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RADIOFREQUENCY OR PHENOL FOR GANGLION IMPAR NEUROLYSIS IN PERINEAL CANCER PAIN: RESPONDER RATES AND DURATION OF RELIEF IN A RANDOMIZED TRIAL

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ABSTRACT
Ganglion impar neurolysis with phenol is widely used for perineal cancer pain, but its effect may be short-lived, whereas radiofrequency thermocoagulation produces a controlled thermal lesion that may give more durable relief. We compared the analgesic efficacy and the duration of pain relief of conventional radiofrequency thermocoagulation and phenol neurolysis of the ganglion impar in a randomized, double-blind trial. Patients with perineal cancer pain (visual analogue scale score of 5 or more) refractory to tramadol and pregabalin and responsive to a diagnostic block received fluoroscopy-guided radiofrequency thermocoagulation (80 °C for 120 s) or neurolysis with 4–6 mL of 8% phenol. The primary outcome was the proportion of patients achieving at least a 50% reduction in pain score. Secondary outcomes were pain scores, duration of pain relief, and tramadol and pregabalin consumption over 3 months. Forty patients (20 per group) completed the study. Responder rates were similar up to 2 weeks (100% vs 90–100%) but were significantly higher after radiofrequency thermocoagulation at 1 month (80% vs 45%; P = 0.022), 2 months (55% vs 20%; P = 0.022) and 3 months (30% vs 0%; P = 0.020). The median duration of pain relief was 3 months after radiofrequency thermocoagulation and 1 month after phenol neurolysis (log-rank P = 0.002). Pain scores were lower after radiofrequency thermocoagulation at every time point (3.90 ± 0.45 vs 4.90 ± 0.45 at 3 months; P < 0.001), and tramadol and pregabalin consumption was lower at every follow-up visit (P ≤ 0.010). Conventional radiofrequency thermocoagulation of the ganglion impar provided a significantly longer duration of pain relief than phenol neurolysis, with consistently lower pain scores and analgesic requirements. Larger trials are needed to confirm the size of this advantage.

KEYWORDS: Cancer pain; Perineal pain; Ganglion impar; Radiofrequency ablation; Neurolysis; Phenol

INTRODUCTION
Pain affects about 44.5% of patients with cancer, and roughly one in three has pain of moderate-to-severe intensity (Snijders et al., 2023). Perineal pain is among the most difficult cancer pain syndromes to treat. It usually arises from colorectal, anal, urogenital and gynecological tumours or their recurrence, and typically combines visceral, somatic and neuropathic components, so that systemic analgesics alone often give incomplete relief (Oliveira et al., 2024; Abed et al., 2026). Opioids remain the basis of pharmacological treatment (Fallon et al., 2018; Paice et al., 2023), but dose escalation is limited by constipation, nausea, sedation and cognitive effects (Konysheva and Myasoyedov, 2026), and guidelines recommend interventional procedures for patients whose pain is not controlled with systemic therapy (Fallon et al., 2018; Aman et al., 2021).
The ganglion impar is the single, unpaired terminal ganglion of the paravertebral sympathetic chains. It lies in the retroperitoneum anterior to the sacrococcygeal junction and receives nociceptive and sympathetic afferents from the perineum, distal rectum, anus, distal urethra, vulva and distal vagina (Scott-Warren et al., 2013; Ferreira and Pedro, 2020). Its position and size vary considerably between individuals (Oh et al., 2004; Walters et al., 2013). Since Plancarte et al. (1990) first described its blockade for perineal pain of malignant origin, ganglion impar block has been shown to be effective and safe in cancer-related perineal pain (Sousa Correia et al., 2019; Oliveira et al., 2024).
Because local anaesthetic blocks are short-acting, neurolytic agents such as phenol are commonly used to prolong the effect (Koyyalagunta and Burton, 2010; Ferreira and Pedro, 2020). Neurolytic sympathetic blocks reduce pain and opioid consumption in abdominal and pelvic cancer (de Oliveira et al., 2004; Ahmed et al., 2015), but the duration of relief after ganglion impar neurolysis varies widely (Malec-Milewska et al., 2014). The spread of the injectate cannot be fully controlled, and injured nerve fibres can regenerate (Westerlund et al., 2003; Koyyalagunta and Burton, 2010). In a recent randomized trial in severe perineal cancer pain, ganglion impar neurolysis with phenol gave less pain relief than pulsed radiofrequency of the S2–S4 roots (Abed et al., 2026).
Radiofrequency thermocoagulation (RFTC) was introduced as a more controlled and localized alternative to chemical neurolysis of the ganglion impar (Reig et al., 2005; Demircay et al., 2010). It produces a defined thermal lesion around the active tip (Cosman et al., 2014; Walsh et al., 2022), and it has been used successfully in both

