

Comparative evaluation of transsacrococcygeal and transcoccygeal approach of ganglion impar block for management of coccygodynia

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Abstract

Background and Aims: Coccygodynia or Coccydynia is pain in the area of coccyx and ganglion impar block is commonly used technique for treatment of coccygodynia.

Material and Methods: Forty patients of either sex in the age group of 20-70 years suffering from coccygodynia, who failed to respond to six weeks of conservative treatment were enrolled in the study. All patients were subjected to detailed clinical history, examination in the Pain Management Centre (Pain Clinic) of our Institute and imaging studies were reviewed. The patients were randomly divided into two groups of 20 each by a computer generated randomization number table: Group-TS (n = 20): Patients were administered ganglion Impar block by trans-sacrococcygeal approach Group-TC (n = 20): Patients were administered ganglion Impar block by trans-coccygeal approach with 8 ml of 0.5% bupivacaine plus 2 ml of 40mg/ml methylprednisolone acetate under fluoroscopic guidance.

Results: Both the techniques of ganglion Impar block were effective and provided good pain relief to the patients with coccygodynia. There was a statistically and clinically significant improvement in pain score after ganglion Impar block in both the groups at all time intervals during the study period. ($p < 0.05$). The mean pain score after ganglion Impar block was < 2 at all time intervals throughout the three month study period in all patients in the two groups. All patients in both the groups had excellent satisfaction immediately after ganglion Impar block. Five patients each in both groups required second ganglion Impar block during the three months study period.

Conclusion: Both trans-sacrococcygeal and trans-coccygeal approaches of ganglion Impar block with a combination of local anaesthetic and steroid are safe and effective for management of coccygodynia. Trans-coccygeal ganglion Impar block through the first intra-coccygeal joint is better in terms of improvement in pain score, functional disability, patient satisfaction and ease of administration.

Keywords: Coccygodynia, ganglia impar block, transsacrococcygeal approach, transcoccygeal approach

Introduction

Coccygodynia or Coccydynia is pain in the area of coccyx which can occur due to acute trauma (fall, dislocation, child birth, sprained ligament), chronic trauma (osteoarthritis), metastasis (rectal or colon carcinoma) or can be a referred

pain (vaginismus, chordoma).^[1,2] True incidence of coccygodynia is unknown and the male-to-female ratio is 1:5. Most cases are posttraumatic (60–70%), the rest idiopathic (30–40%).^[3]

Typically the patient feels pain in the coccygeal region in sitting position which is exacerbated when rising from the seated

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position. The pain gets relieved on standing after some time. There is exquisite focal tenderness on palpation of coccyx and sacrococcygeal junction. The diagnosis is confirmed by clinical examination and X-ray of coccyx that may show displacement, dislocation, or osteoarthritis of coccygeal segments. The initial line of treatment is conservative: a combination of analgesics, anti-inflammatory agents, and physiotherapy (sitting on cushion donuts and heat application) is used.^[2,4] Patients with persisting pain require interventional pain management procedures like ganglion impar block.^[5-7]

Ganglion impar or ganglion of Walther is a retroperitoneal structure that is formed by the fused terminal ends of both right and left paravertebral sympathetic chains. It is generally located just below the midpoint of line joining sacrococcygeal joint and tip of coccyx. However, its location has been variably reported from being anterior to the sacrococcygeal joint or the coccyx or at the tip of the coccyx.^[2,8] Ganglion impar block has evolved as the most common technique for the treatment of coccygodynia because it is easy and quick, provides significant pain relief, and has a low incidence of complications. There are different techniques for performing ganglion impar block.^[6,9-11]

