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Ganglion Impar block improves neuropathic pain in coccygodynia: A preliminary report

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ABSTRACT

Aim of the study: To define the effectiveness of ganglion Impar block in improving neuropathic pain.

Materials and methods: Patients who had pain around the coccyx for more than three months and did not respond to conservative treatment were included in this study. All the patients underwent fluoroscopy guided transsacrococcygeal ganglion Impar block with injecting 3 mL of 0.5% bupivacaine, 2 mL saline, and 1 mL (40 mg) of methylprednisolone. Patients were evaluated with visual analog scale (VAS) for pain, Leeds assessment of neuropathic symptoms and signs scale (LANSS) for neuropathic pain, Beck depression Inventory (BDI) for mood and Short-form 12 (SF-12) for quality of life before, 1 month 3 months and 6 months after the injection. Patients' painless sitting duration was also recorded.

Results: A total of 28 patients were included in the final analyses. VAS and LANSS scores improved significantly throughout the follow-up periods. BDI scores also improved while SF-12 scores did not show significant changes. Painless sitting period of the patients' improved significantly.

Conclusions: Ganglion Impar block is effective in decreasing the neuropathic component of chronic coccygodynia. This improves painless sitting in patients but its reflections on quality of life is not clear.

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1. Introduction

Coccygodynia can be defined as pain around the coccyx, which usually worsens by prolonged sitting or changing positions from sitting to standing up. It is seen more frequently in women and can be related to trauma or giving birth [1]. The abnormal mobility of the coccyx is suggested as a risk factor, while it is seen more frequently in patients with increased body-mass index [2]. Coccygodynia is a relatively benign condition and responds well to conservative treatment such as the use of pressure relieving cushions and use of medical treatment like non-steroidal antiiflammatory drugs. However, in some cases, pain persists and requires interventional approaches [3].

Chronic pain of any etiology can have neuropathic components due to continuous neuroinflammation [4], which is also accompanied by central sensitization [5]. Chronic coccygodynia is not very different in mechanism than other causes of chronic musculoskeletal pain and therefore has neuropathic components. In both cases, a continuous inflammatory insult starts as a mechanical injury but turns into a chronic inflammatory state which may alter the responsiveness of the neurons involved in the pain pathways [6]. However, the incidence of neuropathic pain accompanying chronic coccygodynia is unknown.

Ganglion Impar block has been implemented as a relatively successful method in coccygodynia for the last twenty years. Ganglion Impar is the sympathetic ganglion located just anterior to the coccyx and responsible for the pain sensation of the coccyx and perineal area. Blocking of this ganglion has been shown to be safe and effective in coccygodynia [7–9]. Since it is a sympathetic ganglion, it would be involved in neuropathic processes [10], making it a sensible target in the presence of neuropathic pain.

The aim of this study is to document the effectiveness of ganglion Impar block in patents with neuropathic pain in the coccyxs accompanying chronic coccygodynia, that did not respond to conservative measures such as cushion use and medication. This study also investigated the effectiveness of ganglion Impar block in patients' painless sitting time and pain on palpation on the coccyx. The changed of quality of life and overall mood has also been documented.

2. Materials and methods

This study was conducted between April 2017 and September 2017 in Pain Medicine Clinic. Patients with coccygodynia between the ages of 18–65 who do not respond to conservative treatment for three months have been recruited and defined as patients with chronic coccygodynia. Exclusion criteria were: (1) Any previous injection to the coccygeal region, (2) allergic reaction history to local anesthetics, (3) present infection at the injection site, (4) presence of bleeding disorders, (5) coccygodynia associated with cancer metastasis or coccygeal fracture, (6) history of surgery in lumbar or coccygeal region and (7) having accompanying neurologic disorders that can cause neuropathic pain such as polyneuropathy. All patients underwent ganglion Impar block. Patients were not allowed to use any medication and all the previous medications were discontinued during the follow-up period. Patients were followed up one month, three months and six months after the injection. Therefore a single group repeated measures design was implemented. Patients' painless sitting periods (min) have also been recorded. In the final analyses, only patients who had neuropathic pain according to their Leeds assessment of neuropathic symptoms and signs (LANSS) scores were included. Patient selection and elimination algorithm have been described in Fig. 1. All patients gave written informational consent to be part of this study. This study was approved by the local ethical committee with the number of 2017/162.

