccygeal injection of ganglion impar bupivacaine plus methylprednisolone for resistant post-traumatic coxadynia.
Methods: Patients with posttraumatic coxadynia treated with impar ganglion block between October 2019 and April 2021 were retrospectively evaluated. Patients over 18 years of age at the time of injection, whose symptoms persisted for more than 6 months, and not responding to conservative treatment were included in the study. The visual analog scale (VAS) score SF -36 and Pittsburg Sleep Quality Index (PSQI) measurements recorded during the outpatient examination of patients before the procedure were evaluated. VAS, SF-36, and PSQI evaluations were repeated in all patients by calling them for the final control in the 6th month after the injection.
Results: When comparing our patients' assessments before the intervention and controls at month six, there was a significant decrease in VAS score, a significant improvement in SF -36 subcategories, and a significant increase in Pittsburgh Sleep Quality Index scores. ($p < 0.001$)
Conclusion: Ganglion impar injection is a treatment method that can help relieve pain, improve sleep quality, and improve daily life functions in cases that do not respond to medical treatment and lifestyle modification.

Keywords: Bupivacaine, ganglion impar blockade, methylprednisolone, Pittsburgh Sleep Quality Index, post-traumatic coxadynia, visual analog scale

ÖZ

Amaç: Koksidini, en sık etiyolojik nedeni direkt-indirekt travma olan, omurganın uç kısmının ağrılı bir durumudur. Akut vakalarda genellikle konservatif tedavi ile iyileşme sağlanırken, daha inatçı vakalarda girişimsel tedavi yöntemleri ön plana çıkmaktadır. Genellikle lokal anestezik ve kortikosteroid kombinasyonlarından oluşan enjeksiyonlar, floroskopi kontrolünde, doğrudan posterior koksigeal bölgeye uygulanabileceği gibi, prekoksigeal bölgeye de uygulanabilmektedir. Tercih edilen prekoksigeal blok impar ganglion bloğudur. Bu blok tekniğinin birçok farklı teknik varyasyonu vardır. Bu çalışma, dirençli travma sonrası koksadinia nedeniyle transkoksigeal ganglion impar bupivikain artı metilprednizolon enjeksiyonu uygulanan hastaların 1 yıllık sonuçlarını sunmayı amaçlamaktadır.
Gereç ve Yöntemler: Ekim 2019 ile Nisan 2021 tarihleri arasında impar ganglion bloğu ile tedavi edilen travma sonrası koksadinisi olan hastalar geriye dönük olarak değerlendirildi. Enjeksiyon sırasında 18 yaş üzerinde olan, semptomları 6 aydan uzun süredir devam eden ve konservatif tedaviye yanıt vermeyen hastalar çalışmaya dahil edildi. Hastaların işlem öncesi ayaktan muayenesi sırasında kaydedilen VAS, SF-36 ve Pittsburg Uyku Kalitesi İndeksi ölçümleri değerlendirildi. Tüm hastalara enjeksiyon sonrası 6. ayda son kontrole çağrılarak VAS, SF-36 ve Pittsburg Uyku Kalitesi İndeksi değerlendirmeleri tekrarlandı.
Bulgular: Hastalarımızın girişim öncesi ve altıncı aydaki kontrol değerlendirmeleri karşılaştırıldığında, VAS skorunda anlamlı düşüş, SF-36 alt kategorilerinde anlamlı iyileşme ve Pitssburgh Uyku Kalitesi İndeksi skorlarında anlamlı artış görüldü. ($p < 0,001$)
Sonuçlar: Ganglion impar enjeksiyonu, tıbbi tedaviye ve yaşam tarzı değişikliğine yanıt alınamayan durumlarda ağrının giderilmesine, uyku kalitesinin iyileştirilmesine, günlük yaşam fonksiyonlarının iyileştirilmesine yardımcı olabilecek bir tedavi yöntemidir.

Anahtar Kelimeler: Bupivikain, ganglion impar blokajı, metilprednizolon, Pittsburgh Uyku Kalitesi İndeksi, posttravmatik koksidini, VAS skoru

Introduction

The coccyx contributes to rectal control by providing an attachment point for the muscles that support the pelvic floor and, together with ischial tuberosity, forms tripodal support in the sitting position. Anatomical studies have shown that there are many variations, with partial or complete fusion observed at different levels (1). The coccyx is associated with the sacral nerve roots and the terminal ganglion of the sympathetic ring (2). The ganglion impar (Walther's ganglion) forms the termination of the paravertebral sympathetic chain. Although it is normally located at the level of the sacrococcygeal joint, in cadaver studies, it has been found that its height can vary by an average of 1.9 cm

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(3).

