ORIGINAL RESEARCH PAPER
Volume - 15 | Issue - 03 | March - 2026 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

ULTRASOUND AND CT-GUIDED COMBINED TECHNIQUE FOR CELIAC PLEXUS BLOCK IN CHRONIC PAIN MANAGEMENT

Anaesthesiology

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ABSTRACT

Background: Celiac plexus block (CPB) is an established intervention for managing intractable upper abdominal pain secondary to malignancy and chronic pancreatitis. While ultrasound (US) guidance enables real-time needle visualization, it is limited in confirming final needle position and neurolytic spread. Computed tomography (CT) guidance provides accurate anatomical confirmation but lacks real-time trajectory monitoring. We evaluated a combined US- and CT-guided technique to enhance procedural safety and efficacy. **Methods:** In this prospective observational case series, four patients with severe chronic upper abdominal pain (VAS > 5) refractory to opioid therapy underwent CPB using a hybrid imaging approach. Real-time ultrasound guidance was used for needle advancement through an avascular window, followed by CT confirmation of needle tip position and neurolytic spread. Neurolysis was performed using 80% ethanol with 2% lignocaine. Pain scores were recorded pre-procedure, 10 minutes post-procedure, and at two-week follow-up. Complications and opioid requirements were documented. **Results:** All patients demonstrated rapid and significant reduction in pain within 10 minutes of the procedure. Sustained analgesia was observed at two weeks, with reduced opioid requirements. One patient developed transient loose stools that resolved within 24 hours. No major vascular, neurological, or infectious complications were observed. **Conclusion:** The combined ultrasound- and CT-guided technique for celiac plexus neurolysis appears to enhance procedural accuracy and safety while providing rapid and sustained pain relief. Larger comparative studies are warranted to validate these findings.

KEYWORDS

Celiac plexus block; Celiac plexus neurolysis; Chronic abdominal pain; Ultrasound guidance; Computed tomography guidance

INTRODUCTION

Chronic upper abdominal pain is a debilitating symptom commonly associated with malignancies such as pancreatic cancer, gallbladder cancer, metastatic disease, and chronic pancreatitis. When pain becomes refractory to opioid therapy or when escalating opioid doses produce intolerable side effects, interventional pain procedures offer a valuable alternative. Celiac plexus block (CPB) and celiac plexus neurolysis have long been established as effective strategies for managing intractable upper abdominal pain.

Traditionally, CPB has been performed using various approaches differing in access route, neurolytic agents, and imaging guidance. Ultrasound (US)-guided techniques enable bedside procedures with real-time needle visualization and avoidance of major vascular structures. However, ultrasound alone has notable limitations, including difficulty confirming final needle tip position in the antecrural space, impaired visualization due to bowel gas, and limited acoustic penetration in obese patients [3,4].

Computed tomography (CT) guidance allows excellent delineation of retroperitoneal anatomy and confirmation of neurolytic spread [1,2]. It facilitates precise needle placement while minimizing injury to vital structures such as the pancreas, aorta, celiac artery, and superior mesenteric artery. However, CT lacks real-time trajectory monitoring during needle advancement [2].

This case series explores a hybrid approach combining ultrasound and CT guidance to maximize procedural accuracy, enhance safety, and improve analgesic outcomes in patients with refractory upper abdominal pain.

METHODOLOGY

This prospective observational study evaluated the feasibility, safety, and short-term efficacy of a combined ultrasound- and CT-guided celiac plexus block.

The primary objective was to evaluate the efficacy of this combined imaging approach in providing analgesia for chronic upper abdominal pain unresponsive to opioid therapy. Secondary objectives included assessing the safety profile of the hybrid technique, determining the accuracy of needle placement and neurolytic agent spread using dual-modality imaging, and evaluating short-term outcomes such as changes in pain scores and patient satisfaction within two weeks of the procedure.

Four patients were included in the study: three with pancreatic malignancy and one with chronic pancreatitis. All patients had severe pain, defined as a Visual Analog Scale (VAS) score greater than 5, despite high-dose opioid therapy.

Written informed consent was obtained from all patients. Intravenous access was secured, and standard American Society of Anesthesiologists (ASA) monitoring was applied. Patients were positioned supine, and the anterior abdominal wall was prepared and draped under strict aseptic precautions.

Using real-time ultrasound guidance, a 22G Quincke needle was advanced through an avascular window while carefully avoiding bowel loops and major vascular structures as described in previous bedside US-guided techniques [4]. Needle position was subsequently confirmed using CT imaging to ensure accurate placement in the antecrural space and to visualize the spread of the injectate [1–3]. A test dose of 2% lignocaine (Loxicard) was administered to exclude intravascular or intrathecal placement. Neurolysis was then performed using 80% ethanol mixed with 2% lignocaine. CT imaging confirmed appropriate spread of the neurolytic agent. (Figures 1 and 2)