2.1. *Ganglion Impar block*

One experienced pain medicine specialist has performed the GIBs under fluoroscopic guidance. With the patient prone, the intergluteal area was sterilized, and a small amount of local anesthetic (3 ccs 2% prilocaine, AstraZeneca, Turkey) was given at achieving blockade of cutaneous and subcutaneous tissues. The sacrococcygeal joint was visualized via digital subtraction angiography machine (Infinix-i Core Toshiba Medical Systems Tochigi, Japan). A 22-gauge spinal needle was used to reach the ganglion Impar. After a 1 mL injection of non-ionic contrast and spreading of the dye gives a ''reverse comma'' appearance in the lateral view, 3 mL of 0.5% bupivacaine (AstraZeneca, Turkey), 2 mL saline, and 1 mL (40 mg) of methylprednisolone (Pfizer, Turkey) were injected in the area (Fig. 2).

2.2. *Pain evaluation*

Patients' overall pain levels were evaluated with a 10 cm visual analog scale (VAS). Neuropathic component of the pain was assessed with the Leeds assessment of neuropathic symptoms and signs scale (LANSS). LANSS was developed by Bennett in 2000 to evaluate the neuropathic components of pain. It has one part of pain questions and a part to evaluate touch and pinprick sensation. On the LANSS Pain Scale, a score of 12 or more was classified as neuropathic pain, and a score under 12

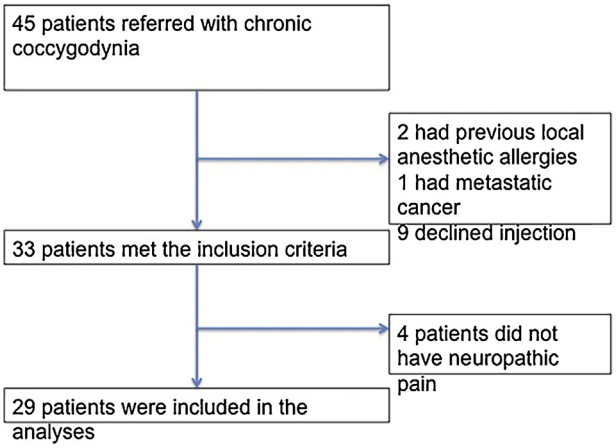

Fig. 1 – Patient recruitment flowchart.

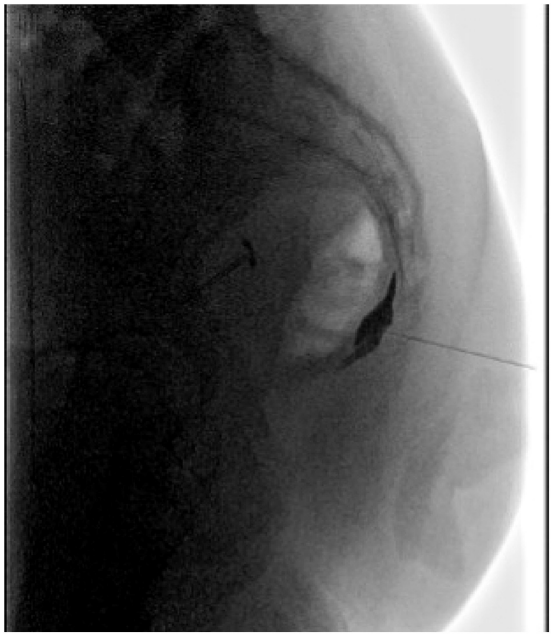

Fig. 2 – Fluoroscopic view of ganglion Impar block after the administration of contrast material.

was classified as nociceptive pain. It does not reflect the severity of pain or neuropathic pain itself, just the presence and absence of it. It is easily administered and validated in Turkish [11].

