

A new technique of ganglion impar pulsed radiofrequency ablation

Ji Yeong Kim, Sung Eun Sim, Subin Yoo, Mina Joo, Hue Jung Park

Department of Anesthesiology and Pain Medicine, Seoul St. Mary's Hospital, College of Medicine, The Catholic University of Korea, Seoul 06591, Republic of Korea.

The ganglion impar block was first introduced in 1990 by Plancarte *et al.*^[1] Since then, several modified versions have been reported by Wemm and Saberski,^[2] Nebab and Florence,^[3] and Foye.^[4] They tried to reduce pain effectively by considering the anatomy of the ganglion impar and coccyx. There were differences in the strengths of each individual's technique. However, owing to the anatomical diversity of the structure itself,^[5] it was difficult to determine which technique would be more effective. Radiofrequency ablation (RFA) developed in the ganglion impar block also faced this controversy. In this clinical background, we present a new technique to implement ganglion impar RFA. Written informed consent was obtained from the patient before the initiation of the study.

A man aged 70 years, with no significant medical history, visited for pain around the right side of the anus with a numeric rating scale (NRS) of 6. After the initiation of herpes zoster vesicle infection 10 months back, he continued to receive conservative treatment in dermatology for herpes zoster neuralgia; however, the symptoms persisted. On physical examination, the pain area was limited to the right sacrum 4 to 5 dermatome, with no other neurologic deficit. The caudal block was initially performed. As there was no noticeable impact on the epidural block, the ganglion impar block was performed. The diagnostic block was performed using the transdiscal approach under fluoroscopy guidance. The block was effective; however, the period was short, and the patient complained of difficulty in frequently visiting the hospital. Therefore, we gradually increased the oral dosage. Daily oral administration of pregabalin 300 mg, clonazepam 0.5 mg, tramadol 50 mg, milnacipran 50 mg, and oxycodone 10 mg/naloxone 5 mg was performed regularly, and oxycodone 5 mg/naloxone 2.5 mg was administered only when the pain was severe. Constipation occurred as a side effect of narcotic analgesics, and the botulinum toxin injection was planned for lengthening the impact of the ganglion impar block.^[6] Fifty units of botulinum toxin type

A (BOTOX®; Allergan, Irvine, CA, USA) mixed with 2 mL of normal saline was injected after diagnostic 3 mL of 0.25% bupivacaine (5 mL in total). The procedure was performed under fluoroscopy guidance by a skilled expert. After the botulinum toxin injection, the existing pain score decreased to less than half, and it was maintained for approximately 8 weeks after the procedure and repeated up to five times at intervals. However, over time, the duration of the effect became shorter. Moreover, the anal pain higher than NRS 7 persisted despite the increased dose of drugs including opioid analgesics. The patient inquired about treatment methods other than botulinum toxin. Therefore, we discussed other treatment methods with the patient, such as RFA,^[7] sacral nerve stimulation, and intrathecal pump insertion. However, the patient opted to proceed with the ganglion impar RFA.

Our new technique was modified from Huang^[8] method. The 10 cm long 22-gauge radiofrequency (RF) cannula with a 10 mm active tip (HARYARD Health Inc., Alpharetta, Georgia, USA) was used. The length between the patient's sacrococcygeal joint and coccyx tip was measured in advance, and the RF cannula was bent; however, the bent position was set to a position that was the distance measured from the needle tip. Here, the bending angle was determined to be the previously identified sacrococcygeal angle [Figure 1A]. In the prone position, the needle entry point was defined slightly lateral (opposite side of the affected area) to the tip of the coccyx [Figures 1B and 1C]. After adjusting the needle toward the sacrococcygeal joint, after contacting the coccyx, walking off the coccyx, and finally, the needle tip was positioned at the sacrococcygeal joint slightly inclined to the affected side. Initially, the needle was placed between the sacrococcygeal joint and a contrast agent was injected for confirming the ganglion impar [Figure 1D]. Before RF ablation was performed, motor and sensory tests were conducted. These comprised a sensory response of 50 Hz at a stimulation intensity between 0.1 and 0.4 V, and the

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Correspondence to: Hue Jung Park, Department of Anesthesiology and Pain Medicine, Seoul St. Mary's Hospital, College of Medicine, The Catholic University of Korea, 222, Banpo-daero, Seocho-gu, Seoul 06591, Republic of Korea
E-Mail: huejung@catholic.ac.kr

