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Review Article

How I Do It: Celiac and Splanchnic Plexus Neurolysis

Abstract

Celiac block to alleviate pain in the upper abdomen was first described by Kappis in 1914. Since then the role of this procedure has been fairly established in the management of pain related to pancreatic disease and also in pain related to liver, gall bladder and gastric diseases. This article discusses the clinical indications and technical details of celiac and splanchnic neurolysis.

Keywords: *Block, celiac, neurolysis, splanchnic*

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Introduction

Celiac block to alleviate pain in the upper abdomen was first described by Kappis in 1914. Since then, the role of this procedure has been fairly established in the management of pain related to pancreatic disease and also in pain related to liver, gallbladder, and gastric diseases.

Anatomy [Figures 1-3]

The celiac plexus is the upper and largest of the autonomic nerve plexi. It extends in front of and along both sides of the aorta and around the celiac artery trunk in the retroperitoneal space. Ganglionic nodes are present on both sides of the plexus lateral to and inferior to the celiac trunk.

Superior to the celiac plexus, the sympathetic nerves are located lateral to the lower dorsal vertebrae behind the crura of diaphragm and form the so-called splanchnic plexi on both sides from which the greater and lesser splanchnic nerves emerge to connect with the celiac plexus.

The celiac nerve plexus contains afferent and efferent visceral sympathetic and interspersed preganglionic parasympathetic fibers. These supply mainly the pancreas, stomach, liver and gallbladder, and small intestine.

Terminology

Celiac block is a term used to describe temporary treatment either by long-acting anesthetics such as bupivacaine or steroids such as triamcinolone. This is generally used in benign disease.

Celiac plexus neurolysis is the term used to describe long-term treatment using alcohol or phenol generally used in malignant disease.

Indications

The need for this procedure is ideally discussed in a multidisciplinary forum. The main indication is chronic pain, which can no longer be managed with medication mainly from upper abdominal organs. The most common patients for this procedure are those with pancreatic cancer. Other malignant conditions include cholangiocarcinoma and painful liver metastases.

The efficacy of celiac plexus block in nonmalignant conditions, particularly chronic pancreatitis, has not been high despite the possibility of repeat blocks; however, it is still an option in some of these patients.

Contraindications

- Uncorrectable coagulopathy
- Active infection in the vicinity of the celiac plexus
- Inability of the patient to lie on the procedure table.

Relative contraindications include abdominal aortic aneurysms and bowel obstruction.

Preprocedure Preparation

Procedure is ideally performed under general anesthesia or, if not possible, conscious sedation. Patient monitoring throughout the procedure is required.

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Available imaging should be reviewed in detail noting vascular structures to determine the appropriate approach and course. Laboratory tests should be reviewed.

Informed consent should be obtained quoting the main possible complications: bleeding, severe diarrhea, and hypotension. It is important to point out that the pain will not be eliminated, but the procedure will help make it more manageable with medications.

Intravenous (IV) access is secured with normal saline. Broad-spectrum antibiotics (e.g. ciprofloxacin 400 mg IV) should be given before the start of the procedure, particularly if transhepatic approach is necessary and in the presence of biliary dilatation.

Imaging

If a recent computed tomography (CT) or magnetic resonance imaging of the abdomen is not available, order CT with IV contrast as it provides an easier assessment of the bone landmarks and multiplanar reconstruction.