The term coccydynia refers to a painful condition in the last part of the spine. Although this term was first used by Simpson in 1859, the history of intervention for pain in the coccyx dates back to the ancient Greek physician Paul of Aegina (4). Coccydynia may occur with direct trauma, at birth, or through an unknown etiology. High body mass index and female sex have been reported as risk factors for coccydynia (5). The most common etiologic causes are direct or indirect trauma. The mechanism of trauma is often a backward fall (6). It has also been reported that prolonged sitting in hard and uncomfortable areas can cause coccydynia with a cumulative effect (7).

The predominant symptom of patients is pain over the coccyx, which worsens when sitting. The pain may be aggravated by defecation and sexual intercourse. On physical examination, there is usually pain on direct palpation of the coccyx. Radiologic evaluation is primarily done by direct radiography. Postacchini and Massobrio described six different configurations of the coccyx (2,8) (Figure 1). Instability of the coccyx has been reported to be more common in traumatic coccydynia cases than in non-traumatic cases (5).

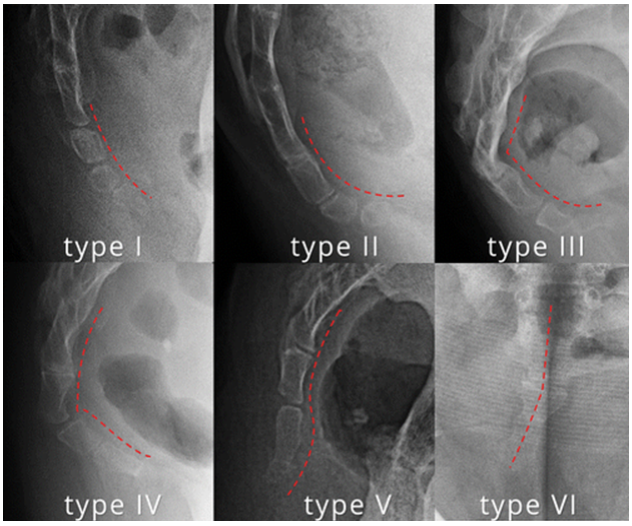

Figure 1. Classification of coccygeal angulation by Postacchini and Massobrio. Type 1 has a slight curvature, type 2 has an anteriorly increasing curvature, type 3 has a sharp angle, type 4 has a subluxation, type 5 has a retrusion of the coccyx and a bony spur, and type 6 has a scoliotic deformity.

Since, in most cases, there is a high rate of regression, conservative treatments are often preferred among the treatment options during the first stage (9). Many different studies have reported a very high success rate with conservative treatment (10).

Seat rings, coccyx triangle pillows, hot or cold baths, manual therapy, relaxation exercises for the levator ani, postural training, transcutaneous electrical stimulation, and topical or oral non-steroidal anti-inflammatory drugs (NSAIDs) are the preferred methods of conservative treatment. In patients not benefiting from any of these treatments, injection, and radiofrequency thermocoagulation treatments are the mainstay (11). Many different techniques have been described for the localization, content, and supporting imaging techniques of the injection in the treatment of coccydynia (11,12).

Injections, usually consisting of combinations of local anesthetics and corticosteroids, can be administered directly into the coccyx and can also be combined with rectal manipulation (13). Ganglion impar block is an acceptable treatment modality among injection treatments, with proven efficacy. This technique, first described by Plancarte for the treatment of cancer cases with pelvic metastases, has evolved and has been performed in several variants (14). Today, ganglion impar block is used in the treatment of many different types of pain and perianal hyperhidrosis (15), except for oncological pain and coccydynia (16). Anatomical studies have shown that the ganglion impar may be located at the sacrococcygeal joint, at the level of the coccyx, or the coccygeal type (3). The drugs used during the injection are essentially local anesthetics, corticosteroids, or neurolytic agents (14). Although the technique can be performed under fluoroscopy, USG (17) and CT-guided (18) blocks have also recently been described. In many of the techniques described, the trajectory of the needle may also differ: through the anococcygeal ligament (14), sacrococcygeal joint (19), intercoccygeal joint (20), bone segment (21), and paracoccygeal (20). The shape and structure of the needle to be used for injection may also vary. Curved needles, self-beveling needles, and a guided needle sent through a large-diameter guide needle can be used (14).