Transcoccygeal ganglion impar block technique has shown clinically better outcomes. The proposed reasons for this are: 1. regardless of the approach, the injectate usually flows predominantly cephalad rather than caudad. The transsacrococcygeal approach may result in most of the injectate flowing too far superior to the ganglion impar, whereas transcoccygeal approach is likely to provide good coverage of ganglion impar; 2. The injections through transcoccygeal approach are in closer proximity to targeted structure (the ganglion impar). The most common location of ganglion impar is just below the midpoint of the line joining the midpoint of sacrococcygeal joint and the tip of the coccyx; 3. The technique of transcoccygeal ganglion impar block is technically easier than the transsacrococcygeal approach since the sacrococcygeal junction can be fused in 51% of patients, whereas the first intra-coccygeal joint is fused only in 12%. Unlike the sacrococcygeal joint and the second intra-coccygeal joint, the first intra-coccygeal joint is almost consistently present and usually well developed; 4. The lateral fluoroscopic view is the best view to visualize the target site when performing ganglion impar block. However, in the transsacrococcygeal approach, bilateral cornua from the first coccygeal bone may cause difficulty with both visualizing and traversing the sacrococcygeal junction. The other coccygeal segments lack any cornu. Thus, no such obstruction occurs during the transcoccygeal approach.^[12-16]

The possible difficulty in performing the transcoccygeal approach of ganglion impar block is that it requires the

puncture of a tiny disk which may be contaminated by skin pathogens or result in chronic pain due to discitis.^[17] The transsacrococcygeal ganglion impar block can be useful in patients with normal anatomy but may prove challenging in patients with arthritic changes in the bones and calcification of the ligaments of the sacrum and coccyx.^[18,19]

This study was conducted to evaluate and compare the efficacy and safety of transsacrococcygeal and transcoccygeal approach of ganglion impar block for the management of coccygodynia with respect to improvement in pain, improvement in disability, need for repeat injections, ease of administering the block and side effects, if any.

Material and Methods

The prospective, randomized study was conducted in forty patients of either sex in the age group of 20–70 years suffering from coccygodynia after institutional ethical committee approval. Patients fulfilling following three criteria were included in the study: i) History, physical examination, and pain pattern consistent with coccygodynia; ii) the cause of coccygodynia being benign in nature with malignancy ruled out; iii) failure to respond to six weeks of conservative treatment with a combination of analgesics, anti-inflammatory drugs, neuromodulators, and physiotherapy. Patients with known contraindications for nerve blocks in sacrococcygeal area, history of adverse reactions to local anesthetics or steroids, previous history of ganglion impar blocks, previous surgery for coccygodynia, uncontrolled diabetes mellitus, and pregnancy were excluded from the study.

All patients were subjected to detailed clinical history; examination in the Pain Management Centre and imaging studies (X ray coccyx-lateral view) were reviewed. Informed written consent was obtained from all the patients after explaining the procedure in detail. Numeric Rating Scale (0–10) for assessment of pain was explained to each patient before performing the procedure. The patients were randomly divided into two groups of 20 each by a computer generated randomization number table: Group-TS ($n = 20$): Patients were administered ganglion impar block by transsacrococcygeal approach under fluoroscopic guidance and Group-TC ($n = 20$): Patients were administered ganglion impar block by transcoccygeal approach under fluoroscopic guidance.

Ganglion impar block was performed taking all aseptic precautions under fluoroscopic guidance in lateral and antero-posterior view with 8 mL of 0.5% bupivacaine plus 2 mL of 40mg/mL methylprednisolone acetate. Patients

were placed in prone position with a soft pillow under lower abdomen to allow flexion of the lumbosacral spine, with internal rotation of the lower extremities so that toes are pointing towards the opposite foot to open up the gluteal cleft. The site of needle insertion was located by fluoroscopic guidance. A skin wheal was raised with 2 mL of 1% lignocaine at the site of needle insertion. A 23-gauge, 3½-inch Quincke type spinal needle was inserted under fluoroscopic guidance through the skin piercing the dorsal sacrococcygeal ligament in the midline directed caudally (group TS) or through the dorsal intercoccygeal ligament at the midline (group TC). The needle was then advanced through the vertebral disc until the tip was placed just anterior to the ligament in the retroperitoneal space, felt as loss of resistance. The position of needle was then confirmed by injecting 1 mL of radio opaque dye iohexol 350mg/mL (Omnipaque 350, GE Healthcare, Ireland). Once the position of needle tip is confirmed, the drug mixture was injected. The patients were observed in the recovery area for one hour prior to departure from operation theater.

