Computed Tomography–Guided Percutaneous Transaortic Celiac Plexus Neurolysis: An Infrequently Used but Effective Approach

Anurag Chahal[1] Mukesh Kumar[2] Sachidanand G. Bharati[3] Sanjay Thulkar[2]

[1] Department of Radiodiagnosis, All India Institute of Medical Sciences (AIIMS), New Delhi, India
[2] Department of Radiology, BRAIRCH, All India Institute of Medical Sciences, New Delhi, India
[3] Department of Anaesthesiology, BRAIRCH, All India Institute of Medical Sciences, New Delhi, India

Address for correspondence Mukesh Kumar, MD, Department of Radiology, BRAIRCH, Room No. 48, All India Institute of Medical Sciences, Ansari Nagar, New Delhi 110029, India (e-mail: mukeshyadav11@gmail.com).

J Clin Interv Radiol ISVIR 2017;1:192–195.

Celiac plexus/ganglion block is used for palliation of severe upper abdominal pain caused by chronic pancreatitis or tumors of the pancreas.

Celiac ganglia are located at T12–L1 level in relation to the celiac axis and superior mesenteric artery (SMA). It is predominantly composed of sympathetic and parasympathetic efferent fibers and visceral sensory afferent fibers. The preganglionic sympathetic efferent supply stems from greater splanchnic (T5–T9), lesser splanchnic (T10–T11), and least splanchnic (T12) nerves. This supply is derived from posterior cord of the vagus nerve (►**Fig. 1**). Visceral afferent nociceptive fibers are received from the liver, pancreas, gallbladder, spleen, adrenals, kidneys, and bowel (distal esophagus till transverse colon).[1] Topographically, the innervation of the uncinate process of the pancreas originates from the superior mesenteric plexus (SMPlx) along the inferior pancreaticoduodenal artery (IPDA), whereas most nerve fibers going to body and tail of the pancreas originate from the celiac plexus.[2]

Chemical neurolysis of the celiac plexus is an effective method of controlling pain that originates from these organs.[3] It has also been reported to be beneficial in managing severe nausea and vomiting in patients with pancreatic cancer. This has been attributed to sympathetic blockade causing parasympathetic predominance causing increased gastric motility and peristalsis.[4] Some authors have also reported that celiac plexus neurolysis improves survival in patients with cancer by reducing opiate requirements, diminishing drug-induced sedation, and enhancing the ability of patients to perform day-to-day activities that are necessary to extend life, such as feeding and ambulation.[5]

The block can be guided by anatomical bony landmarks, fluoroscopy, sonography, or computed tomography (CT). Cross-sectional imaging such as CT and magnetic resonance imaging (MRI) can reveal soft tissue, especially the celiac plexus.[6] CT is the preferred route due to its wide availability, high contrast, and spatial resolution. It clearly depicts retroperitoneal structures, and celiac plexus may sometimes be directly identified. It depicts the exact needle tract and shows diffusion of contrast mixed neurolytic agents. CT fluoroscopy allows real-time monitoring of the procedure.[7]

Case Details

A 61-year-old man with carcinoma of uncinate process of the pancreas metastatic to the liver and mediastinum (►**Fig. 2**) presented with increasing abdominal pain and opioid dependence. After written informed consent, clinical workup, and coagulation screen, the patient was taken up for an ultrasound-guided celiac block with 20 mL of 0.25% bupivacaine and 20 mg of triamcinolone. Postprocedure, the patient reported suboptimal pain relief with no reduction in opioid requirement. Owing to the poor acoustic window, proximity of the splenic vein, and tortuous course of the celiac artery (►**Fig. 3A**), the authors decided to do the neurolysis through a posterior approach under CT guidance. Bilateral paravertebral route seemed rather technically difficult with the given anatomy; therefore, a paravertebral transaortic route was chosen. A 22G Chiba needle (Halyard Health Inc.) was used, and its tip was positioned between the celiac artery and SMA (►**Fig. 3C**) and a check injection of 2 mL of a mixture of 0.5 mL nonionic contrast (Iomeron) diluted with 1.5 mL lignocaine was done. After adequate spread was noted,

received
March 25, 2017
accepted after revision
July 21, 2017
published online
November 24, 2017

DOI https://doi.org/10.1055/s-0037-1606144.
ISSN 2457-0214.

