ANTERIOR APPROACH TO CELIAC PLEXUS BLOCK USING CT GUIDANCE

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ABSTRACT

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Neurolytic celiac plexus block (NCPB) is a useful technique for pain control in patients with intra-abdominal tumors or pain secondary to chronic pancreatitis that does not respond to other therapeutic modalities (not interventional). The anterior approach for NCPB has been considered a relatively safe approach, with a low rate of complications and little risk of neurologic injury secondary to the spread of a neurolytic agent. This is the first national case report of successful NCPB using the anterior approach under CT guidance.

Neurolytic celiac plexus block (NCPB) is an effective method in the management of pain in patients suffering from upper abdominal malignancies, such as pancreatic cancer, bile duct cancer and primary liver neoplasm[1,2]. It may be associated also, with prolonged survival[3,4].

The percutaneous celiac plexus block technique was first described by Kappis in 1919 and subsequently refined by several authors to improve results and avoid complications[5]. Most authors have described and evaluated the procedure via a posterior approach, usually under fluoroscopic guidance[6]. However, conventional posterior approach for celiac plexus block sometimes cannot be used in patients, whose anatomical relationship of the retroperitoneal organs is distorted by cancer growth or by a previously performed operation and concern remains about occasional potentially serious complictions in such cases (paraplegia, pneumothorax, and liver or kidney puncture)[7,8].

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Recently, radiological guidance such as CT or ultrasound has been shown to be fundamental in improving the quality and reproducibility of the neurolytic procedure and in making it safer and more effective[9].

The percutaneous anterior approach to the celiac plexus was advocated early in this century, only to be abandoned because of the high incidence of complications[10]. The advent of fine needles, improvements in radiologic guidance technology, and the maturation of the specialty of interventional radiology have since led to renewed interest in the anterior approach to blockade of the celiac plexus.

Extensive experience with transabdominal fine-needle aspiration biopsy has confirmed the relative safety of this approach and provides the rationale and method for the modification of this radiologic technique of anterior celiac plexus block. The anterior

approach to the celiac plexus necessarily involves the passage of a fine needle through the liver, stomach, intestine, vessels, and pancreas.

The technique (compared with other techiques) is more rapid to perform, more comfortable while the patient stays in the supine position and less painful due to the straight vertical single needle approach. Technically this approach is feasible and comparable in both efficacy and safety to the classic CT-guided posterolateral approach[11]. Surprisingly, it is associated with very low rates of complications[12].

The present case refers to a case of celiac plexus block with a single-needle technique under computer tomographic (CT) guidance using the anterior approach. No side effects or complications were noticed. Analysis of contrast spread would indicate that retroperitoneal anterior pre-aortic contrast spread is necessary to obtain pain relief.

CASE REPORT

A 56- year-old, 170cm, 70kg man with pancreatic cancer presented with severe intractable epigastric pain (pain VAS 7–8, wherein 0 represents no pain and 10 corresponds to worst pain) referring to the back. He had undergone a Whipple's procedure 12 months ago and was on 250mcg/h of transdermal fentanyl (Durogesic®, Janssen-Cilag) plus 500 mg paracetamol+30mg of codeine (Lonalgal® /Boehringer) four times daily. He was scheduled for celiac plexus block following written informed consent.

The patient was placed in the supine position on the CT table. Intravenous fluids were started immediate before the procedure and continued post-operatively to prevent hypotensive response. The skin of the upper abdomen was prepared with antiseptic solution. No sedation was given. Arterial blood pressure, heart rate, and SpO_2 were measured before, during and immediately after the neurolytic procedure. Preliminary CT scans of thin sections (5 mm thick at 5-mm intervals) were obtained through the upper part of the abdomen identifying celiac and superior mesenteric arteries.

The needle entry site was identified 1.5cm below and 1.5cm to the left of the xiphoid process. At that point, the skin, subcutaneous tissues and musculature were anesthetized with 2% lidocaine. A 22-gauge, 20-cm needle (Chiba) was introduced through the anesthetized area perpendicular to the skin and advanced to the depth of the anterior wall of the aorta, as calculated by the CT guidance (Figure 1).

