Frontiers in Health Informatics
ISSN-Online: 2676-7104
www.healthinformaticsjournal.com
2024; Vol 13: Issue 6
Open Access

Efficacy of Radiofrequency Splanchnic Denervation Compared to Neurolytic Retrocrural Celiac Plexus Block for Patients with Chronic Upper Abdominal Cancer Pain

Samy Abdelrahman Amr Erfan[1], Montaser Abdelfatah Mohammad[2], Diab Fuad Hetta[3], Nourhan Alaa Elgalaly[*4]

[1] Professor of Anesthesiology, ICU & Pain Management, South Egypt Cancer Institute, Assuit University, Egypt.
[2] Professor in Anesthesia and Pain Management, South Egypt Cancer Institute, Assuit University, Egypt.
[3] Professor in Anesthesia, intensive care and Pain Management, South Egypt Cancer Institute, Assuit University, Egypt; ORCID: 0000-0002-3453-0718
[4] Assistant Lecturer of Anesthesiology, ICU & Pain Management, South Egypt Cancer Institute, Assuit University, Egypt.
[*]**Corresponding author:** Nourhan Alaa Elgalaly; **Email**: Nourhanelgalay@aun.edu.eg; ORCID: 0000-0002-3913-5995

Cite this paper as: Samy Abdelrahman Amr Erfan et al., (2024) Efficacy of Radiofrequency Splanchnic Denervation Compared to Neurolytic Retrocrural Celiac Plexus Block for Patients with Chronic Upper Abdominal Cancer Pain . *Frontiersin Health Informatics, 13(6)1052-1061*

Abstract

Background: *Chemical neurolysis was the standard for denervation; however, radiofrequency now offers improved outcomes with lesser problems.*

Design: *A prospective, randomized, double-blind clinical experiment.*

Methods: *52 cases were categorized into two groups: retrocrural celiac plexus neurolysis and radiofrequency splanchnic denervation. Pain score, total tramadol intake, Functional Assessment of Chronic Illness Therapy, depression and anxiety scores, and complications were assessed.*

Results: *The splanchnic group exhibited a reduced pain score compared to the celiac group at 2 weeks, 1, 3, and 6 months, with median (IQR) 2(2-3) versus 3(3-3), 2(2-3) versus 3(3-4), 3(2-3) versus 4(3-4), and 3(3-3) versus 4(4-4). Tramadol intake(mg) was reduced at 2 weeks,1, 3, and 6 months in the splanchnic group compared to the celiac group, with median (IQR) 150(100-150) versus 200(150-200), 150(100-150) versus 250(200-250), 150(150-200) versus 250(200-300), and 200(150-200) versus 275(250-300). Quality of life was enhanced in the splanchnic compared to the celiac group at 2 weeks, 1, 3, and 6 months, with mean ± SD values of (92.5±3.9 vs 84.7±2.9), (92.5±3.9 vs 83.9±2.6), (91.5±3.8 vs 81±1.5), and (90±3.5 vs 80±1.1). PHQ scores are diminished in the splanchnic group relative to the celiac group with median (IQR) 4.5(4-5) versus 5.5(5-6), 4(4-5) versus 5(5-6), 5 (4-5) versus 6(6-6), and 5(4-5) versus 6(6-7). Two instances of intercostal neuralgia were recorded following celiac plexus neurolysis.*

Conclusion: *Radiofrequency splanchnic denervation shown superiority over neurolytic retrocrural celiac plexus block in alleviating pain, reducing tramadol use, mitigating depression and anxiety, and enhancing quality of life at 2 weeks, 1, 3, and 6 months.*

Key words: Upper abdominal cancer, Chronic pain, Radiofrequency, Celiac plexus; Chemical neurolysis, Pain measurement, Quality of life, Splanchnic denervation.

Introduction

The incidence of abdominal malignancies is not uncommon; the WHO's most recent cancer epidemiology updates from 2020 indicate that the incidence rate of new cases as follows: Colon (6.0%), Stomach (5.6%), Liver (4.7%), Esophagus (3.1%), Pancreas (2.6%), and Gallbladder (0.6%) [1].