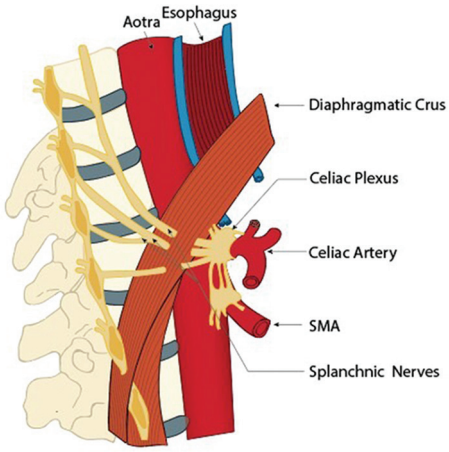

Figure 1: Schematic representation of the anatomy of the celiac plexus and splanchnic nerve connections

Procedure

Although celiac plexus intervention through endoscopic ultrasound (EUS) has gained popularity lately, it remains inferior to the precision of CT guidance in view of the variations in anatomy and frequent advanced malignant disease and the need for splanchnic neurolysis as well. It is possible to perform a celiac block under fluoroscopy relying on bony landmarks and contrast distribution, but the precision in these cases is inferior, and the potential for complications is significantly higher.

CT guidance provides a precise assessment of the needle tracks and positioning and the structures that should be avoided.

Anterior approach [Figures 4-6]

This is selected in cases where the patient can only lie in the supine position or where a posterior approach is not possible due to anatomical variations. It is possible to

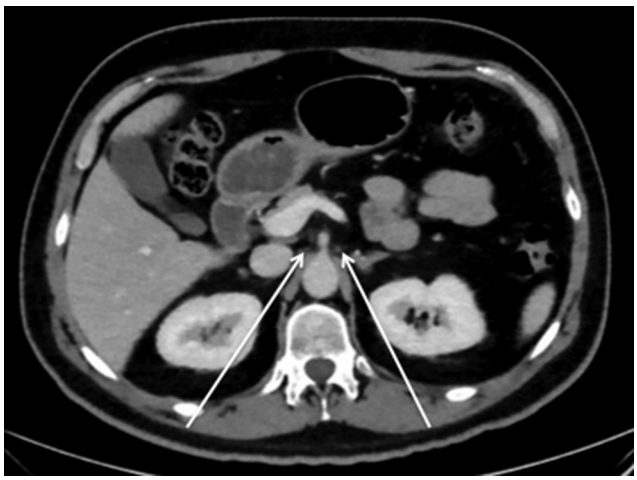

Figure 2: Axial computed tomography at the level of the celiac artery. The celiac plexus is seen as an oval soft tissue (arrows) on both sides of the celiac axis

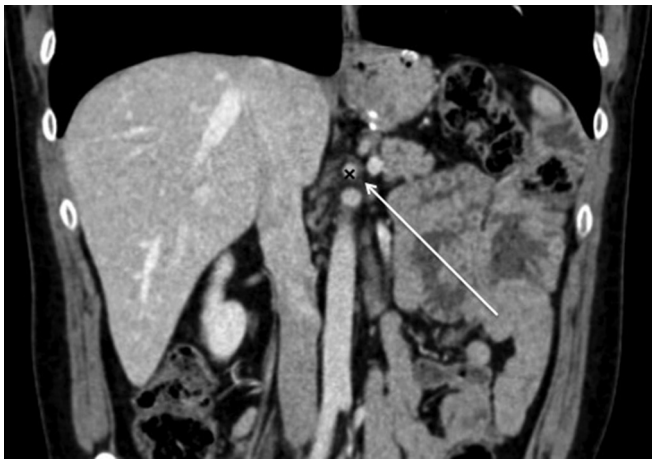

Figure 3: Coronal computed tomography section of the upper abdomen. The proximal celiac axis is seen in cross section (asterisk) and is surrounded by the fibers of the celiac plexus (arrow)

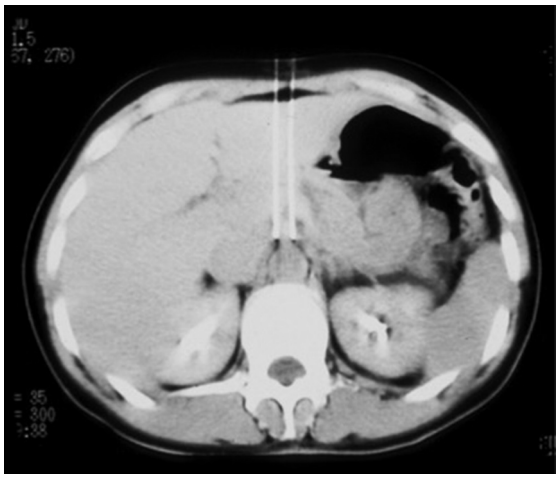

Figure 4: Double-needle anterior approach. The needles are advanced through the liver and placed on each side of the celiac axis

perform a combined celiac and splanchnic neurolysis from this orientation.