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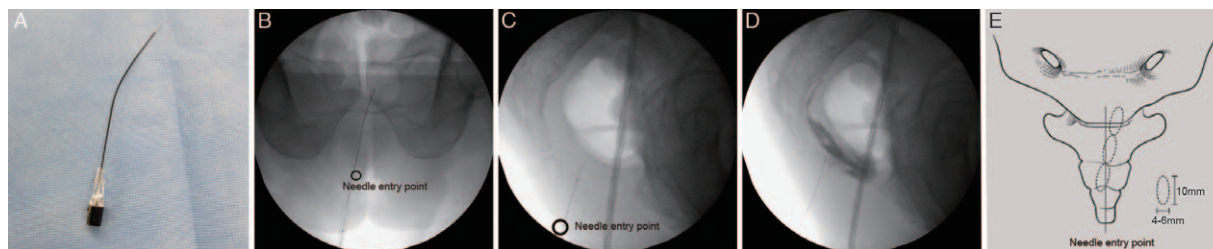


Figure 1: Operation of ganglion impar pulsed radiofrequency ablation. (A) Bented radiofrequency needle. (B) Anterior-posterior image of the first ablation. Notify the location of the needle at the right side of the sacrococcygeal junction. (C) Lateral image of the second ablation. Notify the location of the needle around the first intercoccygeal junction. (D) Contrast confirms the ganglion impar. (E) Schematic diagram showing the ablation lesions of the new technique.

Table 1: Analgesic treatment received by the patient.

Analgesic treatment	Analgesic effect	Duration of the analgesic effect
Epidural block	No effect	No effect
Ganglion impar block	NRS 7 → NRS 4	Few days
Botulinum toxin injection to the ganglion impar	NRS 7 → NRS 4	8 weeks
RFA of the ganglion impar	NRS 7 → NRS 3	16 weeks

NRS: Numeric rating scale; RFA: Radiofrequency ablation.

motor response of 2 Hz at a stimulation intensity between 0.1 and 2.0 V. Following this, pulsed RF thermoregulation was performed at 45°C for 120 s. Then, the ablation was performed after the withdrawal of the RF cannula by 10 mm, considering the active tip length of the RF cannula as 10 mm. Testing and subsequent thermoregulation were performed similarly. Third, the last ablation was performed by the withdrawal of the RF cannula of the second ablation. Overall, the RF thermoregulation was performed thrice at 45°C for 120 s by retracting 10 mm of RF cannula [Figure 1E and Table 1, Supplementary file, <http://links.lww.com/CM9/A505>]. After 16 weeks at the outpatient clinic, the pain was reduced to less than half (NRS 7 reduced to NRS 3) without increasing medication. There were no complications from the procedure.

This case report demonstrates excellent treatment effect without side effects by performing the ganglion pulsatile RF *de novo* for chronic anal pain. As reported by Oh *et al*'s^[5] cadaver study, the ganglion impar has a wide range of possible locations from the sacrococcygeal joint to the coccyx tip. Therefore, only a single ablation may not effectively cover the ganglion. If ablation is not performed at the exact location of the ganglion, the therapeutic effect will also decrease. For compensating this, Reig *et al*'^[9] performed ablation with a two-needle technique by inserting one needle into the sacrococcygeal joint with a transdiscal and the other with a transdiscal into the first intercoccygeal joint. When the pain did not decrease after ablation, neurolysis was added to the sacrum 4 ganglion. However, this method has the disadvantage of requiring needle insertion several times.

Huang^[8] introduced the method of ganglion impar block, and we applied this method for RFA. Huang and us, unlike

Reig *et al*,^[9] did not adopt the transdiscal approach owing to several reasons. In the chronic coccyx pain patient group, there was a previous report that the sacrococcygeal joint fusion occurred in 51% of cases.^[10] Additionally, the ganglion is more commonly located in front of the coccyx bone than in front of the disc.^[5] Second, Huang's and our technique are common in bending the needle to facilitate reaching the target ganglion. Third, the needle insertion point is laterally away from the midline, which is different from the existing methods of Plancarte *et al*'^[11] or Nebab and Florence.^[3] It was expected to reduce the likelihood of infection. However, there is a difference between Huang's and our technique regarding skin indentation. Huang inserted needles under the transverse process of the coccyx, whereas we inserted them from the side of the coccyx tip. The reason was to cover all areas where the ganglion was likely to be located, during the second and third ablation. The primary feature of our technique is multiple lesioning with single needling for covering anatomic variation of the ganglion impar.

In this case, we chose to perform pulsed RF rather than conventional RF. Pulsed RF is relatively recently introduced compared with conventional RF; therefore, there are not many clinical reports of applying pulsed RF to ganglion impar. The exact mechanism of pulsed RF is not known; however, it is less neurodestructive and reversible than conventional RF.^[11] Usmani *et al*'^[12] performed conventional RF or pulsed RF after transdiscal approaching the RF cannula to the first intercoccygeal joint and evaluated the extent to which the pain score decreased after 6 weeks. Consequently, conventional RF reduced the pain score more effectively than pulsed RF. However, there is a limitation that accurate ganglion ablation may be difficult with only one ablation time at the first intercoccygeal joint, and the 6-week follow-up period is too short. As this is only

a case report, several prospective and comparative studies using conventional RF are needed in the future.

Conflicts of interest

None.

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