Pain is a principal complain among cancer patients and the primary motive for seeking medical advice. Visceral pain in abdominal malignancies is generally poorly localized owing to a diminished quantity of receptors and limited representation in the primary somatosensory cortex. [2].

This non localized pain causing for chronic abdominal discomfort resulting in dissatisfaction for both the case and the physicians in its management. Administering effective analgesia in patients with abdominal cancer has become difficult due to the erratic dose-response and the likelihood of inadequate tolerance to analgesic doses in frail persons, frequently elderly, who are simultaneously taking many drugs. Patients often exhibit nausea, repeated vomiting, dehydration, and increased liver enzymes, especially in instances of primary or secondary liver diseases. [3].

Patients may experience unpleasant consequences that diminish their quality of life, despite careful pharmacologic and surgical interventions. Non-pharmaceutical techniques, such as physical therapy, integrative and alternative medicine, lifestyle adjustments, and interventional procedures, may serve as beneficial adjuncts to surgical and pharmacologic treatments [4].

Consequently, the neurolytic sympathetic block has been suggested as an effective, reasonably straightforward, and reproducible management technique [5], providing pain relief and facilitating the cessation of medications or, at the very least, a reduction in their dosage [6, 7].

Techniques employed for nerve ablation and modulation included traditional radiofrequency ablation (RFA) utilizing thermal energy and chemical ablation employing alcohol [8].

The celiac plexus is located next to the first lumbar vertebra, anterior to the aorta. Patients with upper abdominal cancers, who typically have acute, uncontrollable stomach pain, are often given the celiac plexus block [9]. The sympathetic trunk (ganglia 5 to 12) is the source of the thoracic splanchnic nerves, which connect to the celiac ganglion through the diaphragm's crura at the T11 and T12 levels. The discomfort associated with intra-abdominal malignancies can be reduced by ablation of these nerve fibers [10, 11].

By interfering with pain signals throughout the neurological route, neurolysis reduces pain. Neurolytic blocks are used to relieve pain from upper gastrointestinal cancers by targeting the splanchnic nerves and celiac plexus and impeding with pain signals within the neurological route. Examining the effectiveness of these strategies in treating persistent upper abdominal cancer pain is the goal of this trial.

Materials and methods:

It was a prospective, double-blind, randomized, placebo-controlled clinical trial. It obtained Institutional Review Board (IRB) approval under number 182023631 and ethical committee approval number: 63 in 11th of June 2023. The trial was conducted in compliance with the Consolidated Standards of Reporting Trials (CONSORT) statement and was registered in 1st of February 2024 by the authors on Clinical Trials.gov with the unique ID NCT06678061. Before being enrolled, all participating patients gave their signed, informed consent.
-Sample size: The projected minimum required sample size, based on the primary outcome variable, is 52 patients (26 patients each group). The sample size was determined utilizing G*Power software (version 3.1.9.2), predicated on the subsequent assumptions: The primary outcome variable is the average decrease in pain scores among individuals with chronic upper abdominal cancer discomfort. Based on clinical experience, we anticipate a minor impact size difference between the two mentioned groups [12]. The primary statistical analysis employed is an independent t-test to identify the disparity between the two groups. Significance level (Alpha) = 0.05, Statistical power = 0.80, Effect size = 0.7.

The inclusion criteria were patients aged 20 to 70 years with upper GIT cancer, especially cancers of the lower part of the esophagus, stomach, duodenum, pancreas, liver, and biliary tract, as well as individuals exhibiting a Numeric Rating Scale (NRS) pain score of 5 or greater [13]. Participants must have a sufficient reaction to the diagnostic block of the splanchnic nerves, namely a reduction in the Numerical Rating Scale (NRS) of at least 50% for a minimum duration of 2 hours.

The exclusion criteria included: patient refusal, medical conditions such as coagulopathies, moderate to severe cardiac or respiratory incapacitating disorders, liver or renal failure, systemic or localized infections, and structural malformations or lesions of the spine, existence of psychiatric disorders that may obstruct pain evaluation, together with other factors that could lead to protocol noncompliance.

