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Comparative Study of Three Different Volumes if Alcohol in Trans-Aortic Celiac Plexus Block

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ABSTRACT

Background: Pain remains a significant challenge for cancer patients. Upper abdominal cancer patients often experience severe visceral pain, profoundly impacting their quality of life. In such cases, minimally invasive pain interventions like celiac plexus neurolysis may be necessary to alleviate the debilitating pain and improve overall well-being.

Objective: Our study aimed to evaluate the effectiveness of various volumes of 70% alcohol (40 ml, 30 ml, 20 ml) for neurolytic celiac plexus block in alleviating pain associated with upper abdominal tumors.

Patients and Methods: at the Anesthesia, ICU and Pain Management Department of Al Menoufia University Hospital, and the Pain Therapy Unit at Tanta Cancer Center, spanning one year. Ninety patients of both sexes who were suffering from non-resectable upper abdominal tumors were enrolled in the study.

Results: Visual Analog Scale (VAS) scores exhibited a significant decrease for 12 months in all groups with the degree of relief being directly proportional to the volume of the neurolytic agent. Additionally, there was a noteworthy reduction in tramadol requirements observed up to 12 months in both Group I and group II, and up to 5 months only for Group III. Furthermore, Quality of Life Questionnaire-Core 30 (QLQ-C30) scores were markedly decreased in Group III compared to other two groups, but it was better in group I than in group II from 4th month onward.

Conclusion: Administration of 40 ml and 30 ml of 70% alcohol yielded significant outcomes compared to the use of 20 ml of 70% alcohol. Furthermore, the use of 40 ml of 70% alcohol demonstrated superior results when compared to 30 ml in terms of the duration of pain relief, opioid consumption, and overall QOL improvement.

Keywords: Celiac plexus neurolysis, VAS, Quality of life.

INTRODUCTION

The celiac plexus is a considerable visceral plexus, that existing deep in the retroperitoneum, positioned anterior to the aorta at the level of the first lumbar vertebra, between the origins of the celiac artery and superior mesenteric arteries. This plexus carries pain impulses from the upper abdominal organs [(1)].

Neurolytic celiac plexus block (NCPB) is a chemical sympathectomy targeting the celiac plexus, considered an excellent treatment for patients complaining of severe abdominal pain due to presence of upper abdominal malignancies [(2)]. In these patients, chronic refractory pain significantly diminishes QOL and often necessitates high doses of narcotics, leading to serious side effects [(3)].

However, NCPB can lead to complications such as back pain, orthostatic hypotension, diarrhea, retroperitoneal hemorrhage, paraplegia, transient motor paralysis, and abdominal aortic dissection [(4)]. Therefore, it is crucial to aim for optimal effectiveness while using the minimum amount of neurolytic agent.

Aim of the study was to evaluate the effectiveness and safety of pain control using different volumes of 70% alcohol (40 ml, 30 ml, and 20 ml) for trans-aortic NCPB in patients with upper abdominal tumors. Additionally, the study assessed the impact of these varying volumes on reducing daily opioid consumption and improving QOL.

PATIENTS AND METHODS

This study was conducted in the Anesthesia, ICU, and Pain Management Department of Al Menoufia University Hospital and the Pain Therapy Unit at Tanta Cancer Center. The study ran from October 2016 for one year or until the end of the patients' lives.

Ninety patients of both sexes who were suffering from non-resectable upper abdominal tumors were enrolled in the study. They were randomly assigned to one of three equal groups using the sealed envelope technique. The allocation was based on the volume of 70% alcohol, administered through a single-needle trans-aortic approach for neurolytic celiac plexus block (NCPB); Group I: Celiac block with 40 ml, Group II: Celiac block with 30 ml and Group III: Celiac block with 20 ml of 70% alcohol.

Inclusion criteria:

Ninety patients with severe, uncontrolled visceral pain (VAS ≥ 7/10) that were non-responsive or poorly responsive to the maximum tolerable doses of opioids for non-resectable upper abdominal tumors were involved in our study.

Exclusion criteria:

Patients with coagulopathy who had an international normalized ratio >1.5, platelet count <50.000, presence of local infection at the needle insertion site, atherosclerotic disease of the abdominal aorta,

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decompensated cardiac disorders, psychiatric or uncooperative patients, and those who had previously undergone neurolytic blocks affecting cancer-related pain were excluded. As tumor spread is inevitable, so, the patients developing somatic pain (superficial, localized acute discomfort exacerbated by probing of the intercostal areas) due to involvement of neural and somatic structure, at any stage of the study were also excluded.

All patients underwent a detailed history taking, physical examination, and comprehensive investigations, including complete blood count, coagulation profile, and abdominal CT scan. Patients fasted for at least 8 hours before the procedure.