Outcome assessment

The primary outcomes were pain relief, patient satisfaction, and improvement in disability. The secondary outcomes were need for repeat injection, side effects and complications, and ease of administration. Following parameters were recorded to determine the efficacy of block:

Pain was assessed using Numeric Rating Scale (NRS, 0–10). Patients were asked to sit and rise from sitting posture before rating their pain. NRS was measured and recorded at following time intervals: thirty minutes before the procedure; thirty minutes after the block and prior to departure from the operation theater; one week, two weeks, one month, and three months after the block. The Oswestry Disability Index was calculated thirty minutes before the procedure; one week, two weeks, one month, and three months after the ganglion impar block.

Patient satisfaction was assessed thirty minutes, one week, two weeks, one month, and three months after the ganglion impar block on a four point scale: Excellent: when the pain was completely resolved or diminished by 75% or more; Good: when diminution of pain was by 50% to 74%; Fair: when diminution of pain was by 25% to 49%; and Poor: when diminution of pain was less than 25% or there was an increase in pain.

The patients were followed for three months after the initial procedure to determine if further ganglion impar blocks were required. Repeat injections were carried out using the same approach as the initial procedure, if pain relief was not

adequate (NRS >4). The time interval between the two consecutive blocks was recorded. However, no more than three injections were given during the study period. Ease of administration of ganglion impar block was assessed by the operator on a three point scale: Easy (first attempt), Difficult (second or third attempt), and Failure (after three attempts). Side effects and complications like bleeding, rectal puncture, itching, rash, infection, and discitis, if any, were recorded.

During the course of study, no escalation in the dosage of pharmacological agents was done. The patients continued to receive preinjection medications and physical therapy. If clinically permissible, dosage of medications was reduced. However, no new analgesic agents, additional peripheral injections, or central injections were administered and patients did not undergo surgery during the study period.

Statistical analysis

The SPSS Version 15.0.0 statistical package was used for statistical analysis. Chi-square test was used to compare sex distribution, patient satisfaction level, and ease of administration of block between the two groups. Unpaired t test was used to test the difference in age, pain score at different time intervals, change in pain score, Oswestry Disability Index (ODI) Score, change in ODI Score, and number of injections in between the two groups. Repeated measures ANOVA (RMANOVA) was used to compare the change in pain score and ODI at different time intervals within the two groups. Results were considered statistically significant if the *P* value was less than 0.05.

Results

The mean age in group TS was 43.0 ± 13.6 years and in group TC was 37.7 ± 12.1 years. Majority of the patients in the two groups were in 20–50 years age group (14 in group TS and 18 in group TC). Majority of the patients in the two groups were females; 14 and 16 in group TS and group TC, respectively. [Table 1] The mean weight in group TS was 63.0 ± 5.5 kg and in group TC was 64.5 ± 4.5 kg.

The variation in pain score at different time intervals when compared to pain score before ganglion impar block in both the groups was clinically and statistically significant [$P < 0.0001$, Figure 1]. When pain scores were compared in between the two groups, they were clinically less in group TC as compared to group TS. However, they were statistically comparable in between the two groups ($P = 0.34$). When patient satisfaction was compared in between the two groups, although it was clinically better in group TC, it was statistically comparable ($P = 0.75$). No patient in either group reported poor satisfaction at any time

interval during the study period. Only one patient reported fair satisfaction at one-month time interval in group TS.

The variation in Oswestry Disability Index (ODI) score at different time intervals when compared to ODI score before ganglion impar block in both the groups was clinically and statistically significant [$P < 0.0001$, Figure 2]. When ODI scores were compared in between the two groups, they were clinically better in group TC than group TS; however, they were statistically comparable ($P = 0.22$) except at three months interval where statistically better improvement in Oswestry Disability Index was noted in group TC than group TS ($P = 0.04$).