In addition to the proponents of exclusively conservative treatments with injections and manipulative techniques (22), some authors have reported good results with the option of coccygectomy in cases that do not respond to conservative treatments (23). Although more than a thousand years have passed since the definition of this disease, we are still far from a universally accepted treatment protocol for cases of resistant coccydynia.

Our study aimed to show the results of resistant coccydynia cases in which we performed a ganglion

impar blockade under fluoroscopy with the treatment algorithm that we used in our clinic, with a 1-year follow-up.

Materials And Methods

A pre-study power analysis based on previous data determined a sample size of at least 18 patients to reach the desired power of > 0.8. Pre- and postoperative VAS score was the primary outcome for two means T-test power analysis (12,24).

Patients were evaluated retrospectively after approval was obtained from the Gaziosmanpaşa University Clinical Research Ethics Committee (Decision No: 24-KAEK-109). The study was conducted under the principles of the Declaration of Helsinki.

Patients with posttraumatic coccydynia treated with impar ganglion block between October 2019 and April 2021 were retrospectively evaluated. Cases were included in the study if they were over 18 years of age at the time of injection, had a symptom duration of more than 6 months, and had failed at least two different treatments in the previous 6 months (drug pain management, manual therapy, use of a sitting ring, and superficial injection). Before the ganglion impar block, all patients received seat rings and oral and local treatment with non-steroidal anti-inflammatory drugs for 6 months. All patients received 750 mg of naproxen once daily for the first month after the block. Patients not adhering to the pre-and post-blockade treatment protocol and patients with known systemic inflammatory diseases, previous pelvic metastases, and a history of coccygectomy, pilonidal sinus surgery, colorectal surgery, rectal prolapse surgery, and rectal incontinence surgery were excluded from the study. (Figure 2)

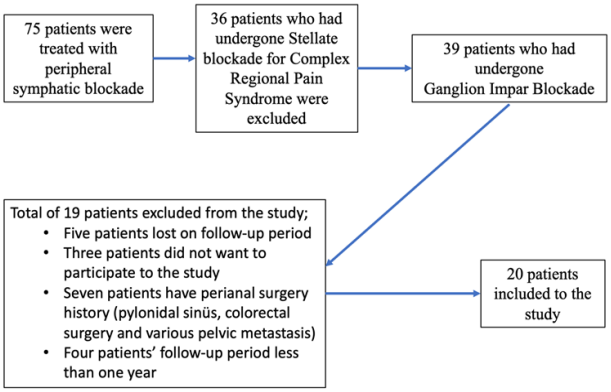

Figure 2. Flow chart presenting how the patients participated in our study under the inclusion and exclusion criteria.

All patients participating in the study were asked to complete an assessment form containing the Visual Analogue Scale (VAS), the Short Form Survey 36 (SF-36), and the Pittsburg Sleep Quality Index (PSQI) before the block procedure. The same assessment forms were repeated for all patients attending the first-year follow-up.

Radiological Technique: Before the procedure, all patients were placed on the operating table in the prone position, and the injection level was determined by a lateral view of the coccyx with a Philips BV Pulsera (Koninklijke Philips Electronics N.V., 5602 BG Eindhoven, the Netherlands) C-arm fluoroscopy device. After obtaining a lateral radiograph containing the sacrococcygeal joint and at least two coccygeal segments, the injection was started.

Injection Technique: Before the procedure, the patients underwent noninvasive cardiac monitoring and oxygen saturation monitoring with a saturation probe. While the patient was in the prone position, the injection level was first determined in the ap plane on the fluoroscopic table. Then, the fluoroscopy was positioned to take a lateral view, and the injection level was accurately determined in the lateral plane (Figure 3). After determining the injection level, subcutaneous infiltration anesthesia was performed with 2 ml of 0.25% bupivacaine using a 27 G x 2'' injector (Setocoject, Set Medikal, Istanbul, Turkey). Then, an 18G Quincke needle (Egemen International, 5514, İzmir, Turkey) was inserted into the lowest intercoccygeal space, visualized in lateral projection by fluoroscopy, with the stylet needle inside. In the case of possible intercoccygeal fusion, the needle was advanced under fluoroscopy control with circular movements together with the stylet. The solution prepared by diluting 1 ml of 74% ioversol solution (Optiray 350, Mallinckrodt Canada ULC, Pointe-Claire, Quebec, Canada) with 4 ml of saline was introduced into the area under fluoroscopy. Therapeutic injection was performed after the region was deemed suitable (Figure 4). Next, 10 ml of injection content, prepared by mixing 1 ml 40 mg methylprednisolone acetate (Depo-Medrol 40 mg/ml vial) 9 ml 0.5% bupivacaine hydrochloride (Buvicaine, Polifarma İlaç Sanayi Tekirdag, Turkey), was applied to the area. For final confirmation of the suitability of the injection site, it was recorded whether the contrast trace was obliterated. Heart rate and saturation were monitored during and for the first 5 minutes after injection. Cases without side effects (cardiac arrhythmias, low saturation, tinnitus,

