

## ORIGINAL RESEARCH

## PAIN MANAGEMENT

# An interventional prospective cohort study of efficacy of unilateral vs bilateral percutaneous posterior approach neurolytic celiac plexus blocks

Muhammad Q. Abbas <sup>1</sup>, Syed M. Abbas <sup>2</sup>, Muhammad F. Farooq <sup>3</sup>, Muhammad Siddique <sup>4</sup>, Shakeel Malik <sup>5</sup>

**Author affiliation:**

1. Muhammad Q. Abbas, MCPS, FCPS, Professor & Head, Department of Anesthesiology, SICU & Pain Management. Sindh Institute of Urology & Transplantation, Karachi, Pakistan; E-mail: [mqamarabbas2001@yahoo.com](mailto:mqamarabbas2001@yahoo.com)
2. Syed M Abbas, FCPS, Professor, Department of Anesthesiology, SICU & Pain Management, Sindh Institute of Urology & Transplantation, Karachi, Pakistan, E-mail: [smabbas69@hotmail.com](mailto:smabbas69@hotmail.com)
3. Muhammad F. Farooq, MCPS, FCPS, Associate Professor, Department of Anesthesiology, SICU & Pain Management, Sindh Institute of Urology & Transplantation, Karachi, Pakistan; E-mail: [mfaisalfarooq@hotmail.com](mailto:mfaisalfarooq@hotmail.com)
4. Muhammad Siddique, MCPS, FCPS, Associate Professor, Department of Anesthesiology, SICU & Pain Management, Sindh Institute of Urology & Transplantation, Karachi, Pakistan; E-mail: [siddique.m75@yahoo.com](mailto:siddique.m75@yahoo.com)
5. Shakeel Malik, FCPS, Assistant Professor, Department of Anesthesiology, SICU & Pain Management. Sindh Institute of Urology & Transplantation, Karachi, Pakistan; E-mail: [onlyshakeel@hotmail.com](mailto:onlyshakeel@hotmail.com)

**Correspondence:** Syed M Abbas; E-mail: [smabbas69@hotmail.com](mailto:smabbas69@hotmail.com); Tel: (+92-21) 99215752 & 99215718; Cell Phone: +92 3331318838; Fax: (+92-21) 99215469 & 99215362

## ABSTRACT

**Background:** The neurolytic celiac plexus block (NCPB) has been a valuable intervention for managing upper abdominal cancer pain. However, the optimal approach for performing a NCPB remains a topic of debate. We conducted this study to establish the efficacy of unilateral vs bilateral percutaneous posterior approach NCPB.

**Methodology:** This prospective, interventional study includes a cohort of individuals through chronic abdominal pain related to malignancies who were scheduled to undergo NCPB. Patients were divided into two groups, one group received the unilateral percutaneous posterior approach NCPB, and the other group received the bilateral NCPB by percutaneous posterior. Pain scores and adverse events at multiple time points post-procedure were recorded. Statistical analysis was conducted to compare pain score and adverse events between the two groups and evaluate the impact of the chosen approach on pain management.

**Results:** Bilateral percutaneous posterior approach provides slightly better pain relief compared to the unilateral approach in the early post-procedure period which is not statistically significant. Complication rates appear to be comparable between the two approaches, with no major safety concerns identified.

**Conclusion:** While the bilateral approach initially offers more effective pain relief, the long-term benefits and safety profiles of both methods are comparable. Clinical decision-making should consider these findings and prioritize individualized patient care.

**Abbreviations:** CPB - Celiac Plexus Block; NCPB - neurolytic celiac plexus block; PACU - post-anesthesia care unit; VAS - visual analogue scale

**Keywords:** Neurolytic celiac plexus block, Pancreatic cancer pain, upper abdominal malignancy

**Citation:** Abbas MQ, Abbas SM, Farooq MF, Siddique M, Malik S. An interventional prospective cohort study of efficacy of unilateral vs bilateral percutaneous posterior approach neurolytic celiac plexus blocks. *Anaesth. pain intensive care* 2024;28(5): 798–803; DOI: [10.35975/apic.v28i5.2559](https://doi.org/10.35975/apic.v28i5.2559)

