Ultrasound-guided percutaneous celiac plexus neurolysis using the anterior transgastric approach and continuous flow apneic ventilation: case report

Neurólise percutânea do plexo celiaco guiada por ultrassom utilizando um acesso anterior transgástrico e oxigenação apneica de fluxo contínuo: relato de caso

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Abstract

Percutaneous celiac plexus neurolysis is an effective method to relieve pain in advanced abdominal cancer, especially in patients with pancreatic carcinoma. It was performed a percutaneous celiac plexus neurolysis, using the anterior transgastric route, under general anesthesia and apneic oxygenation in a patient with an advanced pancreatic adenocarcinoma and chronic abdominal pain refractory to clinical treatment. A color Doppler ultrasound detectable flow at the tip of a Turner-22G needle through continuous injection of saline solution was produced. This technique showed the exact position of the needle dynamically during its progression. Then, 30 ml of ethanol was infused into the preaortic space. The procedure took around eight minutes, and the patient expressed significant pain relief and decrease in his narcotic analgesics requirements.

Keywords: Celiac plexus; Alcoholism; Ultrasonography, doppler, color; Anesthesia; Ultrasonography, interventional; Case reports

Introduction

The percutaneous celiac plexus neurolysis (PCN) is an efficient technique applied to reduce abdominal pain, secondary to inflammatory conditions or retroperitoneal cancers located in the upper abdomen. Pancreatitis and advanced tumors arising from the pancreas, stomach, esophagus and gallbladder are conditions in this location that may require more aggressive pain control when unresponsive to large doses of narcotic agents(1).

This technique consists in an injection of a neurolytic agent (usually absolute alcohol or fenol) using a fine needle guided by ultrasound. The needle is advanced into the preaortic space using a method that allows for precise and quick positioning. In this case report, 30 ml of absolute alcohol was injected into the preaortic space resulting in significant pain relief and decrease in narcotic analgesics requirements.
needle inserted in the retroperitoneum, adjacent to the nervous fibers and ganglia of the celiac plexus. The neurolytic medication disrupts the neural network, destroying the pain pathways\(^2\).

The most utilized access routes to PCN are anterior transabdominal or posterior transcrural guided by fluoroscopy, ultrasonography (US) or computed tomography (CT) scan\(^{1-2}\) (Figure 1).

![Diagram of access routes to PCN](image)

Figure 1. Access routes to PCN. A: anterior transgastric/transpancreatic. B: posterior transcrural. C: anterior oblique transgastric; IVC: inferior vena cava

The US-guided technique, using an anterior route, is faster and cheaper than the CT-guided method\(^{3-4}\). However, the sonographic approach requires much more individual skills and training in interventional radiology. The most relevant drawback of US-guidance is the poor visualization of thin needles during their progression, with the potential of the needle’s improper positioning\(^\text{2,4-5}\).

The objectives of this case report are to review the technical and clinical aspects of image-guided PCN, and to describe one case in which some special techniques of anesthesia and interventional radiology that have optimized the procedure were applied.

**CASE REPORT**

JGF, a 68-year-old male patient, was referred from Vitória, in the state of Espírito Santo, with an advanced and non-resectable pancreatic adenocarcinoma, which was found six months before.

The abdominal magnetic resonance imaging (MRI), or cholangio-MRI, depicted a large solid mass involving the head of pancreas, invading the celiac trunk and the superior mesenteric vessels, with diffuse dilation of the main pancreatic duct (Figures 2A, 2B and 2C).

![MRI images of upper abdomen at celiac artery level](image)

Figure 2. MRI of upper abdomen at celiac artery level. (A) Post-contrast axial T1 image. (B) Axial T2 image. Large expansive solid mass invadeing the head of the pancreas (white arrows), and circumferentially involving the celiac artery (arrowheads). D: duodenum. (C) MR-Cholangiopancreatography. Diffuse dilation of the main pancreatic duct (W), and cystic changes/side-branches dilation at pancreatic head (*). GB: gallbladder; CBD: common bile duct; ST: stomach

In the previous three months, the patient experienced an important worsening of his abdominal pain, despite high doses of opioid analgesics.