Technique:

1- Radiofrequency splanchnic denervation:

Prior to the procedure, the cases were pre-hydrated with 500 cc of normal saline and fasted for six hours. Before the procedure, each patient was shown a visual scale with numbers so they could rate the intensity of their discomfort. To address thoracolumbar lordosis and increase the distance between the iliac crests and rib cage, in the operation room, the patient was lied in prone position with a pillow under the hip and chest. A 20-gauge intravenous cannula was placed, and the monitors, electrocardiography, noninvasive blood pressure, and pulse oximetry were linked in compliance with the American Society of Anesthesiologists' guidelines.

After using fluoroscopy to see the T11 vertebra, the c-arm was shifted 20 to 30 degrees to the ipsilateral side until the T11 transverse processes lined up with the anterolateral border of the vertebrae. The skin and subcutaneous tissue received injections of 1% lignocaine. Under fluoroscopic guidance, a 22-gauge needle was inserted at the anterolateral margin of the T11 vertebra. The distribution of contrast throughout the anterolateral border of the spine, free of posterior contrast leakage, confirmed the final placement. After a negative aspiration for blood or fluid (contrast), 8 ml of 0.25% bupivacaine was given bilaterally to perform diagnostic splanchnic denervation. A 50% drop in pain intensity (measured with NRS) for at least two hours after injection was considered a positive diagnostic block.

As with the diagnostic test, the patient was prepped for therapeutic denervation. The T11 vertebral body's anterolateral area was where the needles were placed. Sensory testing was done to confirm the correct placement using abdominal stimulation in the location matching to his stomach pain after the needles' proper insertion was confirmed by injecting 2 mL of contrast and using intermittent fluoroscopy to guarantee optimal dye dispersion. Prior to the RF lesion, the nerves were anesthetized with 2 cc of 2% lidocaine. Three lesions total were produced in the RFA group by creating lesions on both sides for two minutes each at 80 degrees Celsius.

2- Neurolytic celiac plexus denervation:

Following a 6-hour fast and 500 cc of normal saline pre-hydration, patients had a celiac plexus block. Before the procedure, every case was shown a visual scale with numbers so they could rate their own level of pain. To bend the thoracolumbar spine, the patient was lied in prone position with a pillow under the abdomen. After sterilizing, a mark in the intervertebral space between T12 and L1 allowed the body of the first lumbar vertebra to be identified in the posteroanterior view of fluoroscopy. To align the L1 vertebral body, the C-arm was moved in a caudocephalic fashion. The C-arm was positioned in an ipsilateral oblique orientation (20-30 degrees), utilizing the L1 transverse process in the vertebral body to achieve a tunnel view during needle insertion. The needle's tip was positioned near the antero-lateral boundary of the L1 vertebral body (posterior to the aorta) on the left side. The C-arm subsequently rotated to the postero-anterior position to guarantee the needle's contact with the vertebral body. Following unsuccessful aspiration of blood or cerebrospinal fluid, the procedure was conducted on the opposite side. The needle's tip on the right side needed to be advanced 1 to 2 cm beyond that of the left side. Two milliliters of contrast material were injected into each side for confirmation after a test injection of 5 mL of 2% lidocaine on both sides. A pause of 5 minutes ensued before administering 5 mL of 100% alcohol into each side to for the local anesthetic to take effect. 1 cc of 2% lidocaine was subsequently administered during the needle withdrawal to prevent track development. Two milliliters of contrast material were injected into each side for confirmation after a test injection of 5 mL of 2% lidocaine on both sides. A pause of 5 minutes ensued before administering 5 mL of 100% alcohol

into each side to for the local anesthetic to take effect. 1 cc of 2% lidocaine was subsequently administered during the needle withdrawal to prevent track development.

-Immediate post-procedural follow up:

Patients were admitted for 6 hours to monitor NRS, blood pressure, heart rate, and oxygen saturation at 0, 2, 4, and 6 hours. A chest X-ray was performed to rule out pneumothorax and any potential negative effects of the intervention.