A single-needle trans-aortic approach for NCPB was used. After verifying the needle position, 3 ml of local anesthetic was administered to prevent alcohol-induced irritation before injecting the study solution. The study solution volumes (40 ml, 30 ml, and 20 ml) of 70% alcohol were injected under the guidance of fluoroscopy and close hemodynamic monitoring (including electrocardiogram, blood pressure, and oxygen saturation) in the operating room. Before removing the needle, about 2 ml of normal saline 0.9% was administered to prevent the alcohol from leaking down the needle route.

These procedures were conducted under complete aseptic precautions with patients in the prone position, having a pillow placed under the abdomen to reverse thoracolumbar lordosis. Local anesthesia with conscious sedation (IV midazolam dose 0.03 mg/kg and fentanyl dose 1 µg/kg) was administered. All patients were given 500 ml of Ringer's lactate solution via a large IV cannula and oxygen through a nasal cannula.

All patients were kept in the post-anesthesia care unit (PACU) for 4 hours to monitor vital signs and possible problems. Patients were usually released home the same day with a caregiver and followed up within 24 hours.

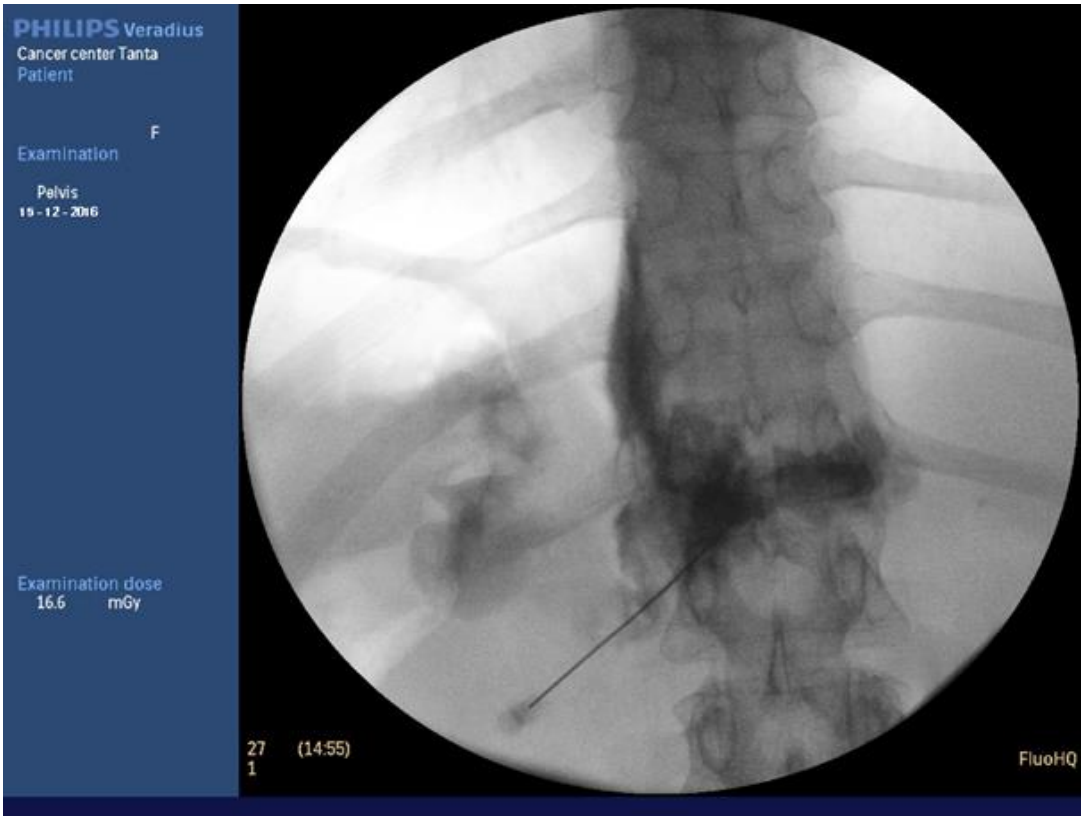

Figure (1): Antero-posterior dye spread in midline with more spread to lateral margin of aorta.

After the procedure, according to the WHO guidelines[5] all patients received anticonvulsant drugs as (gabapentin), also,500 mg of acetaminophen (up to 8 tablets/d), tramadol 100 mg, 200 mg SR as a weak opioid (up to 400 mg/d). When tramadol was not effective in relieving mild to moderate pain, we gave patients a strong opioid (morphine sulfate, MST). According to opioid responsiveness, dosage escalation was required until appropriate analgesia was achieved. The main primary outcome was pain assessment using VAS ranging from 0 to 10. Secondary outcomes included daily tramadol consumption, QOL (using QOL-C30 questionnaire) [6], and possible complications.

Table (1): The QLQ C30 Version 1.0 with Functional/Symptom Scales[6].