non-cancer and cancer-related perineal pain (Usmani et al., 2018; Li et al., 2024; Malhotra et al., 2025). To our knowledge, conventional RFTC and phenol neurolysis of the ganglion impar have not been compared in a randomized trial in patients with cancer. The aim of this study was therefore to compare the analgesic efficacy and the duration of pain relief of conventional RFTC and phenol neurolytic block (NB) of the ganglion impar in patients with intractable perineal cancer pain.

MATERIALS AND METHODS

This prospective, randomized, parallel-group, double-blind (patient and outcome assessor) trial was conducted at the pain unit in South Egypt Cancer Institute, Assiut, Egypt, from June 2024 to July 2026. The study was approved by the Institutional Ethics Committee of the South Egypt Cancer Institute (IRB number: 18-2024-679) and registered at ClinicalTrials.gov (NCT06392399). Written informed consent was obtained from all participants.

Inclusion criteria

Patients aged 20 to 70 years with pelvic malignancy (rectal, rectosigmoid, cervical, vaginal, vulvar or perineal cancer) were eligible for inclusion if they had perineal pain with a Visual Analogue Scale (VAS) score of 5 or more. Eligible patients also had to have either an inadequate response to oral analgesia with tramadol (400 mg daily) and pregabalin (150 mg daily), or intolerable tramadol-related side effects such as headache, dizziness, constipation, rash, sweating, or dry mouth. In addition, all participants were required to show an adequate response to a diagnostic ganglion impar block, defined as a reduction of more than 50% in VAS pain score lasting at least two hours.

Exclusion criteria

Patients were excluded if they had skin infection at or near the needle puncture site, coagulopathy or a prolonged bleeding time, or known hypersensitivity or allergy to any of the study drugs, including phenol. Patients with central or peripheral neuropathy, significant organ dysfunction (including respiratory, hepatic, or renal failure), or vertebral anomalies were also excluded. Finally, patients with any psychiatric illness that could interfere with pain perception or assessment were not enrolled.

Randomization and blinding

Sixty-three eligible patients were randomly allocated into three equal groups (n = 21 each) using a computer-generated random number table with a 1:1:1 allocation ratio. The third group received cooled radiofrequency ablation of the ganglion impar; its comparison with conventional radiofrequency will be reported separately. The present report compares the conventional radiofrequency thermocoagulation group (RFTC group) with the neurolytic block group (NB group). Group allocations were concealed in sequentially numbered, sealed, opaque envelopes, which were opened only after the patient had given written informed consent and had shown a positive response to the diagnostic ganglion impar block. Because the two techniques require different equipment and steps, the physician performing the procedure could not be blinded to group allocation. However, the patients and the outcome assessor responsible for recording outcomes and adverse effects were unaware of the group assignment.