-Six months follow up for:

1- Variation on the Numeric Pain Rating Scale (NRS) at the initial 2 weeks relative to pre-procedural pain levels. Subsequently, conduct follow-ups at one month, three months, and six months [13].
2- Total opioid intake at one month, three months, and six months post-procedure.
3- Functional Assessment of Chronic Illness Therapy or Cancer Therapy (FACT) [14].
4- Scores for depression and anxiety as measured by the Patient Health Questionnaire (PHQ-9) [15].
5- Additional noted adverse effects.
All data were collected by anesthesia residents unaware of the study protocol.

-Post-procedural treatment:

Patients were administered oral tramadol at a dosage of 50 mg twice day, with titration based on response, up to a maximum of 400 mg daily. If there is no reaction, oral morphine sulfate will be commenced at 30 mg twice daily and adjusted based on the response.

Statistical Analysis:

SPSS Version 22.0 (IBM Corporation, Armonk, NY) was used on a personal computer to do the statistical analysis. Before conducting additional statistical analysis, the Anderson-Darling test was used to determine whether the continuous data distribution was normal. IBM SPSS statistics version 24 for Windows was used to analyze the data. The Shapiro-Wilk test was used to assess the data for normality. Continuous variables having a normal distribution, such age and BMI, were compared using the independent t-test and expressed as mean ± SD. The median (IQR) of ordinal variables and non-normally distributed continuous data will be compared using the Mann-Whitney U test. A Chi-squared test was used for data that was displayed as percentages and counts. Statistical significance was indicated by a $P < 0.05$.

Results:

Sixty patients were enrolled in our study; four did not meet the inclusion criteria, and two declined to continue. The remaining fifty-four patients were divided into two equal groups: splanchnic and celiac. Subsequently, two patients were excluded: one from the splanchnic group due to death one week post-intervention, and one from the celiac group who was admitted to the ICU diagnosed with hepatic coma **(Figure 1).**

Concerning the baseline demographic data and patient characteristics (Age, sex, BMI, diagnosis and patients' treatment), there is no significant difference between both groups. **(Table 1)**

The splanchnic group exhibits significantly lower pain scores compared to the celiac group, as indicated by the numeric rating scale (NRS) at 2 weeks, 1 month, 3 months, and 6 months post-procedure: 2 (2-3) versus 3 (3-3), 2 (2-3) versus 3 (3-4), 3 (2-3) versus 4 (3-4), and 3 (3-3) versus 4 (4-4), respectively, $P < 0.001$. **(Table 2)**

The median and interquartile range of total daily tramadol consumption are reduced at 2 weeks, 1 month, 3 months,

and 6 months in the splanchnic group compared to the celiac group: 150 (100-150) versus 200 (150-200), 150 (100-150) versus 250 (200-250), 150 (150-200) versus 250 (200-300), and 200 (150-200) versus 275 (250-300), respectively, P <0.001. The preprocedural tramadol intake is identical in all groups, with a median IQR of 300 (200-350) versus 300 (250-350), P= 0.40. **(Table3)**

Patients in the splanchnic group exhibit superior quality of life post-intervention, as evidenced by elevated scores on the Functional Assessment of Chronic Illness Therapy questionnaire (FACT) compared to the celiac group at 2 weeks, 1 month, 3 months, and 6 months post-intervention, (mean ± SD) (92.5± 3.9 vs 84.7± 2.9), (92.5± 3.9 vs 83.9± 2.6), (91.5± 3.8 vs 81± 1.5), (90± 3.5 vs 80± 1.1) respectively, P<0.001. **(Table 4)**

Depression and anxiety are significantly reduced following splanchnic denervation compared to celiac plexus block, as determined by the Patient Health Questionnaire (PHQ-9). The median (IQR) scores are 4.5 (4-5) versus 5.5 (5-6), 4 (4-5) versus 5 (5-6), 5 (4-5) versus 6 (6-6), and 5 (4-5) versus 6 (6-7), respectively, with P<0.001. **(Table 5)**

Concerning the early post-intervention complications, three cases in the splanchnic group complained pain at the insertion site, while four patients in the celiac group did the same. Additionally, 2 patients required fluid resuscitation due to severe hypotension following splanchnic denervation, compared to 4 patients after the celiac plexus block. Five individuals in the celiac group experienced diarrhea, whereas no patients in the splanchnic group reported this symptom.