metallic taste in the mouth, and dizziness) were referred for the service. The patients monitored for side effects in the service with blood pressure, fever, satiety, and heart rate monitoring at 15-minute intervals were mobilized and discharged after one hour of follow-up. No additional treatment protocol was applied to the patients in the postoperative period, and they were informed that they should not receive analgesic medical treatment.

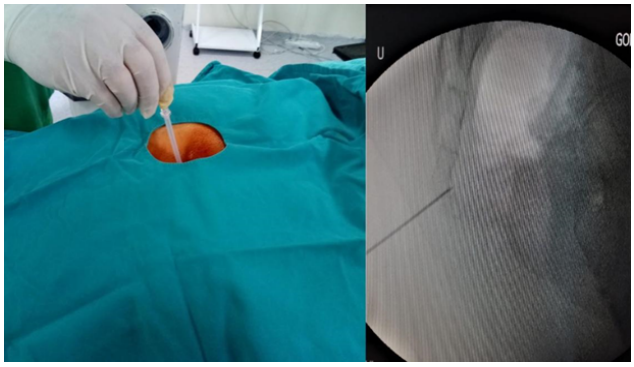

Figure 3. Advancing to the injection site with the lateral coccyx fluoroscopy before the procedure.

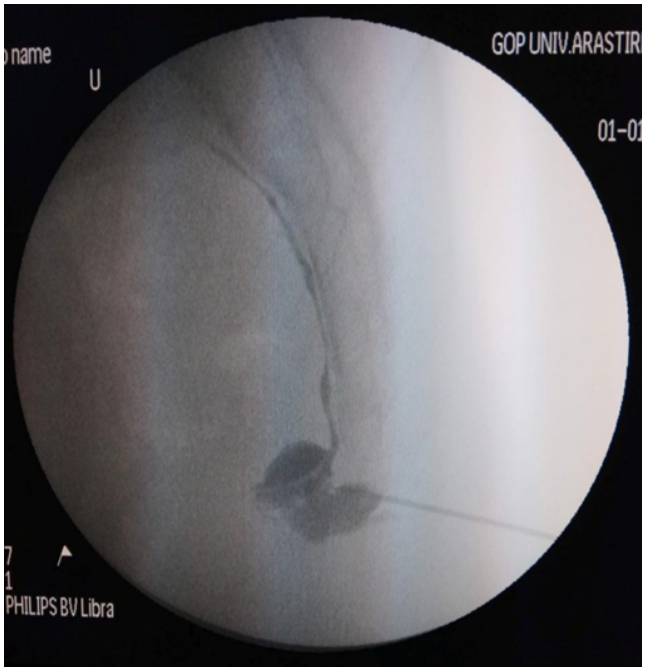

Figure 4. The contrast material image formed on the lateral radiograph after the injection of diluted radiographic contrast material was obtained to confirm that it was in the correct location.

Statistical analysis

Descriptive analyses were performed to obtain information on the general characteristics of the study groups. Data on continuous variables are reported in terms of mean ± standard deviation; data on categorical variables are reported as n (%). The Paired Sample-t test was used to compare the means of the measurements before and after the study. Pearson's correlation coefficient was used for the relationship between the quantitative variables. P-values below 0.05 were considered statistically significant. Prepackaged statistical software was used for the calculations (IBM SPSS Statistics 20, SPSS Inc., IBM Co., Somers, NY).

Results

Twenty patients meeting the study criteria and followed up for one year were included in the study. The mean age of the patients enrolled in the study was 41.05 ± 11.27 years (20–70). There were 17 female (85%) and three male (15%) patients. The mean symptom duration of the patients was 22.25 ± 17.06 (6–60) months. It was observed that pain started after falling in 18 patients (90%) and after heavy lifting in two patients (10%) (Table 1).