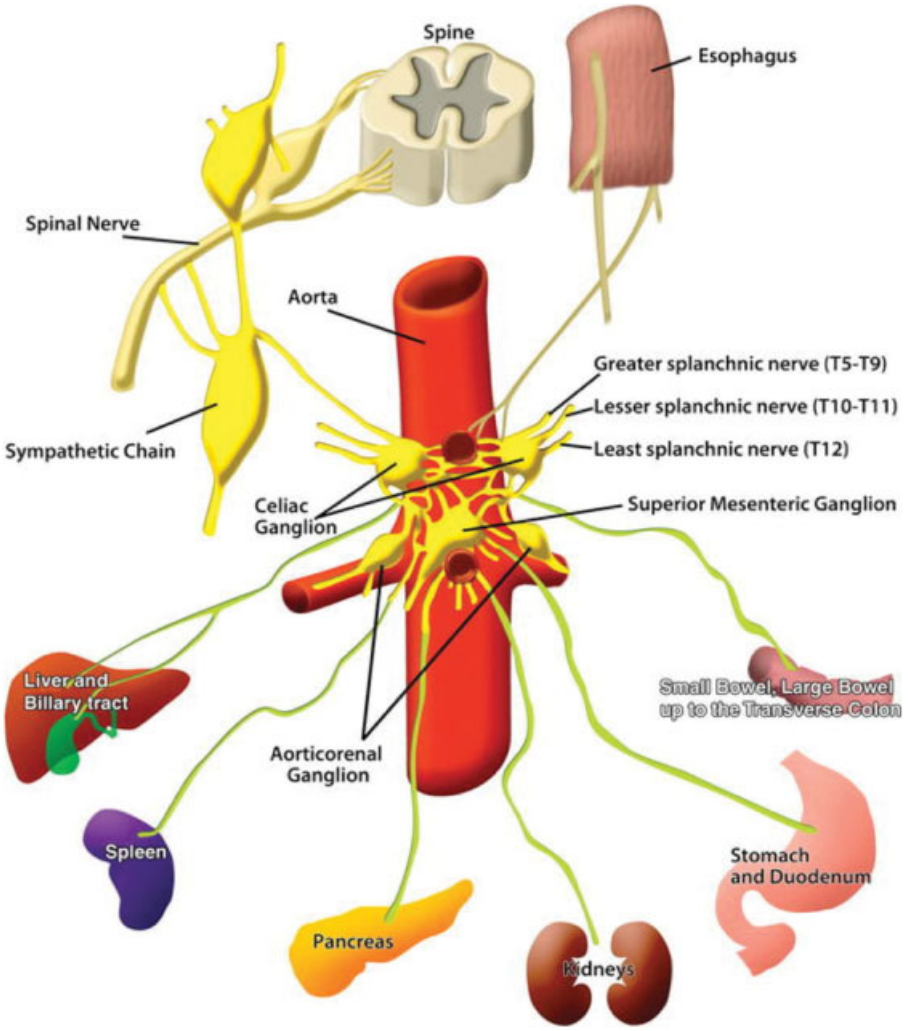

Fig. 1 Animated image showing relevant anatomy of celiac plexus. Reprinted with permission from Kambadakone et al.[7]

15 mL of mixture of absolute alcohol, bupivacaine, and contrast (in the ratio of 6:3:1) was injected.

Check scan showed bilateral spread of the solution around the origin and along the perivascular sheath of SMA (►**Fig. 3D**). The patient reported significant reduction in numerical pain score from 9 to 1 within 45 minutes of procedure. Transient episode of diarrhea lasting less than 24 hours was noted, which is usually expected postsplanchnic sympathicolysis. The patient