Regarding the delayed consequences, two patients experienced intercostal neuralgia following alcohol injection during celiac plexus block. **(Table 6)**

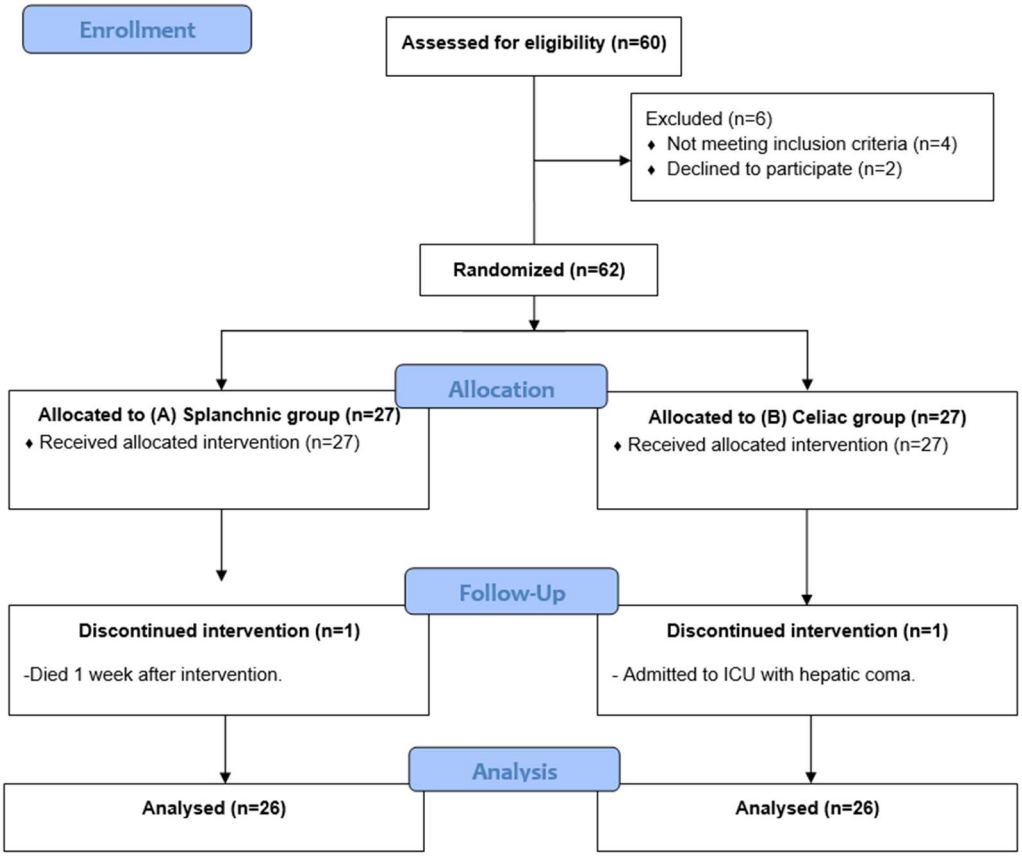

Figure (1): Patients' flow chart

Table (1): Demographic data

Variables	Splanchnic group (N= 26)	Celiac group (N=26)	P. value
-Age (yrs.):	42.11 ±12	40.15 ±11.8	0.55
- Sex (no. and percentage):			
• Male:	11 (42.3%)	12 (46.1%)	0.39
• Female:	15 (57.6%)	14 (53.8%)	0.39
-BMI (kg/m^2):	30.9±4	30.1±3.7	0.48
-Diagnosis (no. and percentage):			
• Cancer Pancreas	6 (23.07%)	6 (23.07%)	0.50
• Cancer Gall bladder	2 (7.69%)	1 (3.8%)	0.27
• Hepatocellular carcinoma	6 (23.07%)	6 (23.07%)	0.50
• Cancer Stomach	5 (19.2%)	5 (19.2%)	0.50
• Cholangiocarcinoma	2 (7.69%)	3 (11.53)	0.32
• Cancer Esophagus	4 (15.3%)	4 (15.3%)	0.50
• Cancer Duodenum	1 (3.8%)	1 (3.8%)	0.50
-Patients received:			
• Chemotherapy	7 (26.9%)	6 (23%)	0.37
• Radiotherapy	6 (23%)	7 (26.9%)	0.37
• Surgery	4 (15.3%%)	5 (19.2%)	0.35
• Combination (chemo-radiotherapy/ chemo-surgical/ radio-surgical)	5 (19.2)	6 (23%)	0.36
• None	4 (15.3%)	2 (7.6%)	0.19