2.3. *Quality of life and mood evaluation*

Quality of life has been evaluated by short form 12 (SF-12). The SF-12 is a health-related quality-of-life questionnaire consisting of twelve questions that measure eight health domains to assess physical and mental health [12]. In the final analyses, patients' mood has been evaluated with Beck Depression Inventory (BDI). BDI is a 21-item, self-report rating inventory that measures characteristic attitudes and symptoms of depression. It is an easily applied self-reporting form, and it is validated in Turkish [13].

2.4. *Statistical analyses*

A post-hoc sample size analyses was performed after the finalization of the study. G-power software package for power analysis was used (ver. 3.1.6; Franz Faul, Kiel University, Kiel, Germany).The change in LANSS was used as the primary outcome measurement. Consequently, as 28 patients were included in the final analyses, the power of the study was calculated as 0.99 with an effect size of 8.6 and an α level of 0.05. All statistical analyses were performed using Statistical Package for the Social Sciences version 20.0 (IBM Corp.). Descriptive statistics were calculated and consisted of the mean, standard deviation (SD), 95% confidence interval (CI), and range. Tests of normality were done using Shapiro-Wilks normality test. According to the normality of the variable, one-way repeated measures ANOVA or Freidman tests were used for continuous variables. The significance of pairwise comparisons was calculated after Bonferroni corrections were made. The mean values were reported to give a better understanding of the data in Freidman analyses. When analyzing the presence of neuropathic pain after the injections, patients' LANSS scores were calculated and patients' neuropathic pain were determined absent or present. The significance of these changes were calculated with McNemar test since it is a within-subjects design with a dichotomous value. The level of significance was set at $p < 0.05$.

3. Results

28 patients were included in the final analyses. 23 of the patients were female (82.1%) with a mean age of 43.75 ± 11.74 (min: 20 max: 65). Mean BMI of the patients was 29.49 ± 4.27 (min: 20.2 max: 37.3). Mean symptom time was 25.9 ± 27.7 months (min:3 max:108). 19 patients had a history of trauma to the coccyx (67.9%).

When the patients VAS levels were analyzed, mean VAS before injection was 7.89 ± 0.2 [Confidence interval (CI) 7.38–8.40], while mean VAS after one month 2.39 ± 0.4 (CI 1.53–3.26), at three months 3.11 ± 0.5 (CI 1.95–4.26) and at six months 3.89 ± 0.6 (CI 2.56–5.22) (p values for all points are <0.0001). A similar change was seen in LANSS scores as well with mean LANSS scores before the injection were 15.1 ± 0.7 (CI 14.4–17.9), after one month 6.46 ± 1.15 (CI 4.09–8.84) after three months 5.82 ± 1.0 (CI 3.08–7.76) and after six months 6.82 ± 1.0 (CI 4.64–9.01) (p values for all follow up points are <0.0001) (Fig. 3). When calculated according to its guide, there were only 7 (25%) patients who had ongoing neuropathic pain after 1 month, 4 (14%) after 3 months and 5 (17%) after 6 months of the injection. McNemar tests determined these changes were also statistically significant ($p < 0.0001$ for each follow-up point).

When the patients' SF-12 scores were analyzed, there were significant improvements in SF-12 physical health domain in 1 month and 3 months after the follow-up, but this improvement seems to disappear after six months. SF-12 mental health domain showed a significant difference only on the 3rd month (Table 1). BDI scores improved significantly after the injection and this change continued throughout the follow-up period (Table 2). Patients' painless sitting period has also increased significantly after injection as it was 15.07 ± 2.99 min before the injection (CI 8.9–21.25), 82.38 ± 12.64 min after one month (56.34–108.48), 98.15 ± 12.30 (72.73–123.58) after three months and 82.11 ± 14.37 min (51.49–111.73) after six months ($p < 0.0001$ for all follow up points) (Fig. 4).

We have not seen any major adverse effect in these patients. Minor adverse effects involving vasovagal reaction and transient increase in pain were observed in only two of our patients.