Figure 1: CT confirmation of needle placement

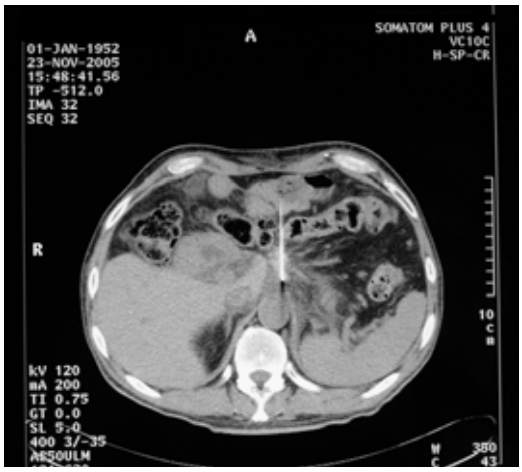
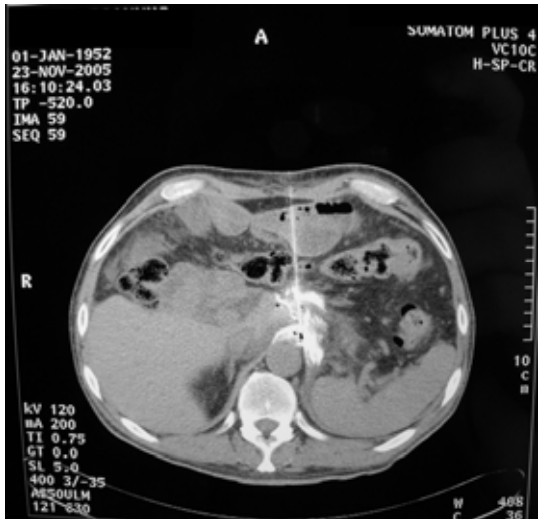


Figure 2: Diagnostic celiac plexus block

A diagnostic celiac plexus block with 5 ml of 2% lidocaine plus equal amount of water-soluble contrast (Iohexol®, Omnipaque®) were injected to confirmed needle placement (Figure 2). This resulted in almost immediate and near-complete pain relief. A neurolytic block was then performed using 15 ml of alcohol 95% along with contrast media (2 ml) to verify the correct spread of the agent

(Figure 3). Evaluation of the alcohol spread was based on the presence of the contrast medium around the anterolateral wall of the aorta, anterior to the crura of the diaphragm, from above the celiac artery to the superior mesenteric artery.

Figure 3: Alcohol spread plus contrast media around the celiac plexus



The patient reported significant pain relief for the next 12 hours (VAS 2) which was followed by severe pain lasting nearly 24 hours (VAS 7 – 8). Following this, he benefited from once again almost complete pain relief (VAS 2-3 and discharged 24 hours later following an uneventful recovery. No complications were noticed e.g. hypotension, intravascular injection, bowel penetration and others.

With the excellent pain relief from the celiac plexus block and minimal analgesia derived from transdermal fentanyl (75mcg/h) and 500mg Paracetamol plus 30mg Codeine (Lonalgal®/Boehringer) twice daily, he remained almost pain free (pain on VAS=2-3) until his death, three months later.

DISCUSSION

The anterior approach to the celiac plexus is generally considered to be safe and effective pain relief method for abdominal tumor pain that is unresponsive to conventional medical treatment [13].

Advantages of the anterior approach to blocking the celiac plexus include relative ease, speed, and reduced periprocedural discomfort as compared with the posterior techniques[14]. Perhaps the greatest advantage of the anterior approach is the fact that patients are spared having to remain prone for a long time, which can be a significant problem for patients suffering from intra-abdominal pain. The supine position is also advantageous for patients with ileostomies and coloctomies. In addition, the anterior approach is propably associated with less discomfort because only one needle is used. Furthermore, the needle does not impinge on either periosteum or nerve roots or pass through the bulky paraspinous musculature. Finally because of the precrural needle placement, there is less risk of accidental neurologic injury related to retrocrural spread of drug to somatic nerve roots or epidural and subarachnoid spaces.

Potential disadvantages of the anterior approach to celiac plexus block include the risks of infection, abscess, hemorrhage and fistula formation[12], although preliminary findings indicate that these complications are exceedingly rare, further experience is needed to draw a definitive conclusion.

The celiac plexus consists of large, paired ganglia situated in the upper abdomen. It lies in loose areolar tissues within the retroperitoneal space posterior to the stomach and the pancreas and close to the coeliac artery. It overlaps the aorta at the level of the L1 vertebra. The plexus is separated from the vertebrae by the crus of the diaphragm that originates from the anterolateral surfaces of the upper lumbar vertebrae. The tendinous origins of the diaphragm blend with the anterior longitudinal vertebral ligaments. This forms an important barrier to the spread of injectate.