Preparation and monitoring

All procedures were performed in the pain clinic procedure room by the same experienced interventional pain physician. After a 20-gauge intravenous cannula was inserted, standard monitoring (electrocardiography, non-invasive blood pressure, and pulse oximetry) was applied, and conscious sedation was provided with intravenous midazolam 1–2 mg and fentanyl 1 μg/kg. Patients were placed in the prone position with a pillow under the pelvis to flatten the lumbar lordosis and improve access to the sacrococcygeal region. The skin was prepared with 10% povidone-iodine and draped under strict aseptic conditions, and the skin and subcutaneous tissues at the entry site were infiltrated with 2–3 mL of 2% lidocaine.

Intervention

Under fluoroscopic C-arm guidance using anteroposterior and lateral views, the sacrococcygeal junction (or the first intercoccygeal junction) was identified. The needle was introduced at the midline through the dorsal sacrococcygeal ligament and advanced through the junction under intermittent lateral fluoroscopy until its tip lay just anterior to the ventral sacrococcygeal ligament, identified by loss of resistance. Correct needle position was confirmed by injecting 1 mL of radio-opaque contrast into the retroperitoneal space, which produced the characteristic "reverse comma" spread along the anterior surface of the sacrococcygeal junction on the lateral view, with no intravascular or intrarectal spread.

RFTC group

A 22-gauge 10-cm radiofrequency needle with a 5-mm active tip was used, connected to a NeuroTherm NT1100 radiofrequency generator (St. Jude Medical, Plymouth, MN, USA). Before lesioning, tissue impedance was checked to be within 200–500 Ω. Sensory stimulation was applied at 50 Hz, and the needle position was accepted when a sensation consistent with the distribution of the patient's usual pain was reproduced at ≤ 0.5 V. Motor stimulation at 2 Hz was then applied up to 2 V to confirm the absence of motor responses in the lower limbs or anal sphincter. After negative aspiration for blood and cerebrospinal fluid, 1 mL of 2% lidocaine was injected to minimize discomfort during lesioning, and a single thermal lesion was performed at 80 °C for 120 s. Patients remained in verbal contact throughout the procedure and were reassured that it could be stopped at any time at their request.

NB group

A 22-gauge spinal needle was placed and its position confirmed with contrast as described above. After negative aspiration for blood and cerebrospinal fluid, 4–6 mL of 8% phenol was injected slowly under intermittent fluoroscopy, followed by 1 mL of normal saline to flush the needle before withdrawal and prevent deposition of phenol along the needle track.

Postoperative assessment and data collection

Data collection and patient assessment were performed by a trained pain physician who was blinded to group allocation.

Pain intensity was assessed using the VAS at baseline and at 2 h, 24 h, 1 week, 2 weeks, 1 month, 2 months and 3 months after the procedure. Daily tramadol and pregabalin consumption was recorded at baseline and at 1 week, 2 weeks, 1 month, 2 months and 3 months post-procedure. Patient satisfaction was evaluated using the Global Perceived Effect (GPE) questionnaire (Dworkin et al., 2005), and health-related quality of life was assessed using the Functional Assessment of Cancer Therapy–General (FACT-G) questionnaire (Peipert and Cella, 2019); both instruments were administered at 1 week, 2 weeks, 1 month, 2 months and 3 months post-procedure. The time required to perform each procedure was also recorded.

All patients were monitored for procedure-related adverse events throughout the follow-up period. Common adverse events included persistent pain or lack of benefit, minor bleeding or bruising at the injection site, and transient motor weakness or numbness. More serious adverse events included injury to surrounding structures, infection, permanent nerve injury, and allergic reactions to the agents used during the procedure.

Study outcomes

The primary outcome was the percentage of patients achieving at least a 50% reduction in pain intensity from their pre-procedural baseline VAS score, determined at each follow-up time point.

Secondary outcomes reported here were VAS pain scores at baseline and at 2 h, 24 h, 1 week, 2 weeks, 1 month, 2 months and 3 months after the procedure, the duration of pain relief (time to loss of at least 50% VAS reduction) and tramadol and pregabalin consumption.