	SCALE		NO	YES	
1. Do you have trouble in doing any strenuous activities, like carrying a heavy shopping bag or a suitcase?	(Physical.)		1	2	
2. Do you have any trouble taking a **long** walk?	(Physical.)		1	2	
3. Do you have any trouble taking a **short** walk outside of the house?	(Physical.)		1	2	
4. Do have to stay in bed or a chair for most of the day?	(Physical.)		1	2	
5. Do you need help with eating, dressing, washing yourself or using the toilet?	(Physical.)		1	2	
6. Are you limited in any way in doing either your work or doing household jobs?	(Role,)		1	2	
7. Are you completely unable to work at a job or to do household jobs?	(Role,)		1	2	
8. Were you short of breath?	Dyspnea(symptom)	1	2	3	4
9. Have you had a pain?	Pain(symptom)	1	2	3	4
10. Did you need a rest?	Fatigue(symptom).	1	2	3	4
11. Have you had any trouble in sleeping?	Insomnia(symptom),	1	2	3	4
12. Have you felt weakness?	Fatigue(symptom),	1	2	3	4
13. Have you lacked appetite?	Appetite Loss(symptom),	1	2	3	4
14. Have you felt nauseated before?	Nausea and Vomiting(symptom)	1	2	3	4
15. Have you vomited before?	Nausea and Vomiting(symptom),	1	2	3	4
16. Have you had constipation?	Constipation(symptom)	1	2	3	4
17. Have you had diarrhea?	Diarrhea(symptom)	1	2	3	4
18. Were you feeling tired?	Fatigue(symptom)	1	2	3	4
19. Did pain interfere with your daily activities?	Pain	1	2	3	4
20. Have you had difficulty in concentrating on things, like reading a newspaper or watching television?	(Cognitive)	1	2	3	4
21. Did you feel tense?	(Emotional)	1	2	3	4
22. Did you worry?	(Emotional)	1	2	3	4
23. Did you feel irritable?	(Emotional)	1	2	3	4
24. Did you feel depressed?	(Emotional)	1	2	3	4
25. Have you had difficulty remembering things?	(Cognitive)	1	2	3	4
26. Did your physical condition or medical treatment interfered with your **family** life?	(Social)	1	2	3	4
27. Did your physical condition or medical treatment interfered with your **social** activities?	(Social)	1	2	3	4
28. Did your physical condition or medical treatment caused you financial difficulties?	(Financial Difficulties)	1	2	3	4
GLOBAL HEALTH STATUS					
29. How would you rate your overall **physical condition** during the past week?					
1 Very poor	2	3	4	5	6	7 Excellent
30. How would you rate your overall **quality of life** during the past week?					
1 Very poor	2	3	4	5	6	7 Excellent

Ethical approval:

After obtaining an approval from our institutional and regional ethical committees [Al-Menoufia University Hospital, and the Pain Therapy Unit at Tanta Cancer Center] and obtaining written informed permission from patients and/or their caretakers. The study adhered to the Helsinki Declaration throughout its execution.

Statistical analysis

The statistical interpretation was conducted using SPSS version 27.0. The data distribution's normality was evaluated using histograms and the Shapiro-Wilk test. The ANOVA (F) test with a post-hoc Tukey test was used to evaluate quantitative parametric data, which were provided as mean±SD and range. Using a modified Bonferroni correction test for group comparisons, the Kruskal-Wallis test was used to assess quantitative non-parametric data, which were presented as median and IQR. The X^2-test was used to examine the qualitative variables, which were provided as frequency and percentage (%). Statistical significance was defined as a P-value of less than 0.05.

RESULTS

A total of 123 patients were thoroughly considered for eligibility. Of these, 14 patients did not meet the requirements, and 9 declined to participate in the study. While, the remaining 100 patients were randomly assigned into 3 groups.

Patients developed neuropathic or somatic pain were excluded (so, 30 patients were included in each group), however the patients who died before the end of the study had their scores continued to the end of assessment period using intention to treat method [7] (Figure 2).

