ORIGINAL ARTICLE

Outcome of Percutaneous Ultrasound-guided Celiac Plexus Neurolysis for Managing Pain in Chronic Pancreatitis

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Abstract

Background: Chronic pancreatitis is a debilitating condition often accompanied by severe pain. Ultrasound-guided celiac plexus neurolysis (CPN) has emerged as a potential technique for managing this pain. This study aims to evaluate the outcome of ultrasonography (USG) guided CPN in patients with chronic pancreatitis.

Methods: This prospective study was conducted from 2022 to 2023, including 10 patients diagnosed with chronic pancreatitis experiencing severe pain. All patients underwent USG-guided CPN. Pain relief was assessed using the Visual Analog Scale (VAS) before the procedure and at 1 week, 1 month, and 3 months post-procedure. Complications were recorded in a data sheet.

Results: A significant reduction in VAS scores was observed at all follow-up points compared to baseline. At 1 week, the mean VAS score decreased from 8.5 ± 1.2 to 3.2 ± 1.5 ($p<0.001$). At 1 month, the mean VAS score further decreased to 2.8 ± 1.3 ($p<0.001$), and at 3 months, it was 3.5 ± 1.6 ($p<0.001$). Mild complications, such as transient hypotension and diarrhoea, were reported in a few cases and treated accordingly. No severe complications were observed.

Conclusion: USG-guided celiac plexus neurolysis is an effective technique for managing pain in patients with chronic pancreatitis. Further long-term studies are recommended to explore the durability of pain relief.

Keywords: Celiac plexus, Neurolysis, Chronic pancreatitis, Chronic pain, VAS

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Introduction

Chronic pancreatitis is a progressive inflammatory disease characterized by irreversible damage to the pancreatic tissue, destroying exocrine and endocrine functions leading to severe abdominal pain, malabsorption, and diabetes mellitus. Patients often experience debilitating symptoms and a significant decline in quality of life[1]. The pain of chronic pancreatitis represents a major challenge to those working in the field, including pain specialists, gastroenterologists and surgeons and remains refractory to effective treatment in many cases[2].

Pancreatic pain is predominantly transmitted through the celiac plexus or the solar plexus. This complex network of nerve fibers provides autonomic innervation to a wide range of abdominal organs, including the liver, gallbladder, stomach, pancreas, spleen, kidneys, small intestine, and the first two-thirds of the large intestine[3]. Celiac plexus block and neurolysis have been used for many years to manage abdominal pain resulting from chronic pancreatitis and advanced malignancy[4,5]. This interventional technique is used to manage intractable abdominal pain that does not respond to less aggressive analgesic interventions.

Initially, this was performed by using surgical, CT-guided injection, endoscopic, and fluoroscopic approaches. These approaches have had complications that might be overcome by better visualization of the region[6,7,8]. Ultrasound (US) is a real-time technique that identifies soft tissues, vessels, and nerves. The US-guided procedure exposes neither patient nor physician to unnecessary radiation and is less time-consuming[9]. Therefore, this study aims to evaluate the outcome of percutaneous ultrasound-guided celiac plexus neurolysis (CPN) in managing pain in chronic pancreatitis.

Methods

This prospective study was done in a specialized private center in Dhaka during the period from October 2022 to September 2023. Patients suffering from abdominal pain due to chronic pancreatitis, not controlled by traditional analgesics and suffering from side effects of analgesic drugs were included in this study. Patients with coagulopathy, colonic gas distension and unwilling to participate were excluded. Patient's history, general examination, investigation reports (abdominal ultrasound, CT abdomen, chest X-ray, coagulation profile) were recorded. All patients were advised to stop pain medications overnight and informed about complications.