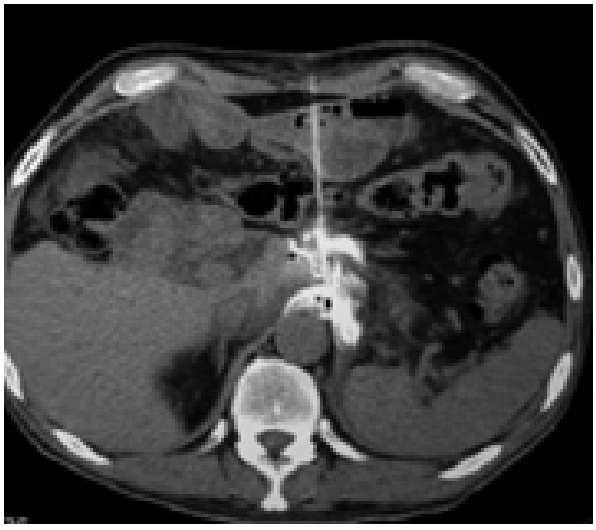

Figure 1: Anterior Approach Of Needle And Dye At Coeliac Plexus

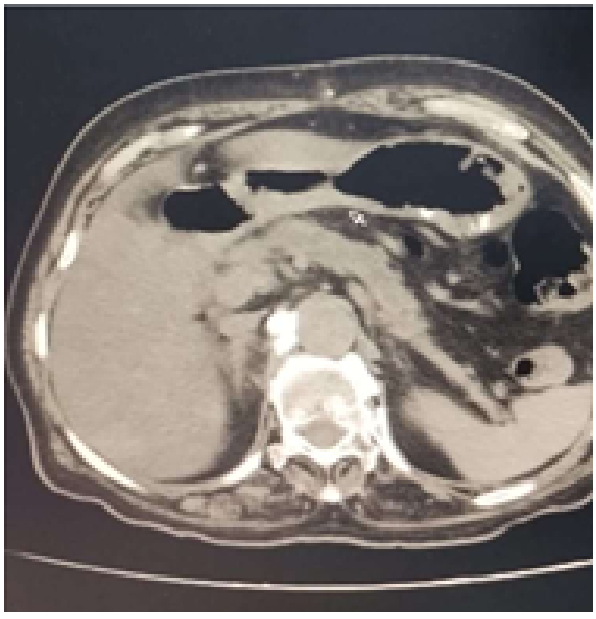

Figure 2: Dye Spread In Anterolateral Aspect Near The Coeliac Plexus

Pain scores were recorded pre-procedure, 10 minutes post-procedure, and at two-week follow-up. Opioid requirements and adverse effects were also documented.

RESULTS

The four cases included one patient with chronic pancreatitis on oral morphine (5 mg every six hours), one patient with a cystic neoplasm of the pancreatic head receiving tramadol and morphine, one patient with pancreatic carcinoma, and one patient with gallbladder carcinoma on oral morphine.

All patients experienced a rapid and clinically significant reduction in pain within 10 minutes of the procedure, as measured by the VAS. At two-week follow-up, sustained pain relief was observed in all patients. Opioid requirements were reduced, and patient satisfaction was high. Only one patient developed loose stools, which resolved spontaneously within 24 hours. No vascular injury, neurological deficits, infectious complications, or other major adverse events were observed.

DISCUSSION

Celiac plexus neurolysis is widely recognized as an effective intervention for upper abdominal cancer pain. Previous studies have demonstrated analgesic success rates ranging from 60% to 80% with imaging-guided techniques [2,3].

Ultrasound-guided anterior approaches offer the advantage of real-time needle visualization and avoidance of vascular injury [4]. However, their limitations include the inability to definitively confirm final needle tip position in the antecrural space and difficulty in assessing neurolytic spread [3,4].

CT-guided techniques provide excellent visualization of retroperitoneal structures and allow confirmation of needle position and neurolytic dispersion [1,2]. Anatomical simulation studies have further supported the accuracy and safety of CT-based approaches [1]. However, CT lacks continuous real-time needle tracking during advancement [2].

By integrating both modalities, the hybrid approach capitalizes on the strengths of each technique. Ultrasound provides real-time trajectory monitoring, while CT ensures precise anatomical confirmation and documentation of neurolytic spread. In this small case series, the combined approach resulted in rapid pain relief, minimal complications, and sustained short-term benefit. Although limited by sample size, these findings suggest that dual-modality guidance may enhance both safety and efficacy.

LIMITATIONS

The primary limitations of this study include the small sample size of four patients and the short follow-up duration of two weeks, which restrict generalizability. The absence of a comparison arm, such as ultrasound-only, CT-only, or endoscopic ultrasound-guided techniques, limits the ability to draw conclusions regarding relative superiority. Additionally, objective quantification of long-term opioid consumption and extended pain assessment beyond two weeks were not performed.

CONCLUSION

Percutaneous imaging-guided celiac plexus neurolysis remains an invaluable therapeutic option in the management of refractory upper abdominal pain. The combined use of ultrasound and CT guidance provides real-time needle visualization along with confirmed placement and documented spread of the neurolytic agent within the antecrural space. This dual-modality approach enhances procedural safety, reduces the risk of injury to critical retroperitoneal structures, and provides rapid and sustained pain relief. Larger controlled studies are warranted to further validate these findings and establish the comparative benefits of hybrid imaging guidance in chronic pain management.

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