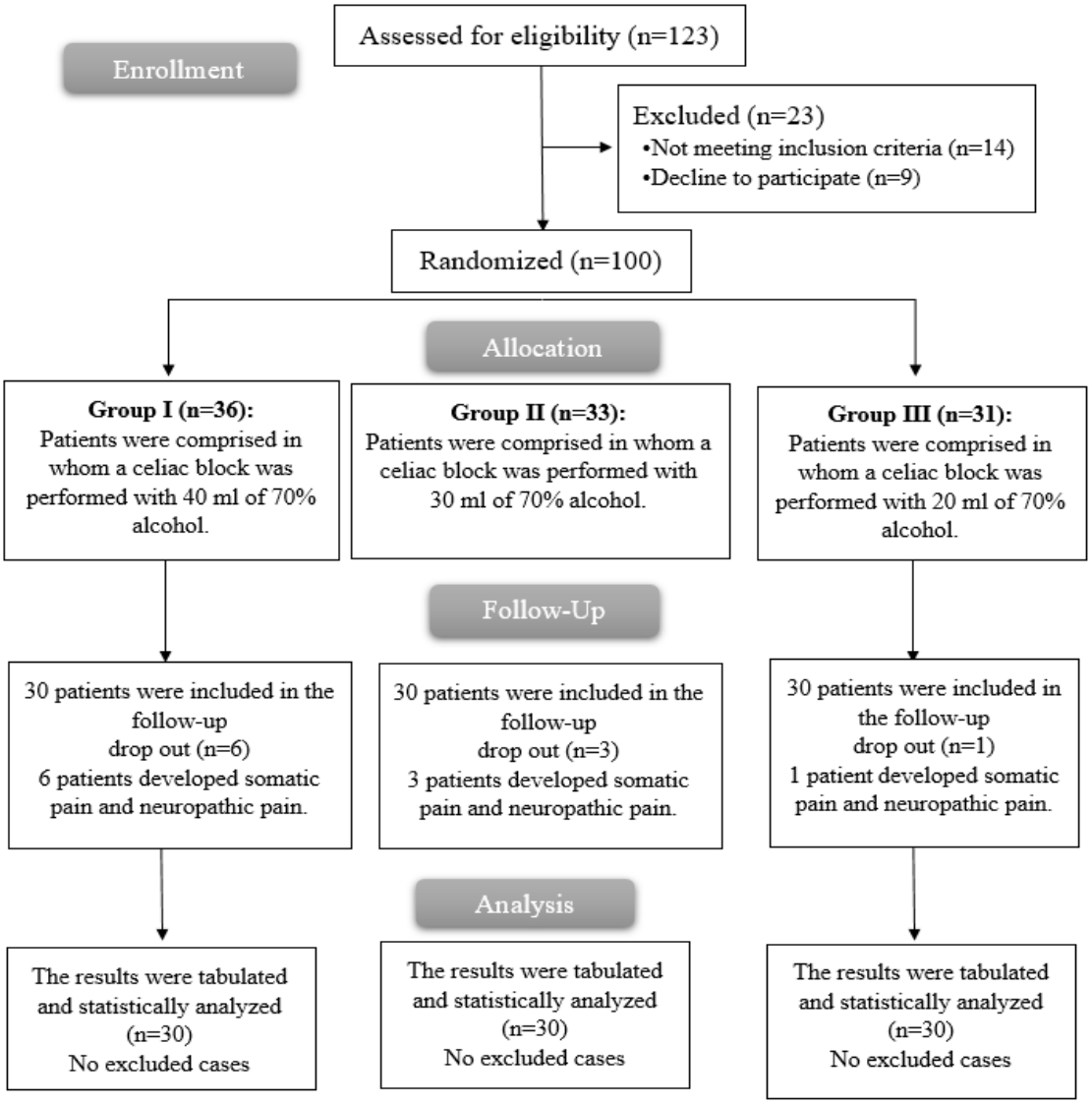

Figure (2): Consort flowchart of the enrolled patients.

The patients' demographic data, duration of pain, time since diagnosis, tumor site, and medical history were not significantly different among the three groups (Table 2).

Table (2): Patients' characteristics, duration of pain, time since diagnosis and medical history

		Group I (n=30)	Group II (n=30)	Group III (n=30)	P value
Age (years)	**Mean ± SD**	53.6 ± 7.11	56 ± 8.31	57.9 ± 9.52	0.147
	Range	40 - 67	36 - 75	38 - 71	
Sex	**Male**	16 (53.33%)	19 (63.33%)	15 (50%)	0.557
	Female	14 (46.67%)	11 (36.67%)	15 (50%)	
Weight (kg)	**Mean ± SD**	70.3 ± 8.51	69.5 ± 7.47	72 ± 7.9	0.487
	Range	55 - 85	54 - 82	58 - 86	
Height (cm)	**Mean ± SD**	170.1 ± 5.13	169.2 ± 6.78	168.9 ± 3.93	0.651
	Range	162 - 180	155 - 178	164 - 177	
Duration of pain (months)	**Mean ± SD**	4.6 ± 2.16	5.5 ± 1.63	5.5 ± 1.61	0.082
	Range	0.83 - 9	3 - 9	3 - 9	
Time since diagnosis (months)	**Mean ± SD**	7.8 ± 2.87	8.5 ± 1.55	9 ± 2.55	0.151
	Range	1.5 - 12	6 - 11	6 - 18	
Site of tumour	**Head of pancreas**	9 (30%)	4 (13.33%)	7 (23.33%)	0.274
	Tail of pancreas	4 (13.33%)	5 (16.67%)	1 (3.33%)	
	Hepatocellular carcinoma	16 (53.33%)	18 (60%)	17 (56.67%)	
	Stomach	1 (3.33%)	2 (6.67%)	5 (16.67%)	
	Cholangiocarcinoma	0 (0%)	1 (3.33%)	0 (0%)	
Chemotherapy	Yes	16 (53.33%)	23 (76.67%)	23 (76.67%)	0.079
	No	14 (46.67%)	7 (23.33%)	7 (23.33%)	
Radiotherapy	**Yes**	0 (0%)	2 (6.67%)	2 (6.67%)	0.351
	No	30 (100%)	28 (93.33%)	28 (93.33%)	

Data presented as mean ± SD, number of patients (%) in each group.