Age, and BMI are represented by mean and standard deviation. Sex, diagnosis are represented by number and percentage. Patients received chemotherapy, radiotherapy, surgical intervention, combined therapy or "None" who refused to receive any medical or surgical intervention and data is represented by number and percentage.

Table (2): Numeric rating scale (NRS).

Variables	Splanchnic group (N=26)	Celiac group (N=26)	P. value
-Preprocedural NRS	5 (5-6)	5 (5-6)	0.57
-2 weeks postprocedural NRS	2 (2-3)	3 (3-3)	<0.001
-1-month postprocedural NRS	2 (2-3)	3 (3-4)	<0.001
-3 months postprocedural NRS	3 (2-3)	4 (3-4)	<0.001
-6 months postprocedural NRS	3 (3-3)	4 (4-4)	<0.001

Data is represented by median and (IQR). Mann Whitney test is used for comparison between groups. P. value is considered significant if <0.05.

Table (3): Total daily tramadol Consumption (mg).

Variables	Splanchnic group (N=26)	Celiac group (N=26)	P. value
-Preprocedural tramadol	300 (200-350)	300 (250-350)	0.40
-2 weeks postprocedural tramadol	150 (100-150)	200 (150-200)	<0.001
-1 month postprocedural tramadol	150 (100-150)	250 (200-250)	<0.001
-3 months postprocedural tramadol	150 (150-200)	250 (200-300)	<0.001
-6 months postprocedural tramadol	200 (150-200)	275 (250-300)	<0.001

Data is represented by median and (IQR). Mann Whitney test is used for comparison between groups. P. value is considered significant if <0.05.

Table (4): FACT questionnaire

Variables	Splanchnic group (N=26)	Celiac group (N=26)	P. value
-FACT 2 weeks postprocedural	92.5± 3.9	84.7± 2.9	<0.001
-FACT 1-month postprocedural	92.5± 3.9	83.9 2.6	<0.001
-FACT 3 months postprocedural	91.5± 3.8	81± 1.5	<0.001
-FACT 6 months postprocedural	90± 3.5	80.6± 1.1	<0.001

Data is represented by mean and standard deviation. FACT is the Functional Assessment of Chronic Illness Therapy questionnaire. T- test is used for comparison between groups. P. value is considered significant if <0.05.

Table (5): PHQ-9 questionnaire

Variables	Splanchnic group (N=26)	Celiac group (N=26)	P. value
-PHQ-9 2 weeks postprocedural	4.5 (4-5)	5.5 (5-6)	<0.001
-PHQ-9 1 month postprocedural	4 (4-5)	5 (5-6)	<0.001
-PHQ-9 3 months postprocedural	5 (4-5)	6 (6-6)	<0.001
-PHQ-9 6 months Postprocedural	5 (4-5)	6 (6-7)	<0.001

Data is represented by median and (IQR). PHQ-9 is the Patient Health Questionnaire version 9. Mann Whitney test is used for comparison between groups. P. value is considered significant if <0.05.

Table (6): Complications

Variable	Splanchnic group (N=26)	Celiac group (N=26)	P. value
1- Early complications:			
• Pain at site of injection	3 (11.5%)	4 (15.3%)	0.34
• Hypotension	2 (7.6%)	6 (23%)	0.06
• Diarrhea	0	5 (19.3%)	0.01
2- Late complications:			
• Intercostal neuralgia	0	2(7.6%)	0.07

Data is represented by number and percentage.

