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Image-Guided Pain Management, Part 1: Celiac Plexus Block for Palliative Pain Relief

- **The first line of pain management in patients with pancreatic carcinoma is oral pain medication, including opioid narcotics**
- **When opioid narcotics are no longer effective or their side effects become intolerable, celiac axis block can be an effective palliative method for minimizing pain from large infiltrating pancreatic tumors, reducing or eliminating the need for opioid narcotics**
- **Celiac axis block is performed by CT-guided placement of the needles and injection of absolute alcohol which acts as a neurolytic agent on the celiac nerve plexus**

Severe chronic abdominal pain is a characteristic of advanced cancers of the upper abdominal viscera, especially pancreatic cancer. The sensation of pain from all abdominal and most pelvic viscera is relayed to the central nervous system by the celiac plexus, a network of sympathetic nerve fibers located in the upper abdomen, close to the anterolateral walls of the aorta. Blocking the transmission of pain by treating the celiac plexus with a neurolytic agent, such as alcohol, is a palliative option which has been shown to decrease the need for opiates and limit opioid side effects, especially constipation. The alcohol destroys the nerves by dissolving their fatty sheaths but has little effect on other nearby structures, such as the muscular wall of the aorta. The pain that is best treated by celiac plexus neurolysis is that which begins in the epigastric region and radiates directly to the back.

In carefully selected patients with pancreatic cancer, this procedure has been shown to provide partial to complete pain relief for 90% patients for up to 3 months and 70-90% up until end of life. Pain relief for all types of upper gastrointestinal cancer has been reported to be between 70 and 97%. In some cases, regional tumor infiltration or scar tissue and fibrosis can limit access to the celiac plexus and prevent effective delivery of a neurolytic agent. In other cases, pain may not be effectively controlled after a technically successful procedure, which may be accounted for by metastases in the abdominal wall or peritoneum that have innervation outside of the celiac plexus.

The location of the celiac plexus often varies with regard to bony landmarks and is more reliably found close to the celiac artery, on average 0.6 cm caudad to the celiac artery on the right and 0.9 cm caudad to the celiac artery on the left. CT provides 3-dimensional information of the position of the celiac artery and is used to guide accurate positioning of the needle(s) in the vicinity of the celiac plexus, while avoiding penetration or injection into the spinal cord, major vascular structures, liver, kidneys, bowel, or other organs (Figure 1). Accurate positioning of the needle is confirmed with CT after injecting a small volume of dilute contrast agent (Figure 2A), prior to injection of the neurolytic agent (Figure 2B).

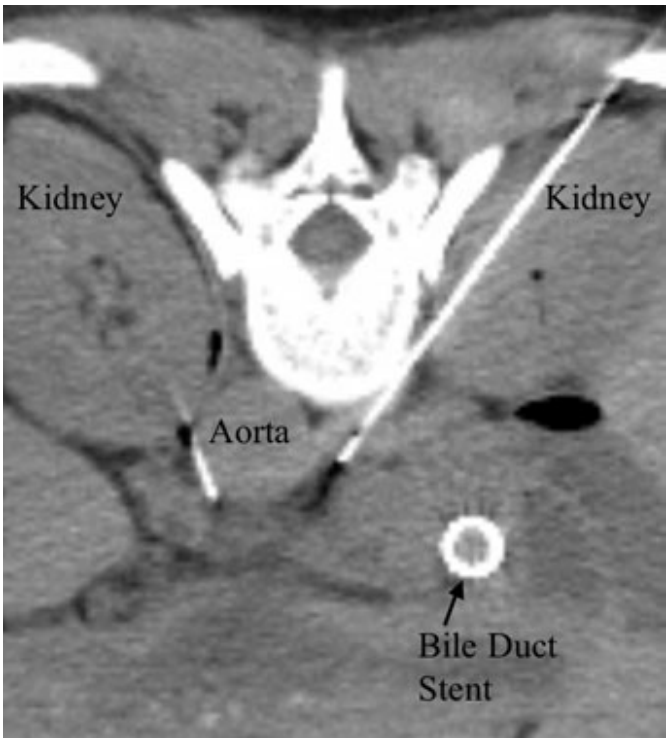

Figure 1. Non-contrast CT image showing two needles in position at the level of the celiac axis in preparation for celiac plexus block.