The mean pre-procedure VAS were approximately 8.7/10, which were significantly reduced after the procedure in all groups for 12 months. Furthermore, there was no difference statistically in VAS measurements between the three groups before the procedure till the 3rd week (P>0.05).

After that, VAS measurements in Group III were significantly higher than both Group I and Group II for the 12th month (p<0.001), while the VAS measurements became significantly lower in Group I than Group II from the 3rd month till the 12th month (p<0.001) (Table 3).

Table (3): Comparison of VAS scale measurements of the three studied groups

	Group I (n=30)		Group II (n=30)		Group III (n=30)		P value		
	Mean ± SD (Range)	P value	Mean ± SD (Range)	P value	Mean ± SD (Range)	P value	P1	P2	P3
Before block	8.7 ± 0.79 (7.3 - 10)	--	8.6 ± 0.84 (7.2 – 10)	--	8.7 ± 0.72 (7.5 – 10)	--	0.890	0.996	0.924
1st week	3.9 ± 0.47 (2.2 - 4.9)	<0.001	4.0 ± 0.64 (2.2 - 4.5)	<0.001	4.2 ± 0.84 (3.2 - 5.1)	<0.001	0.822	0.219	0.529
2nd week	2.7 ± 0.86 (1.4 - 3.9)	<0.001	2.7 ± 0.68 (1.5 - 3.9)	<0.001	2.5 ± 0.55 (2 - 3.8)	<0.001	0.982	0.520	0.634
3rd week	1.5 ± 0.35 (1.2 - 2.2)	<0.001	1.6 ± 0.76 (1.1 - 3.2)	<0.001	1.7 ± 0.63 (1.1 - 2.8)	<0.001	0.649	0.427	0.938
4th week	1.5 ± 0.33 (1.2 - 2.9)	<0.001	1.7 ± 0.71 (1.1 – 3)	<0.001	2.3 ± 0.66 (1.6 - 3.3)	<0.001	0.356	<0.001	<0.001
2nd month	1.6 ± 0.4 (0.7 - 2.6)	<0.001	1.8 ± 0.81 (1.1 - 3.1)	<0.001	2.7 ± 0.7 (1.6 - 3.3)	<0.001	0.613	<0.001	<0.001
3rd month	2.4 ± 0.56 (1.6 - 3.9)	<0.001	3.9 ± 0.44 (3 - 4.9)	<0.001	5.2 ± 0.97 (3.7 - 7.4)	<0.001	<0.001	<0.001	<0.001
4th month	2.7 ± 0.58 (2.1 - 3.9)	<0.001	4.1 ± 0.39 (3.4 - 5.1)	<0.001	6.1 ± 0.91 (4 - 8.1)	<0.001	<0.001	<0.001	<0.001
5th month	2.9 ± 0.73 (2.1 – 5)	<0.001	4.9 ± 0.51 (4.1 - 5.9)	<0.001	6.9 ± 1.15 (4.7 - 8.1)	<0.001	<0.001	<0.001	<0.001
6th month	3.2 ± 0.76 (2.2 - 4.3	<0.001	5.1 ± 0.76 (4 - 6.5)	<0.001	7.3 ± 1.04 (5.5 - 8.3)	<0.001	<0.001	<0.001	<0.001
9th month	4.2 ± 0.79 (2.7 - 6.5)	<0.001	5.4 ± 0.78 (3.9 - 6.7)	<0.001	7.6 ± 0.79 (5.6 - 8.3)	<0.001	<0.001	<0.001	<0.001
12th month	4.5 ± 0.87 (2.5 - 5.7)	<0.001	5.8 ± 0.91 (3.9 - 6.9)	<0.001	8 ± 0.85 (6.5 – 9)	0.044*	<0.001	<0.001	<0.001

*: significant P value as ≤0.05, P1: P value between groups I & II, P2: P value between Groups I & III, P3:P value between groups II & III.

Before the procedure, all three groups had a similar daily tramadol consumption of approximately 400 mg ($p > 0.05$). After the block, there was a significant reduction in tramadol requirements reported in groups I and II up to end of the study, while in group III it was significantly lower for 5 months only than preprocedural block. The lowest tramadol consumption was noted at the third week in all groups (Figure 3). Furthermore, no difference was found among the three groups at 1st week after the procedure in tramadol consumption. After that, it was significantly higher in Group III than both group I and group II from 2nd and 3rd weeks, respectively till the end of the study. Moreover, it was significantly lower in group I than in group II from the 3rd month onwards (Figure 3).