Discussion

In the present study, radiofrequency ablation of the splanchnic nerve outperformed celiac plexus neurolysis in terms of pain relief, overall opioid consumption reduction, improved manifestations of irritability, fewer drawbacks, and improved quality of life. The advantages of RFA intervention compared to alcohol neurolysis include a quick reaction, prolonged analgesic effect, accurate sensory assessment, and an improved safety profile [16-18]. Our study confirmed that the radiofrequency splanchnic group exhibited significantly lower pain scores compared to the neurolytic celiac group, as indicated by the numeric rating scale (NRS) at 2 weeks, 1 month, 3 months, and 6 months post-procedure: 2 (2-3) vs. 3 (3-3), 2 (2-3) vs. 3 (3-4), 3 (2-3) vs. 4 (3-4), and 3 (3-3) vs. 4 (4-4), respectively, with $P < 0.001$. The T11 RF bilateral splanchnic denervation yielded significantly prolonged alleviation of abdominal pain compared to the celiac plexus block. Our findings were corroborated by Kapural et al [18], who compare the duration and effectiveness of splanchnic denervation with celiac neurolysis. They reported an average reduction in pain scores from 7.8 ± 0.8 to 2.9 ± 2.1 for the splanchnic nerve block and from 7.24 ± 1.0 to 4.1 ± 2.1 for the celiac plexus. Comlek, S [17] sought to examine the effects of splanchnic neurolysis in pancreatic cancer patients unresponsive to celiac plexus neurolysis. The study indicated a substantial and dramatic decrease in

pain scores at two weeks (2.8±1.2 versus 6.3±1.1, P<0.001).

Patients with a Numeric Rating Scale (NRS) score of less than 6 while on tramadol pills were chosen for the intervention. The NRS evaluation, quality of life assessment via the FACIT questionnaire, and tramadol dose titration were conducted during weekly visits to the pain clinic, with the primary objective of maintaining an NRS of ≥3 post-intervention by the administration of titrated tramadol doses up to 400 mg daily. No one of the patients in each groups required transition to potent opioids such as morphine sulfate tablets.
Because neural fibers have different sizes and properties, splanchnic denervation and celiac plexus block have different potencies and durations. The splanchnic nerves pass through a rather small area between the pleura and the lateral border of the vertebra before joining vagal parasympathetics, phrenic nerve sensory fibers, and many postganglionic sympathetic fibers to form the celiac plexus, which is widely dispersed around the abdominal aorta, especially anteriorly.
Conversely, Shwita et al. [12] observed a substantial decrease in the visual analogue scale (VAS) in the splanchnic group compared to the celiac group on day 3 of evaluation (P = 0.001). Simultaneously, no statistical significance were seen among the groups at 2 weeks, 1 month, 3 months, and 6 months, p>0.05. The analysis of the brief response duration in this study may be attributed to the use of 70% alcohol neurolysis for both procedures, which is less precise than the radiofrequency approach.

The second most significant finding of the present study was the total daily tramadol consumption in relation to the pre-intervention dosages. The findings indicated that the median and interquartile range (IQR) of total daily tramadol consumption significantly decreased at 2 weeks, 1 month, 3 months, and 6 months in the splanchnic group compared to the celiac group, with values of 150 (100-150) versus 200 (150-200), 150 (100-150) versus 250 (200-250), 150 (150-200) versus 250 (200-300), and 200 (150-200) versus 275 (250-300) respectively, P < 0.001. In consistence with Comlek, S. [17] who reported a clear significant reduction in the daily narcotic demand at 2 weeks (20.8±32.9 versus 93.4±86.2 mg, p<0.001) after employing splanchnic neurolysis, which was also maintained during the 3-month follow-up.