**Received:** March 24, 2024; **Reviewed:** August 05, 2024; **Accepted:** August 08, 2024

## 1. INTRODUCTION

Cancer pain affects millions globally. It is often complex and difficult to be managed. Pancreatic cancer causes severe abdominal pain that lowers quality of life of the victims.<sup>1</sup> Medical researchers have investigated many interventional techniques, including the Celiac Plexus Block (CPB), to alleviate pain.<sup>2</sup> This intervention has showed potential in relieving pain and enhancing patient well-being. The best CPB method is still debated, with unilateral or bilateral posterior percutaneous methods being the main factors.<sup>3</sup> This study compares unilateral and bilateral CPBs for pain relief, patient satisfaction and complications.

CPB is a specialized method that blocks pain impulses from abdominal viscera to central nervous system (CNS). Disrupting the celiac plexus, a complex network of nerves around the celiac artery, can relieve stomach pain, especially in pancreatic cancer and chronic pancreatitis patients.<sup>4</sup> This minimally invasive procedure blocks pain signals by injecting neurolytic chemicals like alcohol or phenol into the celiac plexus under fluoroscopic guidance.<sup>5</sup> Clinical efficacy of CPB is well-documented, however the one best method is still debated.<sup>6</sup>

The unilateral and bilateral percutaneous posterior techniques are the main CPB methods. Unilateral celiac plexus neurolytic agent injections are guided by fluoroscopy, ultrasonography or computed tomography (CT).<sup>7</sup> Bilateral technique injects neurolytic drug on both sides of the celiac plexus. Pain management physicians must choose amongst various treatments to determine pain alleviation, complications, and patient outcomes.<sup>6</sup>

According to the available literature, the bilateral strategy may relieve pain better than the unilateral approach. The idea holds that bilateral blockage disrupts more pain-transmitting nerves, improving pain control.<sup>8</sup> The bilateral approach may have the risk of hypotension, diarrhea, and alcohol or phenol toxicity.<sup>9</sup> The supporters of the unilateral NCPB claim that it may relieve pain similarly to bilateral NCPB, while minimizing the complications.<sup>9,10,11</sup> Unilateral NCPB may be more efficient and cost-effective, which is important in healthcare. A full evaluation of two NCPB techniques is sought to provide evidence-based advice for pain management professionals.<sup>12,13,14</sup> We can help clinicians choose unilateral or bilateral NCPBs based on pain alleviation, patient satisfaction, and probable consequences.<sup>15,16,17</sup>

We could find only one study from Pakistan; it is from Malik et al<sup>18</sup> who published a cohort of 35 patients from a tertiary care hospital in Pakistan. Therefore, we conducted this study, which may contribute to the evolving field of pain management and facilitate

informed decision-making among our clinicians, ultimately improving the quality of life of individuals suffering from debilitating malignancy related upper abdominal pain.

## 2. METHODOLOGY

Our current research was designed as a prospective, single-center, non-randomized interventional study. Patients were allocated either to the unilateral or bilateral approach group based on their clinical presentation and the decision of their treating physician. The research adhered to ethical guidelines and written informed consent was obtained from all participants. Approval was sought from Ethical Review Committee preceding to commencement of our research. It was then registered with clinicaltrials.gov (No. NCT06316908).

All upper abdominal malignancy adult patients, aged 20 y or older, on palliative care, both male and female, having a visual analogue scale (VAS) more than 7 and on a high dose of analgesics were included. Patients on anti-coagulant medications, having an INR > 1.50 and/or platelets count < 80000, inability to provide informed consent, or those who had previously undergone celiac plexus intervention, were excluded.

We included 30 patients in the study under convenient sampling technique. Patients received a unilateral or bilateral percutaneous NCPB via posterior approach. The procedure was performed under fluoroscopic guidance. The primary outcome measure was pain relief, assessed using VAS before the procedure and at various time points post-procedure. Secondary outcome measures included complication rate and the duration of pain relief.

Data collection was done prospectively by a dedicated research team. All assessments and questionnaires were administered by trained personnel.