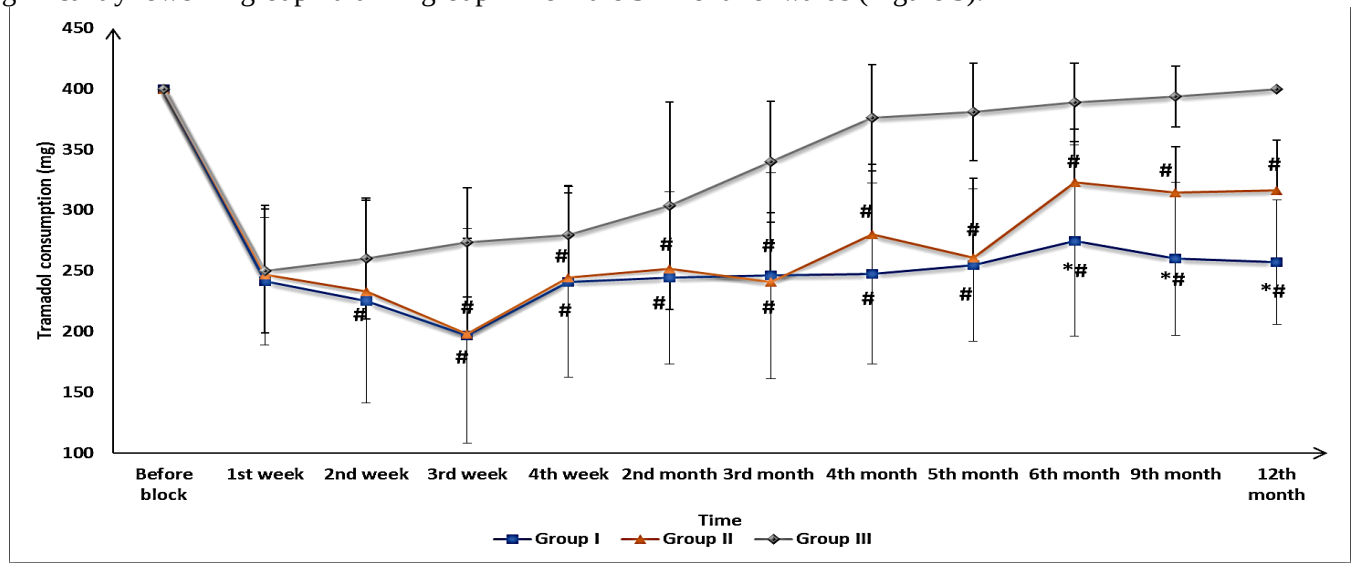

Figure (3): Tramadol consumption measurements of the studied groups.
*: significantly lower than Group II, #: significantly lower than Group III

The quality-of-life QLQ-C30 was insignificantly different among the three groups before block. However, it was significantly higher in group I than group II from the 4th month, up to 12th month. Additionally, it was significantly lower in group III than other groups at all post procedure measurements. Furthermore, in comparison to pre-block measurement, the total QLQ-C30 questionnaire was significantly higher at all measurements in Group I. while in other groups, it was significantly higher up to the 6th month only (Table 4).

Celiac ganglia block was successfully done for all patients and all patients tolerated the procedure well, with no intraoperative serious events observed. The expected intraoperative drop in mean arterial blood pressure more than 20% from baseline) responded well to intravenous fluid therapy. All participants were released from the hospital on the same day when their vital data normalized, which was generally within 4 hours post-procedure.

Table (4): Total QLQ-C30 questionnaire of the studied groups

	Group I (n=30)		Group II (n=30)		Group III (n=30)		P value		
							P1	P2	P3
	Median (IQR)	P value	Median (IQR)	P value	Median (IQR)	P value			
Before block	150.5 (108.5 – 163)	--	140.5 (114.8-155.8)	--	134.5 (115.8 - 152.8)	--	0.695	0.748	0.469
1st week	480 (473.5 - 493.8)	<0.001	478 (461.3 - 507.8)	<0.001	396.5 (379.3 - 408.8)	<0.001	0.773	<0.001	<0.001
2nd week	480 (464.8 - 500.3)	<0.001	472.5 (445.8 - 488.8)	<0.001	380.5 (354.3 - 402.8)	<0.001	0.234	<0.001	<0.001
3rd week	478 (450.5 - 489.5)	<0.001	465.5 (452 – 480)	<0.001	354.5 (338.5 – 374)	<0.001	0.102	<0.001	<0.001
4th week	447 (410 – 466)	<0.001	428 (410 – 446)	<0.001	328.5 (305.5 - 342.8)	<0.001	0.216	<0.001	<0.001
2nd month	440 (418.5 – 455)	<0.001	422 (410 – 432)	<0.001	297.5 (270.5 – 322)	<0.001	0.076	<0.001	<0.001
3rd month	425 (388 - 452.8)	<0.001	397 (387 – 417)	<0.001	273.5 (249.5 - 300.8)	<0.001	0.069	<0.001	<0.001
4th month	430 (403 – 448)	<0.001	351.5 (297.3 - 370.8)	<0.001	239 (199.8 - 263.3)	<0.001	<0.001	<0.001	<0.001
5th month	405 (374.5 - 430.5)	<0.001	333 (245.5 - 350.5)	<0.001	202.5 (177 - 228.5)	<0.001	<0.001	<0.001	<0.001
6th month	370 (350 – 398)	<0.001	279 (226.5 - 322.3)	<0.001	180 (158 – 205)	<0.001	<0.001	<0.001	<0.001
9th month	480 (409.5 – 483.3)	<0.001	200.5 (175-226.5)	0.067	141.5 (134-150)	0.145	<0.001	<0.001	<0.001
12th month	160 (108 – 217.5)	0.045	150 (134 - 150)	0.452	131 (129 - 157)	0.962	<0.001	<0.001	<0.001