Five patients each in both groups required second ganglion impar block during the three-month study period. No patient required a third ganglion impar block in both the groups. The time interval between the two consecutive ganglion impar blocks was 25.2 and 21.4 days in group TS and TC, respectively. Both the groups were similar regarding number and time interval between the two consecutive ganglion impar blocks ($P = 0.84$). Although the ease of administration of ganglion impar block was clinically better with transcoccygeal approach as compared to the transsacrococcygeal approach, it was statistically comparable in between the two groups ($P = 0.83$). Ganglion impar

block was performed in first attempt in 15 and 17 patients in group TS and TC, respectively; on second attempt in 4 and 3 patients in group TS and TC, respectively. One patient in group TS required third attempt.

No complication occurred while performing ganglion impar blocks in any of the patients in the two groups. No patient in the two groups reported any side effect during the three-month study period.

Discussion

Both the techniques of ganglion impar block, i.e., transsacrococcygeal approach and transcoccygeal approach were effective and provided good pain relief and improvement in disability (ODI improved by more than 60%) to the patients with coccygodynia. Improvement in pain score and disability was clinically better in group TC as compared to group TS, but was statistically comparable.

Persistent over-activity of the nerve cells within ganglion impar can cause chronic severe pain in coccyx (coccygodynia). Blocking the signals of ganglion impar can effectively reduce the pain by breaking the vicious cycle of coccyx pain.^[4,6] Blockade of ganglion impar has been described to relieve acute pain as well as the intractable perineal pain of sympathetic origin in patients with rectal, anal, colon, bladder, or cervical cancer.^[9,20-22]

Eighty percent of the patients in our study were in the age group of 20–50 years and 75% of the patients were females. The coccyx is more prominent in women and presumably more prone to injury.^[3] Female preponderance in our study could

Table 1: Distribution of age and sex in the two groups

Parameter	Group TS (TSGIB) n=20	Group TC (TCGIB) n=20	P
Age (in years) Mean±S.D.	43.0±13.6	37.7±12.1	0.200
Male:Female	6 : 14 (30% : 70%)	4 : 16 (20% : 80%)	0.74

Unpaired t test for age and Chi-square test for sex distribution

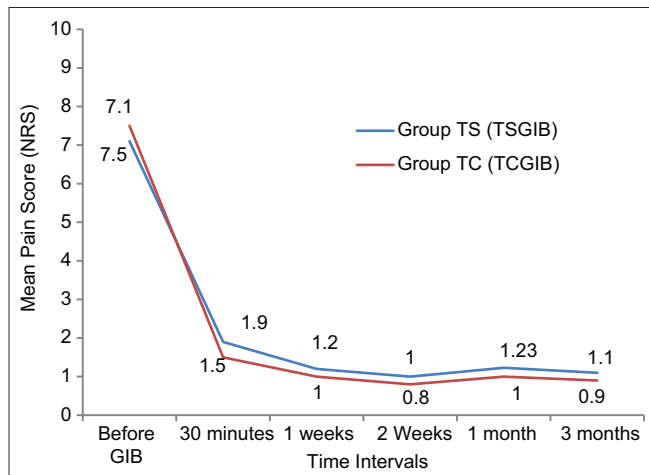


Figure 1: Pain Score (Numeric Rating Scale) in the two groups at different time intervals

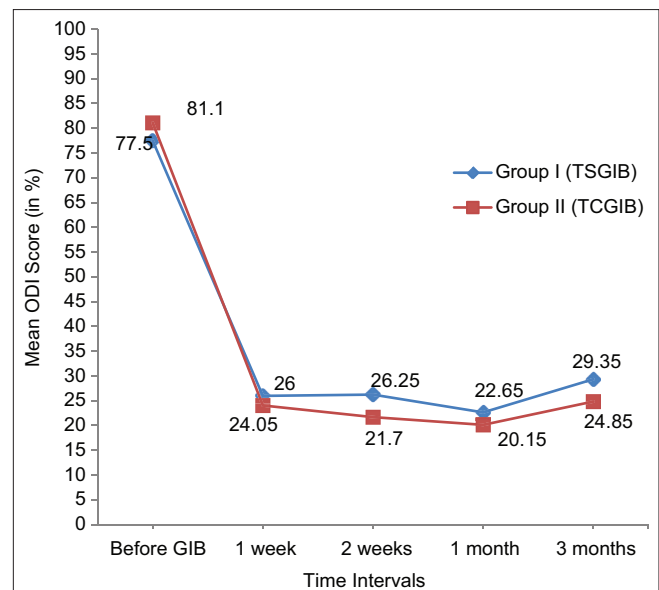


Figure 2: ODI Score at different time intervals in the two groups

also be attributed to the social milieu of our region. Majority of the patients in our study had a history of trauma leading to coccygodynia. The different mechanisms of trauma were fall on their buttocks on hard surface/floor while taking bath, cleaning floor or climbing stairs; falls on projecting objects like corners of stool/furniture, bricks, gear stick knobs; road traffic accidents, etc.