Table 1. Demographic characteristics of patients

Age (years)	41.05±11.27
Gender (Female/Male)	17/3
Follow-up period (months)	12,42
Symptom period (months)	22.25±17.06

When the scores of our patients were compared before the intervention and at the controls at the one year, there was a significant decrease in the VAS score ($p < 0.001$). The evaluation of the SF-36 score revealed a statistically significant increase in the subcategories of physical function, physical role limitation, emotional role limitation, energy/fatigue, emotional well-being, social function, pain, general health, and health change ($p < 0.001$). When patients' sleep quality was assessed with the Pittsburgh Sleep Quality Index (PSQI), it was found that there was a significant increase in sleep quality scores after the injection ($p < 0.001$) (Table 2).

Table 2. Differences in clinical and functional scores before and after the interventions

	Pre-injection	Post-injection	p
VAS	9.35±0.99	3.1±2.05	<0.001
SF-36	45.25±11.86	75.5±10.87	<0.001
Physical function	45.25±11.86	75.5±10.87	<0.001
Physical restriction	25±18.14	62.5±19.02	<0.001
Emotional restriction	29.99±21.36	66.68±24.19	<0.001
Energy/fatigue	37.25±12.3	56±13.14	<0.001
Emotional wellness	43.6±10.61	60.6±12.33	<0.001
Social function	45.63±16.36	51.87±13	0.144

Pain	17.88±12.28	62.88±13.84	<0.001
Overall health change	33.75±9.01	55.75±13.6	<0.001
Health change	43.75±11.11	66.25±16.77	<0.001
Pitsburg sleep quality index	12.3±2.11	5.25±2.43	<0.001

The Paired Sample-t test was used to compare the means of the measurements before and after the study. A p-value was considered statistically significant if they were less than 0.05. VAS: Visual analog scale

No hematomas, superficial or deep infections, or persistent pain were observed at the injection sites of the patients participating in the study.

Discussion

The results of our study show that the ganglion impar block performed in our patients with refractory coxadonia led to a successful improvement in pain, sleep quality, and activities of daily living at the end of the one-year follow-up.

Although coccydynia can occur due to more than one etiological cause and has been defined for more than 100 years, its treatment can be difficult and complex due to unique diagnostic criteria and more than one cause (25). The ganglion impar in the sacrococcygeal region has nociceptive fibers, and successful results can be achieved with the blockade of this ganglion in cases where conservative treatment is unresponsive (26). Impar ganglion blockade has been shown in our results to be an effective method for pain relief and functional recovery. The summary of similar studies is shown in Table 3.

The age, sex, and etiological factors of the patients examined in our study were consistent with previous studies in the literature. Fogel et al. reported that women were affected about five times more often than men (27). Other studies on this topic have reported that admissions due to coccydynia are more common in the fifth decade of life and that they occur most frequently after falls on the coccyx (26,27).

In a study by Maigne et al., a stable coccyx, short duration of symptoms, and onset after trauma were reported as good prognostic factors in patients treated for coccydynia (28). In a study conducted by Mitra et al. on a series of 14 patients, it was found to result in significant improvement in VAS grade in acute and chronic cases after fluoroscopically guided steroid injection (12). Sencan et al. found a significant improvement in VAS and functional scores in patients with a mean symptom duration of 25.9 months in the first three months (29). Since about 90% of our patients had fallen before their symptoms appeared, we believe that they benefited from ganglion-impar blockade at the optimal level.

In a study by Şencan et al., the efficacy of the use of steroids in ganglion impar blockades was compared with the use of only local anesthetics (30). They found that the rate of pain relief after surgery did not change with the two methods; however, the reduction in pain level was significantly better in the third-month control in the steroid supplement group. Glucocorticoids act by preventing the secretion of many cytokines that can cause pain, thanks to their receptors, antidepressant properties, and anti-inflammatory action in centers where pain pathways predominate, such as the hippocampus and the amygdala (31). In addition, corticosteroids have been shown to have direct neural antinociceptive effects in experimental studies (31). In their study, Gunduz et

Tablo 3. The studies on transcoccygeal ganglion impar blockade.