*: significant P value as ≤0.05, P1: P value between groups I & II, P2: P value between Groups I & III, P3:P value between groups II & III.

Additionally, the number of patients converted to morphine was significantly inversely proportional to the volume of neurolytic agent. During the post-procedure follow-up period, no serious procedure-related events were reported. No significant differences between the groups in mortality rate or postprocedural complications (Table 5). Orthostatic hypotension last for hours, and diarrhea lasted up to 2 weeks, both of which were medically controlled.

Table (5): Incidence of patients converted to morphine and complications.

Side effect	Group I (n=30)	Group II (n=30)	Group III (n=30)	P value
Patients converted to morphine	8(26.6%)	10 (33.33%)	13 (43.33%)	**0.049***
Mortality	7 (23.33%)	11(36.67%)	6 (20%)	0.303
Postural hypotension	5(16.6%)	4 (13.3%)	4(13.3%)	0.853
Diarrheaa	11 (36.67%)	10 (33.33%)	8 (26.66%)	0.510
Pain during injection	15 (50%)	11 (36.67%)	7 (23.33%)	0.101
Constipation	0 (%)	0 (%)	0 (%)	---
Pneumothorax	0 (%)	0 (%)	0 (%)	----
Shoulder pain	2 (6.67%)	2 (6.67%)	3 (10%)	0.856
Backache	9 (30%)	9 (30%)	10 (33.33%)	0.949

*: significant P value as ≤0.05.

DISCUSSION

Pain is a prevalent and annoying symptom of cancer, profoundly affecting patients' lives [7,8]. Pharmacological therapy for cancer pain, although indispensable, may sometimes prove inadequate and is often associated with various side effects[9]. Consequently, interventional techniques have been investigated as alternative approaches. Among these, celiac plexus block stands out as an effective method for managing upper abdominal cancer pain, leading to a significant decrease in analgesic consumption and improvements in QOL scales[10].

Despite the inherent risks associated with the transaortic approach to celiac plexus block, such as bleeding or hematoma formation, these risks can be minimized with proper technique and guidance[11]. Additionally, this approach offers several advantages over the retrocrural approach. These advantages include direct access to the celiac plexus, reduced risk of organ injury, and consistent anatomical landmarks[12].

The single needle transaortic approach for celiac plexus block offers further benefits, including simplicity, reduced procedure time, less patient discomfort, decreased risk of complications, and potentially improved accuracy and effectiveness of the block. The ability for more accurate placement of the needle and better delivery of the anesthetic or neurolytic agent allows for a more uniform and concentrated distribution of the injectate surrounding the celiac plexus [13,14].

The commonly recommended volume for a transaortic neurolytic celiac plexus block typically ranges from 20 to 30 ml [15,16]. However, determining the optimal volume of neurolytic agent and ensuring precision in the injection of the transaortic celiac plexus block are crucial factors for achieving the best efficacy and duration of pain relief. It is essential to use the least amount of neurolytic agent possible to minimize the potential complications associated with inadvertent spread to nearby organs[17]. These complications may include hypotension, diarrhea, organ injury, inadvertent intravascular injection, or neurological complications such as lower limb weakness, sensory deficits, or dysesthesia[18]. Therefore, careful consideration of the volume and technique used in transaortic celiac plexus block is imperative to maximize effectiveness while minimizing risks.

In this study, a VAS score of ≤4 with or without opioid medication was considered a successful neurolytic celiac plexus block (NCPB). Our findings demonstrated a significant pain relief after NCPB in all groups for 12 months, with the degree of relief being directly proportional to the volume of the neurolytic agent. The lowest VAS scores were observed at the third week in all groups. This finding is consistent with previous studies by **Rykowski and Hilgier[19],** who noted a gradual increase in VAS after the third month.