Radiofrequency thoracic splanchnic ablation enhances quality of life, cognitive function, and reduces depression and anxiety. [16] This was corroborated in our trial, as indicated by the elevated Functional Assessment of Chronic Illness Therapy (FACT) scores relative to the celiac plexus block at 2 weeks, 1 month, 3 months, and 6 months post-intervention, (mean ± SD) (92.5± 3.9 vs 84.7± 2.9), (92.5± 3.9 vs 83.9± 2.6), (91.5± 3.8 vs 81± 1.5), (90± 3.5 vs 80± 1.1) respectively, P<0.001. Depression and anxiety are significantly reduced following splanchnic denervation compared to celiac plexus block, as determined by the Patient Health Questionnaire (PHQ-9). The median (IQR) scores are 4.5 (4-5) versus 5.5 (5-6), 4 (4-5) versus 5 (5-6), 5 (4-5) versus 6 (6-6), and 5 (4-5) versus 6 (6-7), respectively, with P<0.001.

Reduced opioid intake may enhance quality of life by bolstering the immune system, as opioids have been discovered to exert an immunosuppressive effect at the cellular level. [19] The present investigation indicated a diminished sedative impact of opioids, evidenced by the notable enhancement in social and cognitive scores in the splanchnic group compared to the celiac group [12, 16, 20, and 21].

According to Garcea et al. [22], splanchnic nerve radiofrequency ablation (RFA) improved a number of factors associated with chronic, incapacitating pain, such as anxiety, everyday activities, mood, and perceptions of general health. Every alteration that was noticed was statistically significant.
In the current study, problems associated with both procedures were generally of modest significance, with the exception of back pain, orthostatic hypotension, and moderate diarrhea.
The disadvantages were evident in the initial post-intervention complications, with 3 patients in the splanchnic group reporting pain at the insertion site, while 4 patients in the celiac group. Additionally, 2 cases experienced severe hypotension following splanchnic denervation, whereas 4 patients required fluid resuscitation after the celiac plexus block. Five individuals in the celiac group experienced diarrhea, whereas none in the splanchnic group reported this symptom. Regarding the delayed consequences, two patients experienced intercostal neuralgia

following alcohol injection during celiac plexus block.
The thoracic splanchnic nerve's relatively consistent anatomical relationship with adjacent structures has rekindled interest in the block, as it is situated within a minute area triangular in shape, with clearly defined landmarks and boundaries, making it more accessible than the traditional celiac plexus block. The advantage of RF ablation over chemical neurolysis lies in its precision and reproducibility, yielding a long-term analgesic effect, facilitating neural tissue activation prior to ablation, confirming proximity to the intended target, and mitigating the risk of affecting unwanted targets [23].
Many studies reported a variety of issues after both procedures, such as sexual dysfunction, paraplegia, and pneumothorax. According to Davies [24], there was a 1 in 683 operation chance of serious issues (such as paraplegia, bladder, and bowel abnormalities). However, the application of C-arm guided intervention and the application of a local anesthetic prior to the neurolytic medication injection suggested that the risk of complications was decreased [25].

Study limitations:

A high sample size is required in future investigations, as the proposed causes for the varying responses of individual patients to celiac and splanchnic blocks remain speculative until more robust evidence emerges. The study was constrained by disease progression, particularly in pancreatic cancer, as we lost numerous patients due to rapid deterioration and mortality at various trial phases. Furthermore, we could not detect variations in patient responses between the two blocks concerning the etiology of abdominal pain, malignancy type and stage, cancer-related complications, distinctions among patients undergoing chemotherapy, radiotherapy, combined chemo-radiotherapy, or surgical intervention, and the impact of adjuvant therapy with opioids.

Conclusion:

Our findings indicated that radiofrequency splanchnic denervation was statistically and clinically more effective than neurolytic retrocrural celiac plexus block in reducing pain scores, daily tramadol usage, depression, and anxiety, as well as in enhancing quality of life at 2 weeks, 1 month, 3 months, and 6 months post-treatment, with a lower incidence of side effects.

Conflicts of Interest: The authors declare no conflicts of interest

This work has not been published, in whole or part in other journals.

Authors' contributions:

a-Samy Abdelrahman Amr Erfan: wrote the introduction and discussion.
b- Montaser Abdelfatah Mohammed: did the SPSS result and tables.
c- Diab Fuad Hetta: did the practical work.
d- Nourhan Alaa Elgalaly: data collection and patient follow up.
All the authors revised the manuscript

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