During the procedure, patients were supine and fasted for 8 hours. Intravenous access was established, and hydration initiated. A 3–5 MHz curvilinear transducer was applied to define the common celiac trunk at its origin from the aorta and at its division into hepatic and splenic branches. With all aseptic precautions, skin infiltration was done by 1% lidocaine and then needle placement was confirmed by injecting lidocaine. Ethanol (50%) 15-30 ml was then injected into the celiac plexus under continuous ultrasound guidance. Pain assessment using VAS was conducted immediately post-injection and at 1 week, 1 month, and 3 months post-neurolysis. Common complications were documented and managed accordingly.

Outcome measure

Visual Analogue Scale (VAS): VAS is a simple, easy, and widely used tool to evaluate pain. It is a linear scale measuring 10 cm (100mm) and marked from 0-10 cm (0-100mm). The most common VAS consists of 10 horizontal or vertical lines with its two endpoints '0' and '10' representing 'no pain' and 'worst pain ever' (or similar verbal descriptions), respectively[10].

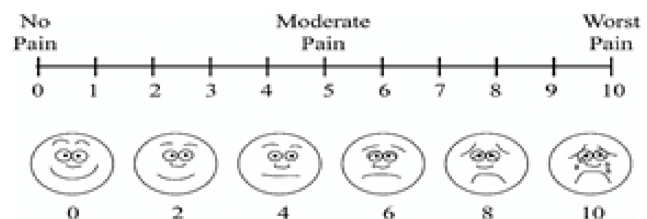

Figure 1: Visual Analogue Scale (1-3 = mild pain; minimal impact on chronic pancreatitis; 4-6 = moderate pain; moderate impact on chronic pancreatitis; 7-10 = severe pain; major impact on chronic pancreatitis)

Statistical analysis

SPSS (Statistical Package for Social Sciences) for Windows (version 23) was used to perform statistical analysis. Quantitative and qualitative variables were expressed as mean ± standard deviation and proportion and percentages, respectively. The results were

presented using tables and/or figures. A p-value of <0.05 was considered statistically significant.

Results

The study was carried out on 10 adult patients suffering from abdominal pain due to chronic pancreatitis. Percutaneous US-guided CPN was successfully performed in all patients of whom 4 (40%) were males and 6 (60%) were females with mean age 27.70±6.038 years. The demographic profile is mentioned in Table I.

Table I: Demographic profile of the patients (n=10).

Variables	Number	Percentage (%)
Age		
<30 years	6	60
>30 years	4	40
Mean± SD	27.70±6.038	
Sex		
Male	4	40
Female	6	60

Data presented as absolute numbers and percentages, and Mean± SD

Figure 2 depicted that the VAS score decreased markedly from the baseline. At 1 week, the mean VAS score decreased from 8.5 ± 1.2 to 3.2 ± 1.5 (p<0.001), at 1 month, further decreased to 2.8 ± 1.3 (p<0.001), and at 3 months, it was 3.5 ± 1.6 (p<0.001).

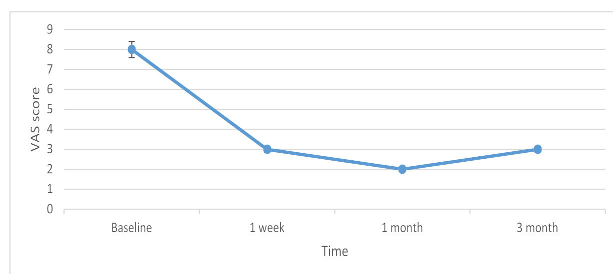

Figure 2: Trends of VAS score over time.

No severe complications were observed. However mild complications like local irritant pain in 6 patients (60%), hypotension in 4 patients (40%), and diarrhoea in 10 patients (50%) occurred after CPN and all responded to I.V fluid therapy and oral rehydration solution (ORS). Table II presents the frequency of complications.

Table II: Frequency of complications among the studied patients.

Complications	Number (n)	Percentage (%)
Local irritation	6	60
Hypotension	4	40
Diarrhoea	5	50
Severe complications like Paralysis, Retroperitoneal hematoma, Pulmonary embolism	0	0

Data expressed as absolute number and percentages.