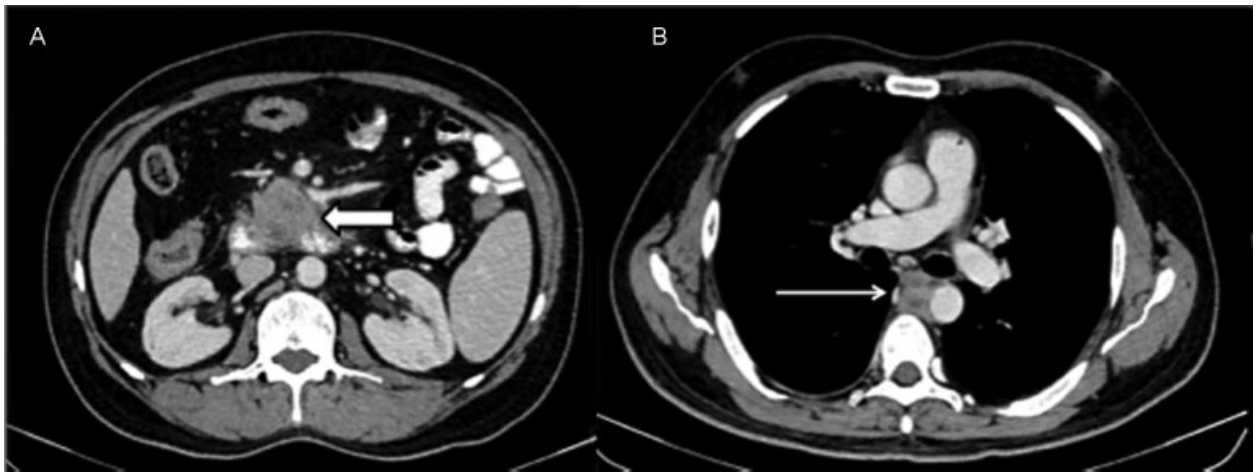

Fig. 2 Axial contrast-enhanced computed tomography (CECT) section of abdomen shows a mass in the uncinate process (thick arrow) infiltrating the third part of duodenum (**A**) and chest section (**B**) showing subcarinal nodal metastatic deposits (thin arrow) with invasion of descending thoracic aorta.