4. Discussion

This study shows that ganglion Impar block can be effective in improving the neuropathic pain in coccygodynia. This

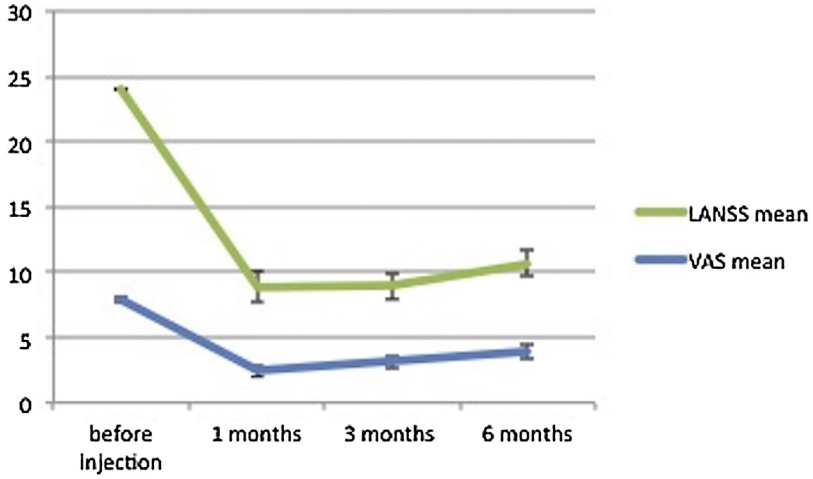

Fig. 3 – Changes of VAS and LANSS scores during follow-up period.

Table 1 – Changes in subscales of Short form-12 (SF-12) during follow-up. SD: standard deviation.

	Mean ± SD (95% CI)	Significance
SF-12 physical Before injection	33.92 ± 1.65 (30.52–37.32)	
SF-12 physical 1 month	41.14 ± 2.05 (36.93–45.35)	$p = 0.26$
SF-12 physical 3 months	42.38 ± 1.81 (38.65–46.11)	$p = 0.07$*
SF-12 physical 6 months	37.91 ± 1.59 (34.63–41.18)	$p = 0.55$
Sf-12 mental before injection	28.89 ± 6.59 (26.34–31.45)	
SF-12 mental 1 month	34.50 ± 9.09 (30.98–38.03)	$p = 0.62$
SF-12 mental 3 months	35.75 ± 10.23 (32.78–39.72)	$p = 0.16$
SF-12 mental 6 months	34.61 ± 9.18 (31.05–38.18)	$p = 0.69$

* shows statistical significance.

Table 2 – Changes in Beck Depression Inventory (BDI) scores throughout the follow-up. SD: standard deviation.

BDI	Mean ± SD (95% CI)	Significance
Before injection	23.37 ± 2.49 (18.24–28.50)	
1 month	14.48 ± 1.93 (10.50–18.45)	$p = 0.001$
3 months	13.96 ± 2.33 (9.17–18.75)	$p = 0.043$
6 months	13.03 ± 2.01 (8.89–17.18)	$p = 0.003$

improvement is accompanied by improved mood, improved painless sitting period and improved quality of life.

The concept of neuropathic pain has changed significantly over the last decade. It was described as 'pain initiated or caused by a primary lesion or dysfunction in the nervous system' by the International Association for the Study of Pain (IASP) in 1994. This description has been changed to 'pain arising as a direct consequence of a lesion or disease affecting the somatosensory system' in 2008 by a task force initiated by the IASP Special Interest Group on Neuropathic Pain (NeuPSIG) in order to describe neuropathic pain more definitively [14]. It has also been reported by NeuPSIG that nociceptive pain conditions may cause secondary lesions in the somatosensory nervous system could ultimately be considered as being partly neuropathic pain, especially over a long period [15]. Changes in the central nervous system in chronic pain patients such as central sensitization and decreased inhibitory signals showed that a neuropathic pathway is involved in chronic pain [16].