Discussion

Celiac plexus block (CPB) or neurolysis (CPN) is an interventional technique to block or ablate the afferent pain fibers from the pancreas at the level of the celiac ganglion. Celiac plexus block is a transient interruption of the plexus by local anesthetic, while celiac plexus neurolysis is prolonged interruption of the transmission of pain from the celiac plexus using chemical ablation. Celiac plexus block is generally performed in the unilateral position, while celiac plexus neurolysis is performed in the unilateral or bilateral position[11]. In this study, percutaneous ultrasound-guided celiac plexus neurolysis (CPN) was performed in patients with chronic pancreatitis.

Several studies described the advantages of US-guided CPN[12,13,14]. Siddaiah and Sardesai mentioned that US-guided CPN is simple, inexpensive in contrast to the EUS-guided CPN and does not require special equipment or formal training in gastroenterology[13]. Marcy et al. recommended using US-guided celiac plexus block whenever possible as because it almost eliminates the risk of inadvertent intravascular or intradural injections[15]. In contrast to CT-guided procedure, ultrasound is not able to display the pancreas and other retroperitoneal structures as clearly and the anatomic display varies on the operator's skills and experience[16].

Different approaches have been proposed but the anterior approach was preferred in this current study as it was found easy and comfortable. Other investigators also found this technique safe and performed CPB or CPN with a high success rate[12,15,17]. We performed CPN through a single unilateral approach in all patients and the success rate was 100%. CPN could also be

performed in a bilateral approach which was documented by several studies[12,18].

In the present study, we used 15-30 ml of 50% ethanol for CPN. Both 50–100% Alcohol or Phenol 10% concentration can be used. Usually, 20–50 mL of ethanol in concentrations of 50–100% is the most commonly used neurolytic agent in clinical practice9. The use of neurolytic volume in different studies ranges from 15-50 ml[12,18].

Most of the studies included cancer patients for CPN[9,12,15,18] but in this study, we included patients with chronic pancreatitis. There is an obvious difference in demographic characteristics between the studies. The mean age of the patients is 27.70±6.038 years, which indicates younger adults, and the male-to-female ratio in the present study is 1:1.5.

The primary outcome of this study was the measurement of intensity of pain by VAS. The pain intensity was significantly decreased from the baseline ($p<0.001$). It was almost zero immediately after injection, thereafter the VAS score became steady for 3 months. The results of other studies demonstrated the similar findings[9,12,15-18].

Several serious complications related to CPN have been observed in different studies but the incidence was rare[6,7,8]. In our study, no serious complications were recorded. Only few patients suffered from minor complications but were easily manageable. Hypotension, diarrhoea and local pain were the most common complications observed in different studies. Bhatnagar et al.[12] found hypotension in 15% of patients, diarrhoea in 55% of patients, and local pain in 85% of patients whereas Tadros and Elia stated that local irritant pain occurred in 60% patients, hypotension in 20% patients while diarrhoea in 50% patients[9].

Limitation

This was a single-centre study with short-duration follow-up done on 10 patients. Although there was some improvement in the following months, with a reduction in severe pain, a significant portion of patients still reported moderate pain even after three months.

Conclusion

Our study demonstrated a favourable outcome for CPN in chronic pancreatitis. USG-guided CPN represents a significant advancement in managing chronic pancreatitis-related pain, serving as a viable option when traditional therapies fall short. It holds promise in revolutionizing pain management strategies, offering renewed hope for those navigating the complexities of abdominal pain with chronic pancreatitis. Further long-term studies are recommended to explore the durability of pain relief.

Declaration

Ethics approval

Informed consent was taken from each participants.

Author Contributions:

Conception and development of the idea: MAH
Writing: MAH, MMK
Data analysis: MSA, SAI
Data collection: MSA, MMA, MAH
Review and Editing: MMK

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