### 2.1. Block procedure

The selected patients were divided into two groups; 15 patients in each group. Forty millilitres of the study drug were prepared in a 50 mL syringe by a pharmacy person. Patients were nil per oral (NPO) for six hours and after a written informed consent, patients were brought in the operating room. A 20G intravenous (IV) cannula was passed and ringer lactate infusion started at 10 mL/kg body weight for all patients, except diabetics who received normal saline. Monitors were applied as per American Society of Anesthesiologist (ASA) standards i.e., electrocardiogram (ECG), oxygen saturation (SpO<sub>2</sub>), and non-invasive blood pressure (NIBP), and vital signs were recorded at intervals of 5 min. Patients were then positioned prone on the operating table and their arms were rested on the arm boards. Pillows were

**Table 1: Comparative demographic data in two groups**

Parameter	Unilateral PCPB	Bilateral PCPB	P value
Age (y)	40.867 ± 15.738	46.33 ± 13.746	0.320
Gender			
▪ Male	8 (53.33%)	5 (33.33%)	
▪ Female	7 (46.67%)	10 (66.67%)	
Weight (kg)	53.67 ± 5.420	56.07 ± 6.670	0.288
Height (cm)	162.93 ± 7.841	164.33 ± 6.57	0.600
BMI (kg/m <sup>2</sup> )	20.29 ± 2.38	20.83 ± 2.81	0.579

*Data presented as mean ± SD or n (%); P < 0.05 considered as significant*

placed under the abdomen between the ribs and iliac crest.

First, a mark was made between the T12 and L1 vertebrae under the fluoroscopic view. A line was drawn between the points at 5 and 7 cm lateral to the spinous process of the L3 vertebra. Injection 2% xylocaine 3-5 mL was locally infiltrated and a 20 cm, 22G Chiba needle was inserted at an angle of 45° with the skin and directed medially and in cephalic direction. After making contact with the body of the L1 vertebra, the needle was withdrawn and reinserted with an increased angle between the needle shaft and the skin until the tip of the needle slipped off the body of the L1 vertebra. Then the needle was advanced 1-1.5 cm in front of the T12 - L1 vertebrae. The position of the needle was confirmed in the anterior and lateral views of the vertebra with the help of radiopaque dye under a fluoroscopic view. After the proper confirmation of the tip of the needle, 40 mL of absolute alcohol were injected into the unilateral block. Whereas, in the bilateral technique 20 mL absolute alcohol were injected on both sides.

During and after the drug administration the pattern of the drug distribution was observed very carefully anterior to the body of the L1 vertebra and psoas fascia, and any visceral and I/V drug administration was avoided. After alcohol administration, 0.25% bupivacaine 5 mL was injected, and the needle withdrawn. The patient remained in the prone position for 20 min, after he was turned supine and shifted to the post-anesthesia care unit (PACU) for monitoring of vital

signs for 30 min, later to be shifted to the ward. Pain scores was recorded immediately after arrival in the PACU and then at 30 min, then at 6, 12, and 24 h. Patients were discharged after 24 h or when stable, pain scores was recorded on telephone or outpatient clinic visits at 7 days, 1 month, 3 months, and 6 months after the procedure, or till death if the patient expired before 6

months.

## 2.2. Statistical analysis

All the data were entered and analysed in SPSS version 22.0. Continuous variables are presented as mean and SD (standard deviation) or Median and (IQR) for non-normally distributed variables. Comparison was made using non parametric Mann-Whitney U test for non-numerically distributed variables (pain scores) between the groups. Categorical variables were compared using chi-square or Fisher Exact test between the groups. P value < 0.05 was considered as significant. Descriptive statistics and graphical representations were used to present the data.

## 3. RESULTS

The study included a total of 30 patients, with 15 in each group (Unilateral and Bilateral NCPB). Both groups, had similar demographic profiles and causes of abdominal pain (Table 1). The distribution of individuals having upper abdominal malignancies were well-matched among the sets. The most prevalent type of cancer was gall bladder malignancy, accounting for 60% of cases, while pancreatic cancer accounted for 37%. Although our cohort only consisted of one patient with stomach cancer, this individual had the highest baseline pain level (Table 2).