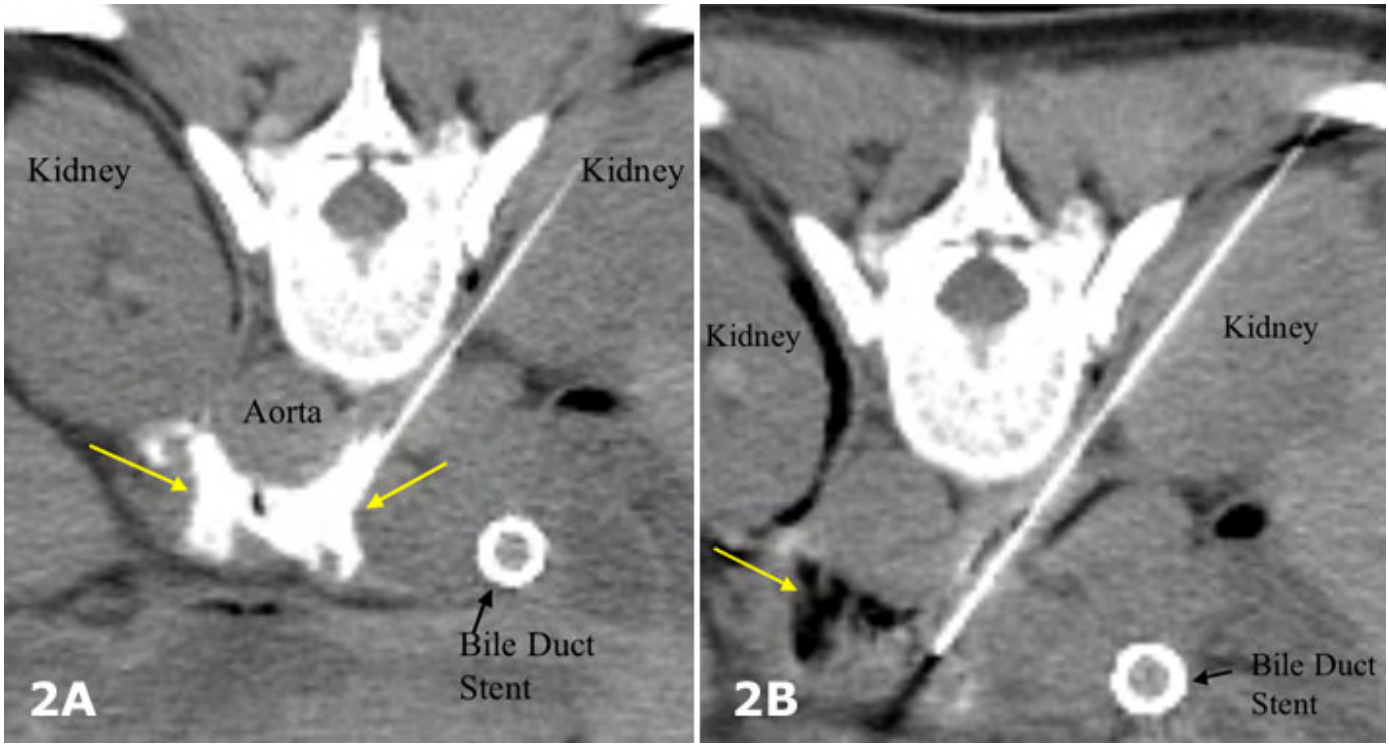

Figure 2. (A) CT image after injection of a small volume of dilute contrast agent through both needles, confirming correct distribution of injected contrast around the celiac axis (arrows) prior to alcohol injection. **(B)** After injection of alcohol, darkened region (arrow) shows its distribution in the vicinity of the celiac plexus.

Interventional radiologists perform the celiac block using either a posterior or anterior approach, depending upon the anatomy of the individual patient and the operator's preference. The posterior bilateral anterocrural approach is used most commonly at MGH. If that is not possible for anatomical reasons, a posterior transaortic approach or an anterior approach can be used. With an anterior approach, there is risk of puncturing the liver, stomach, colon, or pancreas but there is less risk of spinal cord injury.

The Celiac Block Procedure

Prior to the procedure, patients are asked to grade the severity of their pain, on a scale of 1-10. Patients may continue to take their existing medications, including narcotics. IV access is established before the procedure and the patient placed on continuous ECG, blood pressure, and respiratory monitoring with pulse oximetry. IV normal saline is administered to prevent hypotension and the procedure is carried out under conscious sedation. For conscious sedation, patients need to be NPO 8 hours prior to the procedure.

If a posterior approach is used, the patient is placed in a prone or lateral decubitus position on a CT table. After scout CT images are obtained, the axial level of the celiac artery is identified and a corresponding mark is made on the patient's skin. After local anesthesia, a 20 gauge needle is inserted and, with CT guidance, advanced into the anterocrural space, approximately 1-2 cm anterior to the aorta at the level of the celiac artery. After needle aspiration to check for blood, a small volume of dilute contrast agent is injected. If injected contrast fills the region immediately surrounding the aorta in the celiac axis, this confirms that the needle is correctly placed. However, if contrast is observed diffusing into the peritoneal space, the needle is withdrawn and re-positioned. After CT has confirmed that the needle is correctly positioned, 50 ml of absolute alcohol is injected. The alcohol creates a burning, painful sensation when it comes in contact with the plexus, further confirming that the needle was properly positioned. A small volume of normal saline is injected before the needle is withdrawn to minimize the spread of alcohol as the needle is withdrawn. The same procedure may be repeated on the other side of the spine. The following morning, the patient will again be asked to grade the severity of pain on a scale of 1-10 in order to determine if the procedure was a success. However, this assessment may be limited in value because oncologists routinely drop the level of opiates immediately after the procedure.

Complications

Up to 30% of patients experience hypotension during the first 12 hours following the procedure due to loss of sympathetic tone and splanchnic vasodilation. For this reason patients must be on bed rest for 12 hours following the procedure. Up to 60% of patients report diarrhea due to sympathetic block and unopposed para-sympathetic influence, which usually resolves within 48 hours. Patients may also experience a dull aching back or shoulder pain that may persist for up to 72 hours, which is thought to be related to diaphragmatic irritation. Neurological complications including leg weakness, sensory deficits, and paresthesia have been reported in about 1% of cases. Paraplegia has been reported as a very rare complication.

Scheduling

Oncologists who have patients that are candidates for celiac plexus block can set up an appointment by telephoning the Abdominal Imaging and Intervention Division at 617-726-8396.

Further Information

For further questions on CT-guided celiac plexus block, please contact Ronald S. Arellano, M.D., Abdominal Imaging and Intervention, MGH Department of Radiology at 617-726-8396.

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