The patient is placed supine on the CT scan table, and images of the upper abdomen are obtained preferably with IV contrast in the early or late arterial phase. The location of the celiac axis and superior mesenteric artery (SMA) is determined, and a direct path is planned using a single or double-needle approach avoiding, whenever possible, the stomach. A transhepatic approach is commonly used, and on occasions, a transgastric approach may be required.

Spinal needles (22G, 15 cm long) are used to target both sides of the celiac axis. If the tumor bulk is such that the vascular structures are encased, the needles should be placed toward the free edge of the tumor to promote better distribution, and in these cases, it is preferable to combine celiac and splanchnic neurolysis to increase the likelihood of effective pain management.

If the anatomy precludes bilateral needle placement, a single needle aimed at the space between the celiac and SMA origins may be sufficient for the celiac neurolysis

For the splanchnic neurolysis, the needles can be inserted through the crus of diaphragm and even transaortic into the retrocrural space bilaterally.

Posterior approach [Figures 7-9]

The patient is placed in the prone position, and CT images are obtained. A path is selected targeting both sides of the celiac axis for celiac plexus neurolysis and the retrocrural space for splanchnic neurolysis. The path is planned such as the kidneys are avoided, and care is given to avoiding diaphragmatic injury. It may be necessary to use a transaortic approach for the celiac plexus.

A volume of 1–2 ml of iodinated contrast is injected through the placed needles, and repeat imaging is performed. The spread pattern is assessed, and if necessary, adjustment of the needle tip position is made.

For the celiac neurolysis, a combination of lidocaine, bupivacaine, and absolute alcohol is injected slowly. It is preferable to inject 5 ml of lidocaine first to minimize the pain induced by alcohol followed by 30 ml on each side of a cocktail composed of 10 ml bupivacaine and 20 ml absolute alcohol.

For the splanchnic neurolysis, as the space is contained, 2 ml of lidocaine is injected first on each side, followed by 6 ml of a cocktail made of 2 ml of bupivacaine and 4 ml alcohol.

Some authors have described a “test treatment” of a celiac block using lidocaine or triamcinolone before performing the neurolysis. This could be done when the indication is benign disease such as chronic pancreatitis before performing permanent neurolysis but is not necessary in the context of malignant disease.

It is not usually necessary to repeat the imaging after the injection unless there is a clinical concern.

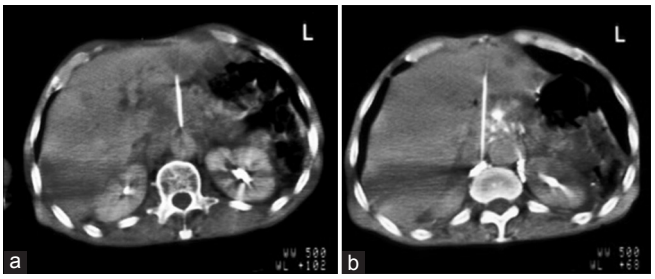

Figure 5: (a) A single transhepatic needle is placed at the level of the celiac axis. (b) Computed tomography section slightly higher showing a transhepatic needle placement for a right splanchnic plexus neurolysis after contrast was injected through the single celiac needle and the left splanchnic and the right splanchnic needles demonstrating satisfactory distribution

Figure 6: Computed tomography section demonstrating a transhepatic transaortic approach to the placement of the left splanchnic needle with contrast demonstrating satisfactory distribution in the left retrocrural space. The single celiac needle is also in good position