Author	Mitra et al. 2007 (n=12)	Gunduz et al. 2015 (n=24)	Sencan et al. 2018 (n=29)	Sencan et al. 2019 (n=30)	Buttaci et al. 2005 (n=32)	Gonnade et al. 2017 (n=26)	Our study
Number of Patients	14	22	28	34	6	31	20
Age (years)	43.4	41	43.7	38.1	N/A	42.9	41
Gender (M/F)	7/7	2/20	5/23	6/28	N/A	13/18	3/17
Follow-up time (months)	N/A	6	6	3	N/A	6	12.42
Symptom Period (months)	N/A	N/A	25.9	16	N/A	N/A	22.2±17
Block Technique	TC	TC	TC	TC	N/A	TC	TC
Drugs	L+TA	B+MP	B+MP	B+MP	B	B+MP	B+MP
Scores	VAS >50% impro-vement	VAS 9□2.5	VAS 7.8□3.8 LANSS 15.1□6.82	NRS 7.8□4.9	VAS >50% improvement	NRS 7.9□3.2 ODI 48.9□26.1	VAS 9.3□3.1 SF-36 45.2□75.5

TC: Transcoccygeal, L: Lidocaine, TA: Triamcinolone acetate, B: Bupivacaine, MP: Methylprednisolone, NRS: Numeric rating scale, ODI: Oswestry disability index, LANSS: Leeds assessment of neuropathic symptoms and signs scale, VAS: Visual analog scale

al. showed that the analgesic effect lasted six months or longer in patients receiving a combined injection of local anesthetics and corticosteroids (24). On the other hand, studies examining the results of blockades with only one local anesthetic have reported that the analgesic effect disappears within a few weeks, and repeated injections are required (32). We believe that the significant improvement in our patients' outcomes at one-year follow-up in ganglionic impar blockade, which we performed by combining local anesthetics with long-acting corticosteroids, compared with the initial phase, is due to the neuromodulatory effect of corticosteroids, as found in previous studies.

Pain is the main problem for patients when sitting and sleeping while suffering from coccydynia. In our study, we investigated the sleep quality of patients and their changes in daily life after receiving bupivacaine plus methylprednisolone injection. A study by Sencan et al. reported that the sitting time of patients receiving bupivacaine plus methylprednisolone injection increased significantly after the procedure, but this was not sufficiently reflected in the SF-12 scores (29). With the results we obtained, a significant and durable improvement in both the SF-36 and PSQI scores at the one-year follow-up was observed. Our study is the first to investigate the relationship between ganglion impar block and sleep quality.

The ganglion impar is the last link of the sympathetic chain located in front of the coccyx and, unlike other sympathetic ganglia, is a single ganglion in the middle. It is involved in sensory and sympathetic innervation of the pelvic organs and perineal region (33). Ganglion impar block was first described by Plancart in 1990 and is performed with a retrograde needle through the anococcygeal ligament (14). Due to the risk of complications, such as infection and rectal perforation, that may accompany it, the method defined by Wemm and Saberski was developed and started to be applied via a guide needle originating from the sacrococcygeal junction (19). The success of ganglion impar blockade depends on the correct determination of the anatomical location of the ganglion and the appropriate placement of the needle (3,34). In studies performed on cadavers by Oh et al., it was shown that the ganglion impar is usually located 8.6 mm distal to the sacrococcygeal junction and 25 mm proximal to the coccygeal type (3). When the contrast medium is sent through the guide needle under fluoroscopy, the placement of the needle and the area where the drug is to be distributed is confirmed by the formation of a comma in front of the coccyx. Because there are no standard treatment methods in the treatment of coccydynia, the profit-and-loss ratios of the treatments to be used should be well thought out and decided. Although rare, rectal rupture, neuritis, and cauda equina syndrome may occur after ganglion-impar blocks (35). No complications were observed in our patients.

The lack of a control group, the limited follow-up period of 12 months, and the lack of interim controls were the limitations of our study. Our strengths were that our study was performed in a single center by a single surgeon and that it was supported by more than one functional scoring. In other studies in the literature, patients were assessed using the VAS and SF-12 only.

Conclusion

Ganglion impar blockade is a method that leads to successful pain relief and improvement of daily functions in cases where drug treatment and lifestyle changes are not possible.

Authors' Contributions

MG and MBE conceived of the presented idea. MG and MBE developed the theory and performed the computations. US verified the analytical methods. MG and US collected data. MG wrote the manuscript with the support of MBE. MG supervised the project.

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