Several techniques of NCPB are used. The percutaneous bilateral posterior approach (classic retrocrural) has been the most widely used [15,16]. In the past two decades, several variations in technique have been introduced, including the transcrural [17,18] or single-needle transaortic[19,20] and the single needle anterior approach[12,21-24].

The goal of any technique is to deliver safely good quality analgesia. To optimise this it is vital to identify the optimal needle position and improve the spread of the injectate to the plexus area. In fact, as has been recently demonstrated in a selected group of patients whose celiac area was free from anatomic alterations, only a complete (four quadrants) spread of the neurolytic solution in the celiac area can guarantee long-lasting analgesia[21].

Conversely, irregular or partial injectate spread are common to any technique because of regional distortions by cancer or previous therapies[18,25-27]. Because the NCPB is mainly performed to control pain related to pancreatic cancer, which at the time of presentation had already metastasized in more than 50% of the patients, it is unlikely that at the time of the block in such patients the celiac area could be free from alterations caused by cancer or previous regional therapies[28]. Therefore, a complete spread of the neurolytic agent may be very difficult to achieve in a large part of these patients.

Because of the anatomic variations of the celiac plexus in relation to the vertebral column (from the bottom of T12 to the middle of L2) and its more consistent relation with the celiac artery, CT is considered the best imaging technique to establish a correct needle tip position[29]. Furthermore, CT scanning is useful to define the retroperitoneal anatomy as the anatomic relation of the retroperitoneal organs is often distorted by tumor or previous operations. This aids in determining the best route for needle insertion, avoiding organ puncture, and documenting the contrast spread, which may be irregular despite the correct needle position[21].

Although some authors[23] believe that only a bilateral injection in the prone patient will yield optimal results, several investigators report similar results when injection is performed with a single needle with the patient lying prone[18,26,30] or supine[21,22,31]. Despite many attempts to get better analgesia by trying to locate the optimal needle position to improve the spread of the injectate to the plexus area, published data have not shown a clear advantage of any of these techniques[32]. Some authors state that "the exact level" of the needle tip in relation to the celiac artery is not critical because injected liquids spread extensively in the preaortic soft tissues[18].

Nevertheless, whichever technique is used, the success of a celiac plexus block depends on the adequate spread of the injectate in the celiac area. Partial to complete pain relief may be considered as a successful block. It not necessarily replaces opioids, but definitely can provide analgesia in addition to that achieved by opioids and thereby reduce their consumption and side effects associated thereby. Furthermore, failures are common to any technique due to regional infiltration by cancer tissue, anatomy disruption by either previous surgery or radiation therapy, or insufficient volume of the injected agent. Only a complete spread of the neurolytic solution in the celiac area seems to guarantee long-lasting analgesia.

The literature and textbooks of neural blockade describe a variety of neurolytic volumes. Volumes from 15–80ml are descrybed, with most references using 20–40ml of total solution[20]. In his important textbook, Moore describes the use of 50ml[33].

In this case, we used only 15 ml of alcohol and it was found adequate to provide an effective neurolytic block. So, in agreement with some other authors, limiting the volume of neurolytic solution would intuitively seem to decrease tissue destruction and the potential for neurologic injury[34].

Time to maximal pain relief can be variable. In most patients relief is immediate and complete; in others, it may accrue over a few days[35,36]. In our case although the pain persisted for almost 24 hrs after the block, it subsided for a long duration thereafter.

As in other interventional procedures, the choice of the technique for celiac block depends on the operator's preferences. In the hands of skilled clinician, serious complications should rarely occur from celiac plexus. Because of the proximity of other vital structures, however, coupled with the use of large volumes of neurolytic drugs, side effects

and complications may be seen e.g. hypotension, intravascular, subarachnoid or epidural injection, deficit of lumbar somatic nerve, etc.

CONCLUSION

The anterior approach to the celiac plexus block under CT offers several advantages over the classic posterior approach, including shorter procedure time, less discomfort to the patient, use in patients who cannot tolerate the prone position, and a reduced risk of neurologic complications. The major disadvantage of this approach is possible perforation of the stomach, intestine, liver, or pancreas. Nevertheless, fine-needle pancreas biopsy, which is nearly the same procedure and performed in thousands of patients, has a very low complication rate.

As shown in our case the needle placement was very easy and fast using CT guidance. The volume of injectate alcohol was low (15ml) with no side effects or complications.

In conclusion this case reiterates that the anterior approach to celiac plexus can be obtained successfully by using CT guidance. Improved imaging allows accurate needle placement, while avoiding vital structures such as the aorta and pleura. Accurate placement may also allow the use of reduced volumes of neurolytic drugs.

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