Sample size estimation

The sample size was calculated using G*Power 3 software (Faul et al., 2007). The calculation was based on mean VAS pain scores, as the primary outcome (the proportion of patients achieving at least a 50% reduction in VAS score from baseline) is derived directly from these repeated VAS measurements. Using a repeated-measures analysis of variance (RM-ANOVA, within-between interaction) across five time points (baseline, 1 week, 2 weeks, 1 month, and 3 months), a minimum of 22 patients (11 per group) was required to detect an effect size (f) of 0.25 between the two groups, assuming a correlation of 0.5 among repeated measures, a non-sphericity correction (ε) of 1, an α error probability of 0.05, and a power of 80%. To allow for possible dropouts, 21 patients were allocated to each group.

Statistical analysis

Statistical analysis was performed using IBM SPSS Statistics version 24 for Windows (IBM Corp., Armonk, NY, USA) on patients who completed the 3-month follow-up. The analyses presented here are part of a larger statistical analysis of the three-arm trial and are restricted to the comparison between the RFTC and NB groups, covering the primary outcome and the pain-related secondary outcomes (VAS pain scores, duration of pain relief and analgesic consumption). The remaining outcomes of this comparison (patient satisfaction, quality of life and safety) and the comparison with the cooled radiofrequency group were analyzed separately. The normality of continuous data was assessed using the Shapiro-Wilk test. Age and procedure duration were presented as mean ± standard deviation (SD) and compared between the two groups using the independent-samples *t*-test; because procedure duration in the NB group deviated from normality, this comparison was confirmed with the Mann-Whitney U test. VAS scores were treated as continuous variables, presented as mean ± SD and compared between the groups at each time point using the independent-samples *t*-test. Changes in VAS scores over time were analyzed using repeated-measures ANOVA, with group (RFTC vs NB) as the between-subjects factor and time as the within-subjects factor, applying the Greenhouse–Geisser correction for violation of sphericity, followed by Bonferroni-corrected comparisons with baseline. The duration of pain relief, defined as the time from the procedure to the first follow-up visit at which the VAS reduction from baseline fell below 50%, was estimated with the Kaplan–Meier method and compared between groups with the log-rank test; patients who maintained at least a 50% reduction at 3 months were censored at that time. Analgesic consumption was compared between the groups using the Mann-Whitney U test, and within-group changes from baseline were analyzed using the Friedman test followed by the Wilcoxon signed-rank test with Bonferroni correction. Categorical data, including the proportion of patients achieving at least a 50% reduction in VAS score, were presented as numbers and percentages and compared using the chi-square test, or Fisher's exact test when any expected cell count was < 5. For the primary outcome, the between-group difference in the proportion of responders was reported with its 95% confidence interval (CI), calculated using the Newcombe method. All tests were two-sided, and a P value < 0.05 was considered statistically significant.

RESULTS

Sixty-nine patients were assessed for eligibility. Four patients did not meet the inclusion criteria and two declined to participate, leaving 63 patients who were randomized into three equal groups (n = 21 each). The present analysis

includes the 42 patients allocated to conventional radiofrequency thermocoagulation (RFTC, n = 21) and neurolytic ganglion impar block (NB, n = 21); the 21 patients allocated to the cooled radiofrequency group were not included. During follow-up, one patient in the RFTC group died 1 month after the procedure due to progression of the underlying malignancy, unrelated to the procedure, and one patient in the NB group was excluded after admission to the intensive care unit (cerebrovascular stroke). Consequently, 40 patients (20 in each group) completed the study and were included in the final analysis.

Demographic data, patient characteristics and procedure duration

The two groups were comparable with respect to age (43.50 ± 7.16 vs 44.05 ± 6.63 years, P = 0.802), sex distribution and primary cancer site, with no statistically significant differences (P > 0.05). The procedure duration was significantly longer in the RFTC group than in the NB group (20.45 ± 1.99 vs 16.50 ± 1.15 min, P < 0.001) (Table 1).