The majority of patients in our study being females and in middle age group is similar to that reported by other authors.^[3,11,23] Similar to our study, trauma has been reported to be the major cause of coccygodynia (60–70%).^[1-3,16] Hodges *et al.*^[24] also observed that specific patient factors associated with coccygodynia are female gender and history of recent fall on the buttocks, and reported an association with female gender (75%) and history of a recent fall (41%).

Similar to our study, Buttaci *et al.*^[21] observed that majority of patients reported 50–75% pain relief per ganglion impar block, generally lasting weeks to months. Similar to our study, Toshniwal *et al.*^[11] also reported that all the patients responded well to ganglion impar block and pain was reduced by 50% or above within 30 minutes. Similar pain relief like our study with either of the techniques of ganglion impar block has been observed by other authors.^[12,22]

Datir and Connell^[2] performed transsacrococcygeal ganglion impar blocks in eight patients with coccygodynia. At the end of the six-month follow-up period, six out of eight patients experienced symptomatic relief (four complete relief and two partial relief). Two out of eight did not have any symptomatic improvement. The mean visual analogue score (VAS) pre-procedure was 8 (range 6–10) that decreased to 2 (range 0–5) in six out of eight patients. However, we in our study observed significant pain relief in all the patients in both the groups throughout the three-month study period. The reasons for better results in our study could be the use of fluoroscopic guidance for ganglion impar block, whereas Datir and Connell^[2] used CT guidance for performing the blocks. In addition, our study follow-up period is shorter (three months) than their study (six months).

To the best of our knowledge, no study has evaluated/studied the Oswestry Disability Index in patients with coccygodynia and those undergoing ganglion impar blocks. The Oswestry Disability Index gives information as to how low back or leg pain is affecting the patient's ability to manage everyday life.^[25] This tool is useful to measure functional disability and outcome in patients suffering from coccygodynia, especially the questions pertaining to intensity of pain, ability for personal care, sitting, sex life, social life, and travelling.

All patients in both the groups had excellent satisfaction immediately after ganglion impar block. Patient satisfaction was clinically better in group TC as compared to group TS, but was statistically comparable in between the two groups at all time intervals throughout the study period. Similar to our study, Wray *et al.*^[26] observed that patients felt gratitude that their condition was taken seriously and treated sympathetically.

In our study, five patients each in both groups required second ganglion impar block during the three-month study period. Similar to our study, Buttaci *et al.*^[21] also observed that majority of patients reported pain relief generally lasting weeks to months following ganglion impar block. However, in their study a higher number of blocks were required (20 blocks in six patients, three blocks per patient) as compared to our study (50 blocks in 40 patients, 1.25 block per patient). A possible reason of lesser number of ganglion impar blocks in our study is use of both bupivacaine and methylprednisolone, whereas Buttaci *et al.*^[21] used bupivacaine alone. Similarly, in a study by Datir and Connell^[2] in eight patients, three patients (37%) had partial relief of symptoms and a second repeat injection was given at the three-month interval of the follow-up period. The eight patients included in the study were treated with a total of 11 injections.