Immediately after the procedure, both groups showed a significant reduction in pain and there was no

**Table 2: Demographics of patients in relation to primary oncologic diagnoses**

Type of malignancy	No of patients	Age range (y)	Gender (F/M)	Mean Pain intensity (VAS)	Incidence (%)
Ca gall bladder	14	21-74	9/5	8	46.7
Ca gall bladder with METS	4	45-55	4/0	7	6.7
Ca head of pancreas	5	19-50	1/4	8	16.67
Ca body of pancreas	6	26-54	3/3	8	20.0
Ca stomach with METS	1	19	0/1	9	3.3

**Table 3: VAS pain scores at different time intervals**

Time	Unilateral PCPB	Bilateral PCPB	P-value
Immediate	0 (0)	0 (0)	0.999
6 h	2 (1-2)	2 (1-2)	0.7163
12 h	1 (0-2)	1 (1-2)	0.7195
24 h	0 (0-1)	0 (0-1)	0.5453
07 days	0 (0)	0 (0)	0.999
01 month	0 (0)	0 (0)	0.999
03 month	expired	expired	

Data presented as Median (Range); P < 0.05 considered as significant

**Table 4: Complications**

Complications	Unilateral PCPB	Bilateral PCPB	P-value
<b>Transient hypotension</b>			
▪ Immediate	10 (66.7)	11 (73.3)	0.999
▪ 6 h	9 (60)	10 (66.7)	0.705
▪ 12 h	0	1 (6.7)	0.999
▪ 24 h	0	0	
<b>Pleuritis</b>	0	0	

Data presented as n (%); P < 0.05 considered as significant

statistically difference among the two at any time point during follow-up (Table 3). This suggests that both unilateral and bilateral approaches offered similar pain relief. Patients in bilateral PCPB group experienced slightly longer pain relief, though the difference was not statistically significant.

The complication rates were low and comparable between the two groups, suggesting that the choice of approach did not significantly impact the risk of adverse events (Table 4).

## 4. DISCUSSION

Chronic and intractable abdominal pain may sternly affect the individual's quality of life. For those suffering from conditions such as pancreatic cancer or other upper abdominal cancers, pain management becomes a paramount concern.<sup>19</sup> One interventional pain management technique that has increased prominence in last 3-4 decades is the celiac plexus block (CPB). This procedure aims to alleviate abdominal pain by interrupting the sympathetic innervation to the celiac plexus.<sup>20</sup>

Currently the use of percutaneous NCPN employing fluoroscopy is being less preferred. CT has become the modality of choice for image guidance. Endoscopic ultrasound guided CPN is very much endoscopic

dependent and also affected by varied anatomy due to disease progression. Intraoperative surgical splanchnectomy/intra-operative celiac plexus neurolysis is also a possible alternative for inoperable patients. However, the optimal approach for performing this procedure remains a topic of debate. This discussion delves into the comparison of pain scores in patients who underwent a unilateral and a bilateral PCPB, specifically through the percutaneous posterior approach.

CPB is a recognized procedure specially for cancer related abdominal pain management.<sup>21,22</sup> The celiac plexus is situated around the aorta, in the form of complex network of nerves, and interrupting the pain signals originating from this region can offer significant relief. Traditionally, CPBs were performed through a transabdominal approach, which required a high degree of skill and exposed the patient to various risks. The percutaneous posterior approach offers a less invasive alternative, making it a preferred choice for many patients.<sup>21</sup>

We performed CPN on all of our patients using C-arm fluoroscopic guidance and managed to get good results. Decision of unilateral and bilateral CPN was dependent upon the treating physician on the basis of technical difficulty of the procedure.

It is important to emphasize that the bilateral celiac plexus neurolysis (CPN) requires significant needle advancement on both sides of the celiac artery, making it potentially reliant on the skill and expertise of the operator. It's not a novice's play.

## 5. LIMITATIONS

Our study cohort comprised of only 30 patients, which is a small sample as compared to most of the international study populations.

## 6. CONCLUSION

In conclusion, the comparison of pain scores in the context of neurolytic celiac plexus blocks using unilateral and bilateral percutaneous posterior approaches provides valuable insights for pain management. Our study indicates that both approaches are effective in alleviating pain associated with certain conditions. Unilateral blocks offer a less invasive option, while bilateral blocks may provide more comprehensive

relief. The choice between these two methods should be made considering the patient's specific needs, the underlying condition, and the potential for complications. Ultimately, this research underscores the importance of tailoring treatment approaches to individual patients, aiming to enhance the overall quality of life and pain management.