Table 1. Baseline characteristics and procedure duration of the two study groups.

Characteristic	RFTC (n = 20)	NB (n = 20)	P
Age, years	43.50 ± 7.16	44.05 ± 6.63	0.802[a]
Sex, n (%)			1.000[b]
Male	16 (80)	15 (75)	
Female	4 (20)	5 (25)	
Primary cancer site, n (%)			0.542[c]
Rectum	14 (70)	17 (85)	
Rectosigmoid	4 (20)	3 (15)	
Vagina	1 (5)	0 (0)	
Cervix	1 (5)	0 (0)	
Procedure duration, min	20.45 ± 1.99	16.50 ± 1.15	**< 0.001[a]**

Data are presented as mean ± SD or n (%). Bold P values indicate statistical significance (P < 0.05). RFTC, conventional radiofrequency thermocoagulation; NB, neurolytic block with phenol. [a]Independent-samples *t*-test. [b]Fisher's exact test. [c]Fisher–Freeman–Halton exact test.

Primary outcome: patients achieving ≥ 50% VAS reduction

The proportion of patients achieving at least a 50% reduction in VAS score from baseline was similar in the two groups at 2 h (100% vs 100%), 24 h (100% vs 100%) and 1 week (100% vs 95%) (P = 1.000). From 2 weeks onwards, the proportion of responders declined in both groups and was higher in the RFTC group; the difference was not significant at 2 weeks but was statistically significant from 1 month onwards: 2 weeks (100% vs 90%, P = 0.487; difference 10%, 95% CI −8% to 30%), 1 month (80% vs 45%, P = 0.022; difference 35%, 95% CI 5% to 58%), 2 months (55% vs 20%, P = 0.022; difference 35%, 95% CI 5% to 58%) and 3 months (30% vs 0%, P = 0.020; difference 30%, 95% CI 8% to 52%) (Table 2, Figure 1).

Table 2. Patients achieving at least a 50% reduction in VAS score from baseline (responders).

Time point	RFTC (n = 20)	NB (n = 20)	Difference, % (95% CI)[a]	P
2 h	20 (100)	20 (100)	0 (−16 to 16)	1.000[c]
24 h	20 (100)	20 (100)	0 (−16 to 16)	1.000[c]
1 week	20 (100)	19 (95)	5 (−12 to 24)	1.000[c]
2 weeks	20 (100)	18 (90)	10 (−8 to 30)	0.487[c]
1 month	16 (80)	9 (45)	35 (5 to 58)	**0.022[b]**
2 months	11 (55)	4 (20)	35 (5 to 58)	**0.022[b]**
3 months	6 (30)	0 (0)	30 (8 to 52)	**0.020[c]**

Data are presented as n (%). Bold P values indicate statistical significance (P < 0.05). RFTC, conventional radiofrequency thermocoagulation; NB, neurolytic block with phenol; VAS, visual analogue scale; CI, confidence interval. [a]RFTC minus NB, with 95% CI by the Newcombe hybrid score method. [b]Pearson chi-square test. [c]Fisher's exact test.

Figure 1. Proportion of patients achieving at least a 50% reduction in VAS score from baseline (responders) at each follow-up time point. *P < 0.05 between groups (Pearson chi-square test at 1 and 2 months; Fisher's exact test at 3 months). RFTC, conventional radiofrequency thermocoagulation; NB, neurolytic block with phenol; VAS, visual analogue scale.

Duration of pain relief

The duration of pain relief was significantly longer in the RFTC group than in the NB group (log-rank $\chi^2 = 9.62$, P = 0.002) (Figure 2). The median duration of pain relief was 3 months in the RFTC group and 1 month in the NB group. By 2 weeks, 2 patients (10%) in the NB group and 0 (0%) in the RFTC group had lost their response. At 3 months, 6 patients (30%) in the RFTC group and none (0%) in the NB group still maintained at least a 50% reduction in VAS score.