This is especially the case in coccygodynia, where chronic irritation of coccygeal nerve roots due to the biomechanical alterations in the coccyx is an important mechanism. It has been theorized that this nerve root irritation causes sympathetic over activity as well; making sympathetic blocks like ganglion Impar block a suitable choice [17]. Since the ganglion Impar is the relay point for the coccygeal pain, coccygeal nerve block alone may not achieve the same results, since it is a more peripheral approach. Also, the effectiveness of coccygeal block is not well-defined in coccygodynia while ganglion Impar block has shown to be successful many times in the literature, and with different modalities like radiofrequency ablation [18–20]. Inhibition of nociceptive transmission via the blocking of sympathetic nervous system has an analgesic effect and decreases sensitization. The simultaneous decrease of VAS and LANSS in this study points out that an improvement in its neuropathic component accompanies improvement in pain. This is logical and expected, but not documented before in the literature. It must also be kept in mind that LANSS cannot reflect the severity of pain, but the presence and absence of neuropathic pain, and must be considered along with VAS. The sympathetic component of pain has not been differentiated by diagnostic approaches in this study, which is a weakness.

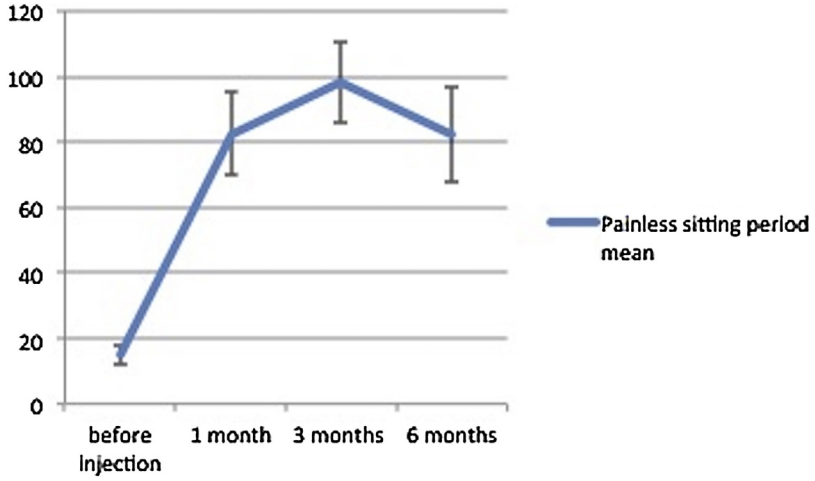

Fig. 4 – Change of painless sitting period during follow-up.

Further research comparing the different methods to different components of coccygodynia would give us more information about the mechanisms.

In this study, only four patients among the 33 referred to the pain clinic did not have neuropathic pain. It must be kept in mind that any study that is done in a pain clinic would be biased about the incidence of neuropathic pain. Coccygodynia is not a very common problem, which response relatively good to conservative measures such as pressure relief cushions and medications and must be treated conservatively when possible [21]. The patients referred to pain clinics are the small percentage of patients with coccygodynia that does not respond to conservative treatment. The incidence of neuropathic pain among these patients cannot be an indication of the overall incidence of neuropathic pain in coccygodynia. A study to determine this should be conducted in a primary care setting to give us realistic results. This is beyond the scope of this study, and it must be kept in mind that results of this study cannot indicate the real incidence.

In coccygodynia pain during sitting is usually the main problem of the patients. In this study, we have documented the painless sitting period of the patients during the follow up to evaluate the effect of the injection on patients' daily lives. This study showed that there is a significant improvement in this variable and this improvement kept on during the six months follow up period. However, this increase did not reflect the scores on SF-12. Existing quality of life measurements are not explicitly made for coccygodynia. Previous studies focused on pain [8,9] and disability [7], rather than the quality of life, probably because of this deficit. Developing a proper quality of life measurement is crucial in coccygodynia to assess the success of interventions, and this area is currently lacking.

One important limitation of this study is the limited number of patients involved. Even with a small sample, ganglion Impar block seems effective. However, to reach solid conclusions, larger studies implementing different injection techniques should be planned in the future. Another limitation is the relatively short follow-up period. Previous studies that span a longer time period showed that repetitive interventions for a sustained pain relief might be necessary in patients with chronic coccygodynia [8]. In this study, all the patients have received just a single injection, and it would be impossible to comment on long-term effects of ganglion Impar block on neuropathic pain with the results of this study.

5. Conclusion

Ganglion Impar block is effective in improving the neuropathic component of coccygodynia along with overall pain sensation and painless sitting period. The exact effects of these improvements on patients' quality of life remain unclear.

Conflict of interest

None declared.

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None declared.

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