## 7. Data availability

The numerical data generated during this research is available with the authors.

## 8. Acknowledgement

We gratefully thank staff of Department of Anesthesiology, SICU & Pain Management. Sindh Institute of Urology & Transplantation, Karachi, for their cooperation and patience during the conduct of this study.

## 9. Conflict of interest

The study utilized the hospital resources only, and no external or industry funding was involved.

## 10. Authors' contribution

MQA: Primary investigator, conceived the idea and performed all cases by himself

SMA: corresponding author, responsible for synopsis writing, Ethical Review Committee approval and www.clinicaltrials registration, data collection and proof reading of the final manuscript.

MFF: Responsible for data collection, results analysis with the statistician and manuscript writing

MS, SM: responsible for data collection and manuscript writing

## 11. REFERENCES

- Cipora E, Czerw A, Partyka O, Pajewska M, Badowska-Kozakiewicz A, Fudalej M, et al. Quality of life in patients with pancreatic cancer: a literature review. *Int J Environ Res Public Health*. 2023;20(6):4895. [PubMed] DOI: [10.3390/ijerph20064895](https://doi.org/10.3390/ijerph20064895)
- Vig S, Bhan S, Bhatnagar S. Celiac plexus block: an old technique with new developments. *Pain Physician*. 2021;24(5):379-98. [PubMed]
- Chary A, Edalat F. Celiac plexus cryoneurolysis. *Semin Intervent Radiol*. 2022;39(2):138-41. [PubMed] DOI: [10.1055/s-0042-1745762](https://doi.org/10.1055/s-0042-1745762)
- Lohse I, Brothers SP. Pathogenesis and treatment of pancreatic cancer-related pain. *Anticancer Res*. 2020;40(4):1789-96. [PubMed] DOI: [10.21873/anticancerres.14133](https://doi.org/10.21873/anticancerres.14133)
- Pacheco-Feijó GM, Amado-Tineo JP, Plancarte-Sánchez R, Valdivia CC, López-Millán JM. Efficacy and safety of celiac plexus neurolysis in chronic pain secondary to oncological pathology: a systematic review and meta-analysis. *Indian J Palliat Care*. 2023;29(4):394-406. [PubMed] DOI: [10.25259/IJPC\\_203\\_2022](https://doi.org/10.25259/IJPC_203_2022)
- Abdelghaffar NA, El-Rahmawy GF, Elmaddawy A, El-Badrawy A. Single vs double needle celiac trunk neurolysis in abdominal malignancy pain management: a randomized controlled trial. *Braz J Anesthesiol*. 2019;69(3):284-90. [PubMed] DOI: [10.1016/j.bjan.2018.12.005](https://doi.org/10.1016/j.bjan.2018.12.005)
- Matsumoto T, Yoshimatsu R, Osaki M, Miyatake K, Yamanishi T, Yamagami T. CT-guided single celiac plexus neurolysis: analgesic efficacy and safety. *Abdom Radiol (NY)*. 2022;47(11):3892-906. [PubMed] DOI: [10.1007/s00261-022-03670-7](https://doi.org/10.1007/s00261-022-03670-7)
- Kwon HJ, Jang K, Leem JG, Shin JW, Kim DH, Choi SS. Factors associated with successful response to neurolytic celiac plexus block in upper abdominal cancer-related pain. *Korean J Pain*. 2021;34(4):479-86. [PubMed] DOI: [10.3344/kjp.2021.34.4.479](https://doi.org/10.3344/kjp.2021.34.4.479)
- Dos Santos Silva RP, Lopes AJM, Bezerra RB, Andrade RA, Andrade RG, da Costa LMF, et al. Persistent hypotension and other complications of celiac plexus neurolysis: a case report and literature review. *Clin Case Rep*. 2023;11(6). [PubMed] DOI: [10.1002/ccr3.7505](https://doi.org/10.1002/ccr3.7505)
- Urits I, Jones MR, Orhurhu V, Peck J, Corrigan D, Hubble A, et al. A comprehensive review of the celiac plexus block for chronic abdominal pain. *Curr Pain Headache Rep*. 2020;24(8):42. [PubMed] DOI: [10.1007/s11916-020-00878-4](https://doi.org/10.1007/s11916-020-00878-4)
- Savader SJ, Bourke DL, Venbrux AC, Trerotola SO, Grass JA, Lund GB, et al. Randomized double-blind clinical trial of celiac plexus block for percutaneous biliary drainage. *J Vasc Interv Radiol*. 1993;4(4):539-42. [PubMed] DOI: [10.1016/s1051-0443\(93\)71917-x](https://doi.org/10.1016/s1051-0443(93)71917-x)
- Filippiadis D, Ptohis N, Efthymiou E, Kelekis A. Performance of percutaneous cryoneurolysis of splanchnic nerves in refractory abdominal pain in pancreatic cancer. *Cardiovasc Intervent Radiol*. 2021;44(5):789-94. [PubMed] DOI: [10.1007/s00270-020-02756-3](https://doi.org/10.1007/s00270-020-02756-3)
- Minaga K, Takenaka M, Kamata K, Yoshikawa T, Nakai A, Omoto S, et al. Alleviating pancreatic cancer-associated pain using endoscopic ultrasound-guided neurolysis. *Cancers (Basel)*. 2018;10(2):50. [PubMed] DOI: [10.3390/cancers10020050](https://doi.org/10.3390/cancers10020050)
- Romanukha DM, Strokan AM, Biloshytsky VV. Celiac plexus neurolysis in pain associated with pancreatic cancer. *Ukr Neurosurg J*. 2022;28(3):52-6. DOI: [10.25305/unj.257987](https://doi.org/10.25305/unj.257987)
- Kambadakone A, Thabet A, Gervais DA, Mueller PR, Arellano RS. CT-guided celiac plexus neurolysis: a review of anatomy, indications, technique, and tips for successful treatment. *Radiographics*. 2011;31(6):1599-621. [PubMed] DOI: [10.1148/rg.316115526](https://doi.org/10.1148/rg.316115526)
- Yasuda I, Wang HP. Endoscopic ultrasound-guided celiac plexus block and neurolysis. *Dig Endosc*. 2017;29(4):455-62. [PubMed] DOI: [10.1111/den.12824](https://doi.org/10.1111/den.12824)
- Pérez-Aguado G, de la Mata DM, Valenciano CM, Sainz IF. Endoscopic ultrasound-guided celiac plexus neurolysis in unresectable pancreatic cancer: an update. *World J Gastrointest*