Figure 2. Kaplan–Meier curves of the duration of pain relief, defined as the time to the first follow-up visit at which the VAS reduction from baseline fell below 50%. Patients who maintained at least a 50% reduction at 3 months were censored at that time. P value from the log-rank test. RFTC, conventional radiofrequency thermocoagulation; NB, neurolytic block with phenol; VAS, visual analogue scale.

VAS pain scores

Baseline VAS scores were comparable between the RFTC and NB groups (6.80 ± 0.89 vs 6.90 ± 0.79, P = 0.710). In both groups, VAS scores decreased significantly from baseline at every follow-up time point (P < 0.001). Repeated-measures ANOVA showed a significant effect of time ($F(3.36, 127.79) = 415.25$, P < 0.001), a significant group × time interaction ($F(3.36, 127.79) = 5.49$, P < 0.001, partial $\eta^2 = 0.13$) and a significant main effect of group ($F(1, 38) = 29.95$, P < 0.001, partial $\eta^2 = 0.44$). VAS scores were significantly lower in the RFTC group than in the NB group at every follow-up time point (P < 0.001 for all), from 2 h (2.65 ± 0.49 vs 3.25 ± 0.44) to 3 months (3.90 ± 0.45 vs 4.90 ± 0.45), with the largest mean difference at 2 months (1.05 points) (Table 3, Figure 3).

Table 3. VAS pain scores at each time point in the two study groups.

Time point	RFTC (n = 20)	NB (n = 20)	Mean difference (95% CI)[a]	P[b]
Baseline	6.80 ± 0.89	6.90 ± 0.79	−0.10 (−0.64 to 0.44)	0.710
2 h	2.65 ± 0.49	3.25 ± 0.44	−0.60 (−0.90 to −0.30)	**< 0.001**
24 h	2.65 ± 0.49	3.25 ± 0.44	−0.60 (−0.90 to −0.30)	**< 0.001**
1 week	2.65 ± 0.49	3.30 ± 0.47	−0.65 (−0.96 to −0.34)	**< 0.001**
2 weeks	2.70 ± 0.47	3.35 ± 0.49	−0.65 (−0.96 to −0.34)	**< 0.001**
1 month	3.10 ± 0.55	4.05 ± 0.69	−0.95 (−1.35 to −0.55)	**< 0.001**
2 months	3.50 ± 0.61	4.55 ± 0.51	−1.05 (−1.41 to −0.69)	**< 0.001**
3 months	3.90 ± 0.45	4.90 ± 0.45	−1.00 (−1.29 to −0.71)	**< 0.001**

Data are presented as mean ± SD. Bold P values indicate statistical significance (P < 0.05). RFTC, conventional radiofrequency thermocoagulation; NB, neurolytic block with phenol; VAS, visual analogue scale (0–10); CI, confidence interval. [a]RFTC minus NB. [b]Independent-samples *t*-test.

Figure 3. VAS pain scores (mean ± SD) over time in the two groups. *P < 0.05 between groups (independent-samples *t*-test). RFTC, conventional radiofrequency thermocoagulation; NB, neurolytic block with phenol; VAS, visual analogue scale.

Tramadol and pregabalin consumption

Baseline tramadol and pregabalin doses were identical in both groups (400 and 150 mg, respectively). Tramadol consumption decreased significantly from baseline at all follow-up time points in both groups (P < 0.001). It was significantly lower in the RFTC group than in the NB group at every follow-up time point, from 1 week (105.0 ± 15.4 vs 135.0 ± 43.2 mg, P = 0.010) and 2 weeks (110.0 ± 20.5 vs 180.0 ± 44.1 mg, P < 0.001) to 1 month (140.0 ± 30.8 vs 202.5 ± 47.2 mg), 2 months (150.0 ± 22.9 vs 212.5 ± 39.3 mg) and 3 months (170.0 ± 25.1 vs 247.5 ± 44.4 mg) (P < 0.001 for all three) (Table 4, Figure 4A).