On the other hand, **Dolly *et al.*** [20] evaluated the effectiveness of injecting 20 ml, 30 ml, or 40 ml of alcohol was 70%, and patients who got 40 ml for up to 16 weeks only had VAS ratings of less than 4/10, compared to those who received 20 ml for just 8 weeks. They ascribed this discrepancy between their two groups to inadequate medical supervision and extremely sluggish increases in opioid dosage in reaction to worsening pain.

Moreover, **Abdel-Ghaffar *et al.*** [21] demonstrated that reduction of pain using 20 milliliters (or less) of alcohol to cause celiac neurolysis is equivalent to using 40 milliliters when paired with appropriate medical treatment, it's worth noting that their study had a shorter follow-up period (12 weeks) and a smaller sample size (14 patients in each group), whereas our study included 90 patients (30 patients in 3 groups) and had a one-year follow-up period.

In our study, all groups had a pre-procedure tramadol consumption of 400 mg daily. As we tracked patients during the follow-up periods post-procedure, the daily tramadol consumption showed an indirect correlation with the volume of the neurolytic agent. The lowest tramadol consumption was noted at the third week in all groups, with reduction persisting up to 5 months only in group III, and up 12 months in group I and group II, with significant reduction in group I than

group II from the 3rd month. Furthermore, the rate of conversion to morphine (strong opioid) was significantly inversely proportional to the volume of neurolytic agent.

Our findings were corroborated by **Dolly *et al.*** [20], who reported complete post-procedure withdrawal of opioids in 47% of patients. Additionally, **Yoon *et al.*** [22] revealed that celiac plexus block effectively controlled pain with a decrease in opioid usage for a mean survival period of approximately 51 days.

Reduced opioid consumption may enhance the QOL by mitigating the sedative and other adverse effects of opioids, while also bolstering the immune system[23,24]. This improvement was primarily reflected in our study results by a significant enhancement in QOL scores, particularly in groups I and II. Similarly, various studies[25,26] evaluating the impact of CPN on QOL using different questionnaires have reported a strong correlation between opioid consumption and improvement in QOL.

We observed a significant improvement in QOL after celiac block, which was proportional to the increasing volume of 70% alcohol until the end of the study. This finding aligns with the results reported by **Dolly *et al.*** [20] who noted improved VAS scores, QOL scores, and decrease in morphine usage with increasing alcohol volume in CPB.

Although **Kawamata *et al.*** [27] found that while an effective pain management with minimal side effects can prevent impairment in QOL due to the prolonged analgesic effect, reduction in side effects, and decreased morphine utilization, it does not markedly promote QOL in individuals suffering pain due to pancreatic cancer. They recommend proper socio-environmental support to significantly enhance QOL. However, **Wong *et al.*** [11] reported that while NCPB enhances analgesia in comparison to systemic pain relief intervention alone, it does not influence QOL or survival.

Furthermore, in a comparative study by **Abdel-Ghaffar *et al.*** [21] between two different volumes of alcohol (40 ml and 20 ml) for celiac block, they found no statistical difference in QOL between both groups. However, as mentioned before their study had limitations, including a shorter follow-up period of 12 weeks and a smaller sample size of 14 patients per group.

The single-needle transaortic approach used in our study was simple and safe, with no observed procedure related-mortality. Interestingly, the procedure-related complications did not significantly differ between groups and were mostly minor, such as transient backache at the injection site (50%) and postural hypotension (33.3%) when using 40 ml of 70% alcohol. Additionally, there was no significant variation in the incidence of postural hypotension among the three groups. This is likely due to preloading with Ringer's lactate, which effectively reduced the occurrence of hypotension even with the injection of 40 ml.

Multiple studies[18,28,29] support our results of minimal complications and safety associated with the transaortic approach. However, **Davies**[30] reported a slightly higher incidence of orthostatic hypotension (50%), and **Eisenberg *et al.***[31] noted higher incidence of transient local pain (96%) with a bilateral posterior approach.

Unfortunately, **Kim *et al.*** [32] reported four cases of permanent paraplegia following CPN performed under C-arm fluoroscopy. They suggested the causes to direct spread of the neurolytic agent into the subarachnoid or subdural space, or ischemic injury to the cord secondary to damage to the artery of Adamkiewicz by the needle or drug induced vasospasm.

Ischia *et al.* [29] observed a lower incidence of orthostatic hypotension after the transaortic approach relative to other posterior approaches for celiac plexus neurolysis (CPN). They ascribed this discovery to the injection of the neurolytic agent anterior to the aorta, which limits its dissemination in the psoas compartment harboring the sympathetic chain.

CONCLUSION

In conclusion, our prospective study demonstrated that the usage of 40 ml and 30 ml of 70% alcohol resulted in significant and prolonged analgesia compared to 20 ml of 70% alcohol. Based on our findings, we recommend the utilization of 40 ml of 70% alcohol for celiac plexus neurolysis, as it was associated with longer duration of pain relief, reduced opioid consumption, and improved QOL without an increased incidence of complications.

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