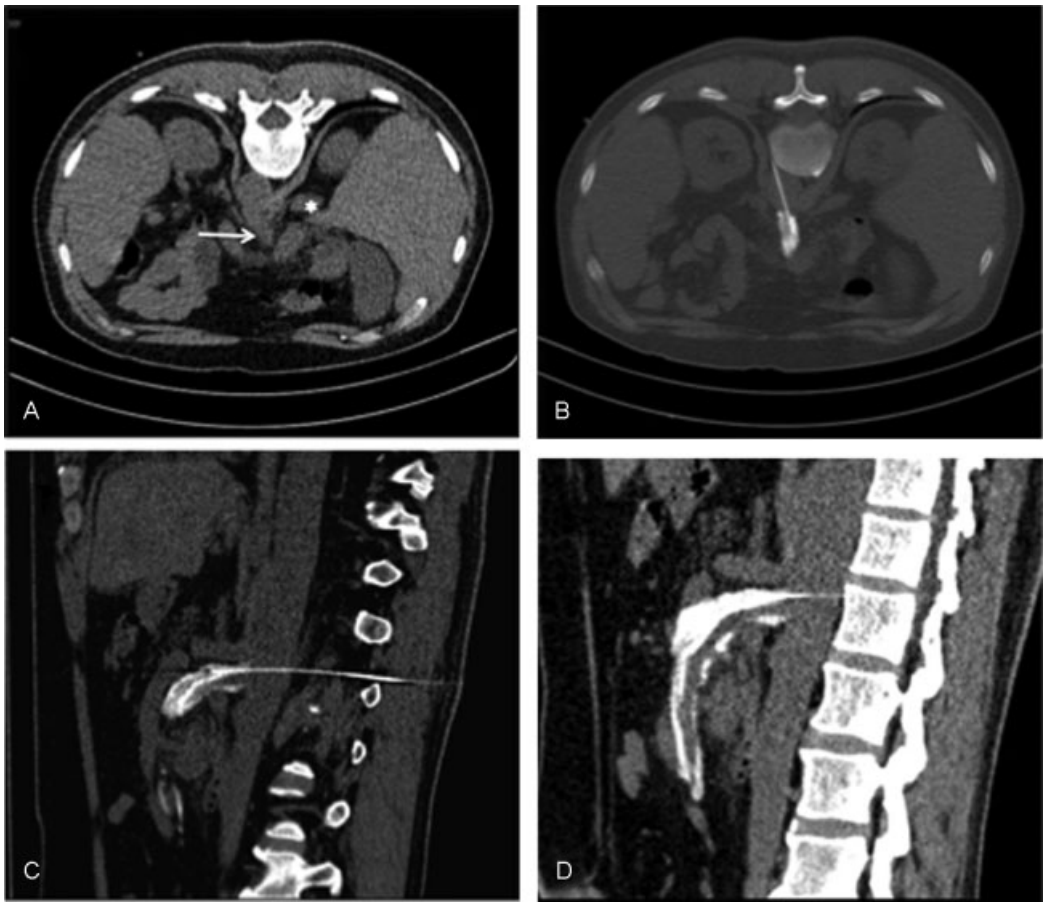

Fig. 3 Axial images noncontrast computed tomography (NCCT) of the patient in prone position during procedure showing tortuous course of celiac artery and practically no space in left side due to IVC (*) and celiac artery (arrow, **A**). Transaortic needle path on left side was chosen and check injection was done (**B**) with needle tip between celiac artery and superior mesenteric artery (SMA), better appreciated on oblique sagittal reformats (**C**). Alcohol-mixed contrast spread along the SMA noted in sagittal reformatted image (**D**).

did not have any hypotension in postprocedure period and was discharged next day after an ultrasound check of the abdomen.

Discussion

Celiac plexus is formed by fibers from three prominent ganglions: right celiac, left celiac, and superior mesenteric ganglion. Superior mesenteric ganglion sends fibers along the SMA as SMPlx, which supplies the uncinate process portion of the pancreas and the bowel, jejunum to proximal colon. The patient reported significant relief despite not having expected periceliac spread probably owing to the site of tumor in the uncinate process. The ideal needle tip position for celiac plexus neurolysis is approximately 1 to 2 cm anterior to the aorta, between the diaphragmatic crura and the pancreas, at the level between the celiac trunk and the SMA.[8]

Ischia et al[9] performed a prospective, randomized study to assess the efficacy of three posterior approaches for needle celiac plexus block (NCPB), viz. transaortic, classic retrocrural, and B/L chemical splanchnicectomy, and found no statistically significant difference in terms of either immediate or up-to-death results. Procedural mortality was nil with the three techniques and morbidity negligible. The procedure achieved pain relief in 70 to 80% of patients immediately after the block and in 60 to 75% until death. Their study showed no increased complications in transaortic approach as is generally perceived.

The authors' choice of transaortic route in the index case was justified owing to lack of easy and safe alternative routes in the index case and its established technical feasibility and safety as mentioned previously. Paravertebral approach was technically more difficult in this case and would have involved needle coursing through multiple small venous structures and kidneys. Moreover, a single injection can achieve bilateral neurolysis, and the volume of drug injected is significantly less than an antecrural approach.[8,10]

Conflict of Interest
None.

References

1 Loukas M, Klaassen Z, Merbs W, Tubbs RS, Gielecki J, Zurada A. A review of the thoracic splanchnic nerves and celiac ganglia. Clin Anat 2010;23(05):512–522
2 Yi S-Q, Miwa K, Ohta T, et al. Innervation of the pancreas from the perspective of perineural invasion of pancreatic cancer. Pancreas 2003;27(03):225–229

3 Mercadante S, Nicosia F. Celiac plexus block: a reappraisal. Reg Anesth Pain Med 1998;23(01):37–48
4 Erdine S. Celiac ganglion block. Agri 2005;17(01):14–22
5 Staats PS, Hekmat H, Sauter P, Lillemoe K. The effects of alcohol celiac plexus block, pain, and mood on longevity in patients with unresectable pancreatic cancer: a double-blind, randomized, placebo-controlled study. Pain Med 2001;2(01):28–34
6 Zhang XM, Zhao QH, Zeng NL, et al. The celiac ganglia: anatomic study using MRI in cadavers. AJR Am J Roentgenol 2006;186(06): 1520–1523
7 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(06):1599–1621
8 Wang PJ, Shang MY, Qian Z, Shao CW, Wang JH, Zhao XH. CT-guided percutaneous neurolytic celiac plexus block technique. Abdom Imaging 2006;31(06):710–718
9 Ischia S, Ischia A, Polati E, Finco G. Three posterior percutaneous celiac plexus block techniques. A prospective, randomized study in 61 patients with pancreatic cancer pain. Anesthesiology 1992; 76(04):534–540
10 Titton RL, Lucey BC, Gervais DA, Boland GW, Mueller PR. Celiac plexus block: a palliative tool underused by radiologists. AJR Am J Roentgenol 2002;179(03):633–636