Similarly, pregabalin consumption was significantly lower in the RFTC group than in the NB group at every follow-up time point (P ≤ 0.001), from 1 week (75.0 ± 0.0 vs 112.5 ± 38.5 mg) to 3 months (165.0 ± 30.8 vs 206.3 ± 33.3 mg). In the RFTC group, pregabalin consumption was significantly below baseline up to 1 month (P ≤ 0.005) and was no longer significantly different from baseline at 2 months (P = 0.127) and 3 months (P = 0.228). In the NB group, it was significantly below baseline only at 1 week (P = 0.008), returned to the baseline level by 1 month and was significantly higher than baseline at 3 months (206.3 ± 33.3 vs 150.0 mg, P < 0.001) (Table 4, Figure 4B).

Table 4. Daily tramadol and pregabalin consumption at each time point in the two study groups.

Time point	RFTC (n = 20)	NB (n = 20)	P[a]
Tramadol, mg/day			

Time point	RFTC (n = 20)	NB (n = 20)	P[a]
Baseline	400.0 ± 0.0	400.0 ± 0.0	1.000
1 week	105.0 ± 15.4	135.0 ± 43.2	**0.010**
2 weeks	110.0 ± 20.5	180.0 ± 44.1	**< 0.001**
1 month	140.0 ± 30.8	202.5 ± 47.2	**< 0.001**
2 months	150.0 ± 22.9	212.5 ± 39.3	**< 0.001**
3 months	170.0 ± 25.1	247.5 ± 44.4	**< 0.001**
Pregabalin, mg/day			
Baseline	150.0 ± 0.0	150.0 ± 0.0	1.000
1 week	75.0 ± 0.0	112.5 ± 38.5	**< 0.001**
2 weeks	78.8 ± 16.8	127.5 ± 35.3	**< 0.001**
1 month	108.8 ± 38.3	150.0 ± 0.0	**< 0.001**
2 months	131.3 ± 33.3	172.5 ± 35.3	**0.001**
3 months	165.0 ± 30.8	206.3 ± 33.3	**< 0.001**

Data are presented as mean ± SD. Bold P values indicate statistical significance (P < 0.05). RFTC, conventional radiofrequency thermocoagulation; NB, neurolytic block with phenol. [a]Mann-Whitney U test.

Figure 4. Daily consumption (mean ± SD) of **A.** tramadol and **B.** pregabalin over time in the two groups. *P < 0.05 between groups (Mann-Whitney U test). RFTC, conventional radiofrequency thermocoagulation; NB, neurolytic block with phenol.

DISCUSSION

In this randomized trial, conventional RFTC and phenol neurolysis of the ganglion impar both produced substantial early relief of perineal cancer pain, with almost all patients achieving at least a 50% reduction in VAS score during the first 2 weeks. The proportion of responders then declined in both groups. It remained significantly higher after RFTC (80% vs 45% at 1 month, 55% vs 20% at 2 months and 30% vs 0% at 3 months), and the duration of relief was significantly longer after RFTC (median 3 months vs 1 month). In addition, VAS scores were significantly lower after RFTC at every time point, and tramadol and pregabalin consumption was lower at every follow-up visit.

The early response in both groups is consistent with the established role of the ganglion impar in perineal pain (Plancarte et al., 1990; Sousa Correia et al., 2019; Oliveira et al., 2024). All patients had responded to a diagnostic block, which selects those whose pain is largely mediated through the ganglion, and cancer-related pain has been associated with a better response to ganglion impar block (Kim et al., 2021). This selection probably explains why nearly all patients in both groups responded initially.