The Interventional Oncology Group of Hospital Israelita Albert Einstein was, then, requested to perform a PCN as an adjunctive palliative pain management. It was performed a PCN using an anterior transgastric route, guided by color Doppler ultrasonography (CDU).

Oriented by CDU real time images and under general anesthesia, the anterior abdominal wall was punctured...
with a long thin needle (Turner biopsy needle, 15 cm x 22 G – Cook Medical™, USA), through the stomach to reach the retroperitoneal space around the celiac plexus. The perforation of the pancreas was not required because it was chosen an ascending oblique route in the upper abdomen, moving ventrally and superiorly to that organ (Figure 1, route C).

A special modality of general anesthesia, called continuous flow apneic ventilation was used, which consists of orotracheal intubation and full curarization for prolonged time (up to ten minutes), obviating incursions of the thoracic and abdominal wall. For that, a continuous flow of free oxygen is provided by a sterile endotracheal canule positioned just above the carina, allowing adequate oxygenation and minimizing CO₂ retention⁶.

Interruption of the respiratory movements allowed excellent control of the abdominal structures, rendering the procedure faster and more precise.

To improve US visualization of the fine needle during its insertion, a CDU detectable flow at the tip of a Turner-22G needle through continuous injection of saline solution was produced. This technique revealed the exact position of the needle dynamically during its progression (Figures 3A, 3B and 3C), as well its location in relation to the celiac trunk – the major vascular landmark to localize the celiac plexus.

After the correct positioning of the needle tip in the vicinity of the celiac plexus was ensured, in a midline plane in front of the aorta, 30 ml of absolute alcohol was injected, trying to achieve an extensive alcoholic infiltration of the periaortic soft tissues.

The retroperitoneal puncture and alcohol injection took exactly eight minutes. There were no complications.

The patient reported marked pain relief, which perceived already in the recovery room, right after the procedure lasting until the time of his death, five months later. He presented as a mild collateral effect of neurolysis, a moderate postural hypotension for five weeks following the procedure, which disappeared spontaneously.

**DISCUSSION**

PCN is an effective tool for palliative pain management, which has been traditionally overlooked by medical community, despite its advantages.

Effective pain relief has been reported in up to 85% of the patients with chronic abdominal pain due to both benign and malignant conditions, also reducing the narcotic analgesics required and the narcotic-dose related side effects⁵⁷.

The contraindications to the procedure are very limited, generally related to anticoagulant therapy, severe coagulopathy, active abdominal infection or sepsis⁷. The celiac plexus is a series of one to five ganglia composed of a dense network of interconnecting presynaptic sympathetic nerve fibers, derived from T5-T12 splanchnic nerves. It is located anterior to the crura of the diaphragm, over the anterolateral wall of the aorta bilaterally, and just caudal to the level of the origin of celiac artery.

It supplies sympathetic, parasympathetic, and visceral sensory afferent fibers to the pancreas, liver, biliary tract,
The pharmacological-induced celiac plexus block impairs pain circuits in those organs\(^2\).

PCN may provide total or partial relief of pain, lasting up to six months to one year, as after that new pain routes may regenerate\(^3\)-\(^4\). The best results are obtained to relieve pain caused by neoplasms in the upper abdomen, especially pancreatic tumors. The extension of cancer invasion and eventual postoperative changes may compromise the outcomes, by limiting the spread of the neurolytic agent around the celiac trunk\(^8\).

The most frequent collateral effects are related to sympathetic block: hypotension (up to 30%, disappearing after 12 hours in most cases) and diarrhea (up to 60%, with good recovery after 48 hours)\(^4\)-\(^5\). Severe neurological impairment, like paraplegia, lower limb paresia and paresthesia are very rare (less than 1% of cases) and exclusively associated with the posterior transcrural approach. These complications are attributed to direct lesion of spinal cord or to alcohol-induced thrombosis of anterior spinal artery\(^9\). They do not occur, therefore, in patients undergoing the anterior transabdominal approach.

**CONCLUSION**

PCN is a safe and efficient palliative tool for pain management in selected cases of chronic abdominal diseases.

It was described one case of PCN performed by an anterior transgastric approach, using fine needle and very precise imaging guidance optimized by continuous flow apneic ventilation and CDU. The association of these techniques allowed performing a very fast and accurate procedure.

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**REFERENCES**