- Endosc. 2021;13(10):460-72. [\[PubMed\]](#) DOI: [10.4253/wjge.v13.i10.460](https://doi.org/10.4253/wjge.v13.i10.460)
18. Malik SH, Hafeez H, Malik NH, Ghafoor AUR. Celiac plexus neurolysis for pancreatic cancer: retrospective analysis of Shaikat Khanum Memorial Cancer Hospital & Research Centre experience. *J Ayub Med Coll Abbottabad*. 2018;30(4):516-9. [\[PubMed\]](#)
  19. Yanaizumi R, Nagamine Y, Harada S, Kuramochi T, Ota S, Abe Y, et al. Neurolytic splanchnic nerve block via transintervertebral disc approach to retrocrural space: a multicenter retrospective study. *Pain Ther*. 2022;11(4):1359-72. [\[PubMed\]](#) DOI: [10.1007/s40122-022-00432-7](https://doi.org/10.1007/s40122-022-00432-7)
  20. Ng KF, Tsui SL, Yang CS. Unilateral approach to posterior retrocrural celiac plexus block. *Chin Med J (Engl)*. 1999;112(1):89-92. [\[PubMed\]](#)
  21. Nakano R, Shiomi H, Ota S, Iijima H. Endoscopic ultrasound-guided celiac plexus neurolysis for advanced cancer-related pain. *Int J Gastrointest Interv*. 2022;11:126-31. DOI: [10.18528/ijgi220026](https://doi.org/10.18528/ijgi220026)
  22. Ghai A, Kumar H, Karwasra RK, Kad N, Rohilla S, Parsad S. Ultrasound guided celiac plexus neurolysis by anterior approach for pain management in upper abdominal malignancy: Our experience. *Anaesth pain intensive care* 2015;19(3):274-281 [\[Free Full Text\]](#)