The administration of ganglion impar block was clinically easier with transcoccygeal approach as compared to the transsacrococcygeal approach; however, it was statistically comparable in between the two groups. Similar to our study, Toshniwal *et al.*^[11] were able to perform transsacrococcygeal ganglion impar block in a single attempt and no difficulty was encountered during the procedure in majority of the patients. However, in three elderly patients, the puncture of the sacrococcygeal ligament was difficult due to the calcification of the ligaments. In these patients, they advanced an 18-gauge, 1.5-inch needle until it pierced the deep dorsal sacrococcygeal ligament. Then, a 22-gauge spinal needle was passed through the 18-gauge needle and positioned in front of the ventral sacrococcygeal ligament. However, in our study, we did not require the use of needle-through-needle technique and the 23-gauge spinal needle could be advanced through sacrococcygeal disc or the intra-coccygeal disc by rotatory movement of the spinal needle. Similar to our study, Datir and Connell^[2] reported a technical success of 100% in all cases with accurate needle placement.

Discitis, bleeding, and accidental rectal puncture are potential complications of ganglion impar block. Puncture of the sacrococcygeal disc necessitates that the integrity of this structure be breached. The sacrococcygeal disc, made up mainly of glycoprotein during the early years of life, may later ossify.^[1,2] No complication (bleeding, rectal puncture) occurred while

performing ganglion impar blocks in any of the patients in the two groups. No patient in the two groups reported any side effect (itching, rash, infection, and discitis) during the three-month study period. Similar to our study, Datir and Connell^[2] reported no complications while performing eleven ganglion impar blocks in eight patients and all the patients tolerated the procedure well. Toshniwal *et al.*^[11] also observed no complications with transsacrococcygeal ganglion impar blocks in 16 patients.

The complications of ganglion impar block can be prevented by fluoroscopically guided needle placement. Increasing emphasis is placed on fluoroscopically guided, target specific injections to improve treatment outcomes. Therefore, modern study designs focus on fluoroscopically guided ganglion impar blocks.^[5,6,27] Ultrasound-guided^[9] and CT-guided^[2] ganglion impar blocks have been performed. Ultrasound does not replace fluoroscopy, because lateral fluoroscopy is still required to establish safe depth and correct site of injection.^[9] The fluoroscopic guided ganglion impar block utilizing contrast dye remains the most common and popular technique and is the gold standard for ganglion impar blocks.^[28] In our study also, we used image guidance (fluoroscopy) that is crucial for minimizing patient risks (rectal perforation) and ensuring, via contrast, that the injectate is providing good coverage to the target site.

In our study, patients in both the groups received the injectate comprising 8 mL of 0.5% bupivacaine plus 2 mL of 40 mg/mL methylprednisolone acetate (80mg). The local anesthetic and steroid doses and volumes injected in the two groups reflect a common practice. Steroids presumably exert their effects by limiting inflammatory response from injuries, inhibiting leukocyte aggregation and preventing degranulation of inflammatory mediators, stabilizing lysosomal and other membranes, and reducing the synthesis and release of pro-inflammatory factors. They also inhibit ectopic discharges from injured sensory nerves. The purpose of steroid injection is to deliver medication close to the site of pathology. The corticosteroid delivered attains higher local concentrations near the site of pathology and is more effective than a steroid administered either orally or by intramuscular injection. Moreover, the dose of corticosteroid required is less as compared to systemically administered steroids.^[6,11,12,21,24,29,30]

Both the transsacrococcygeal and transcoccygeal techniques of ganglion impar block under fluoroscopic guidance are quick and easy to perform. They avoid invasion of the more caudal structures with a needle. There is no need to put the finger in rectum. Thus, there is decreased possibility of irritation to tissues and increased patient tolerance of the procedure.^[28]

The overall benefit of ganglion impar block in management of coccygodynia in our study appears to be good and similar to

that reported by other authors^[6,11,12,24,29] and is likely to be due to several factors, including proper diagnosis based on clinical history, examination, and imaging; the experience and training of the injecting practitioner; use of fluoroscopy; injection level with strong correlation to patient's painful site and ensuring appropriate spread of drug towards ganglion impar.

Both transsacrococcygeal and transcoccygeal approaches of ganglion impar block with a combination of local anesthetic and steroid are safe and effective for management of coccygodynia. Both the approaches provide significant pain relief to the patients. Transcoccygeal ganglion impar block through the first intra-coccygeal joint is clinically better in terms of improvement in pain score, functional disability, patient satisfaction, and ease of administration.

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Conflicts of interest

There are no conflicts of interest.

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