Figure 7: Computed tomography section showing contrast distribution surrounding the celiac axis (arrow) from a bilateral posterior approach

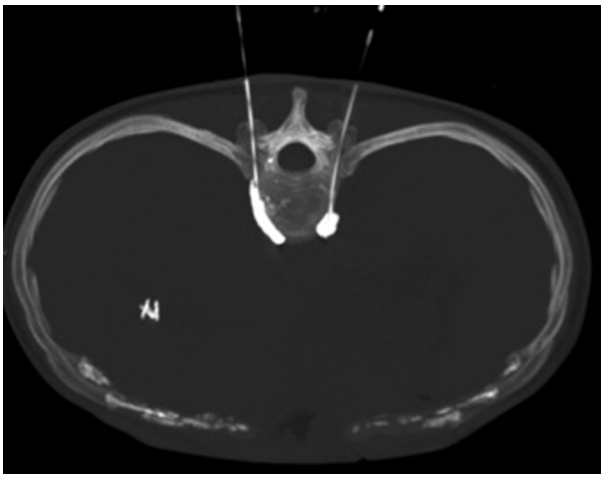

Figure 8: A maximum intensity projection of a computed tomography volume demonstrating the needles in the retrocrural space from a posterior approach and the expected distribution of contrast during a splanchnic block

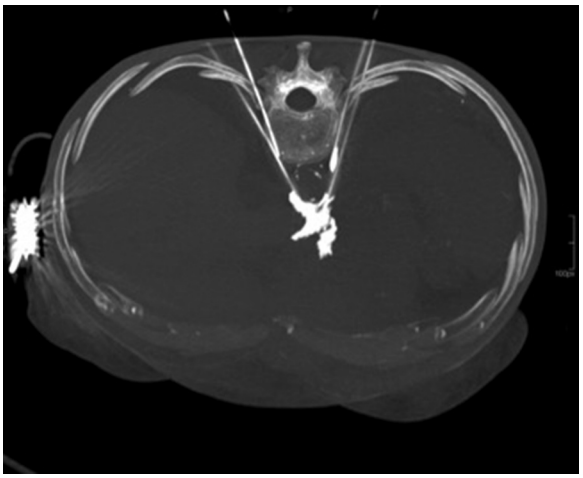

Figure 9: A computed tomography volume maximum intensity projection in a patient undergoing combined celiac and splanchnic neurolysis from a posterior approach demonstrating needle positions and contrast spread

Postprocedure Care

The patient is recovered after sedation or anesthesia according to local practice. Monitoring of the blood pressure and vital signs is required at half-hourly intervals for 2 h and then hourly for 6 h and subsequently as per the clinical condition.

Potential Complications

Besides the usual risks of image-guided needle-based intervention such as local hemorrhage and infection, the celiac block and neurolysis may be associated with two specific complications that can lead to significant morbidity, namely, severe diarrhea and hypotension

1. Diarrhea: Approximately 60% of patients treated with celiac block/neurolysis may experience severe diarrhea. In most cases, the diarrhea stops within 48–72 h; however, in a small number of patients, it may persist for a longer period lasting a week or longer. Treatment measures include the replacement of fluids and anticholinergic medications such as loperamide.
2. Orthostatic hypotension: Approximately 20% of patients may develop hypotension lasting up to 48–72 h probably due to the vasodilation effect following neurolysis of the sympathetic fibers. This seems to be more common in the fluoroscopy-guided procedures than the CT guided or EUS guided possibly reflecting the more precise distribution of the neurolytic agent under CT. Support measures such as fluid replacement and bed rest are sufficient in most cases

Other complications include acute pancreatitis in celiac block and pneumothorax in cases of splanchnic block.

Conclusion

Celiac and splanchnic neurolysis are important procedures for pain management and should be ideally performed under CT guidance.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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