The primary outcome results should be interpreted with caution. The sample size was calculated for mean VAS scores, and the study was not powered to detect differences in the proportion of responders. The observed differences of 30 to 35 percentage points between 1 and 3 months are clinically relevant and were statistically significant at each of these time points (P = 0.020 to 0.022). However, the P values lay only moderately below the significance threshold, and the confidence intervals were wide (lower limits of 5% to 8%), so the true advantage may be considerably smaller than observed. Together with the significantly longer duration of relief, these findings suggest that RFTC maintains a clinically meaningful response in more patients, but this needs confirmation in a larger trial powered for the responder outcome.

The secondary outcomes consistently favoured RFTC. VAS scores were 0.60 to 1.05 points lower after RFTC throughout follow-up, and repeated-measures ANOVA showed a significant group effect and group × time interaction, with the difference increasing over the first 2 months. A difference of this size is smaller than the thresholds usually considered clinically important for individual patients (Dworkin et al., 2008), but it was accompanied by lower analgesic consumption. Tramadol requirements were lower after RFTC at every visit (170.0 vs 247.5 mg/day at 3 months). Pregabalin consumption after neurolysis returned to baseline by 1 month and exceeded it by 3 months, whereas after RFTC it remained below baseline up to 1 month. Lower analgesic requirements matter in this population, in whom dose escalation is limited by adverse effects (Konysheva and Myasoyedov, 2026).

These findings agree in direction with those of Abed et al. (2026), who found that ganglion impar neurolysis with phenol gave less pain relief and higher analgesic consumption than pulsed radiofrequency of the S2–S4 roots in severe perineal cancer pain. Earlier, mostly uncontrolled, reports of chemical neurolysis described relief lasting from weeks to years (Agarwal-Kozlowski et al., 2009; Malec-Milewska et al., 2014; Ahmed et al., 2015; Ferreira and Pedro, 2020); differences in agent, concentration, volume, population and definition of response limit comparison with our results.

Several mechanisms may favour a thermal over a chemical lesion. The effect of a neurolytic block depends on the spread of the injectate, which cannot be fully controlled (Koyyalagunta and Burton, 2010), and because the ganglion impar is small and variable in position (Oh et al., 2004; Walters et al., 2013), parts of it may be exposed to a sub-lethal concentration of phenol. Chemical injury also does not permanently destroy the nerve: experimentally, axonal regeneration after phenol-glycerol injection began about 2 weeks after injection (Westerlund et al., 2003). RFTC, in contrast, delivers controlled thermal energy after sensory and motor stimulation has confirmed that the active tip lies close to the target (Cosman et al., 2014; Walsh et al., 2022), which is why radiofrequency lesioning was proposed as a more precise alternative to chemical neurolysis of the ganglion impar (Reig et al., 2005; Demircay et al., 2010). However, the conventional radiofrequency lesion is small (Cosman et al., 2014), and the benefit of RFTC also declined over time, with only 30% of patients maintaining a 50% reduction at 3 months. Repeat or larger lesions may be needed to extend relief.

LIMITATIONS

This study has several limitations. First, it was a single-center study, which may limit the generalizability of the findings. Second, follow-up was limited to 3 months, and the duration of pain relief was assessed only at scheduled visits, so the exact time of loss of response is not known. Third, only one neurolytic agent, concentration and volume was tested. Finally, the physician performing the procedure could not be blinded to group allocation, and the study included different types of pelvic malignancy, which may differ in pain mechanisms.

CONCLUSION

In patients with perineal cancer pain, conventional RFTC of the ganglion impar provided a significantly longer duration of pain relief than phenol neurolysis, and the proportion of patients achieving at least a 50% reduction in pain was significantly higher after RFTC from 1 month onwards. RFTC was associated with consistently lower pain scores and lower tramadol and pregabalin requirements throughout 3 months of follow-up. Larger randomized trials powered for responder outcomes are needed to confirm the size of the advantage of RFTC over phenol neurolysis.

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