CT GUIDED NEUROLYTIC COELIAC PLEXUS BLOCK (NCPB) IN ABDOMINAL MALIGNANCIES: EXPERIENCE IN A CANCER HOSPITAL

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Abstract: *The purpose of this study is to evaluate the efficacy of CT guided neurolytic coeliac plexus block (NCPB) in advanced pancreatic and other abdominal malignancies who become refractory to routine measures of pain relief. A total of nine patients were subjected to the procedure. A diagnostic block using local anaesthetic preceded the injection of alcohol to assess the expected response. Relief of pain was assessed objectively using a visual analog scale for pain (VAPS). There was significant relief of pain in 8 out of 9 patients.* Thus it is concluded that *CT guided neurolytic coeliac plexus block is an effective way to control pain in advanced abdominal malignancies and helps to improve terminal care.*
Keywords: Coeliac plexus block, Neurolytic block, Abdominal malignancy, CT guidance

INTRODUCTION

Celiac plexus is the largest sympathetic innervation of abdominal viscera. It is located antero lateral to the origin of the celiac artery on both sides. Its involvement by disease, particularly in malignancies such as pancreatic and gastric leads to intractable visceral pain. Over time response to analgesics and opiates diminishes and celiac plexus block is an effective and durable way of managing such pain[1]. CT guided NCPB offers accuracy of needle placement and is done with the patient in prone position. Patient should be off any analgesics on the day of the procedure and a diagnostic block using local anesthetics is first undertaken to evaluate efficacy. If there is significant relief in pain absolute alcohol is then injected for neurolysis. Best results are obtained with bilateral blocks and the effect lasts for 4 to 6 months before nerve regeneration occurs. Possible complications are hypotension, diarrhoea, puncture injuries and sexual dysfunction.

MATERIALS AND METHODS

Nine patients with abdominal malignancies were subjected to NCPB. All had inoperable or recurred intraabdominal malignancies & suffered from intractable upper abdominal pain and/or back pain. 7 patients had pancreatic carcinoma and 2 had gastric carcinoma. All were patients with pain severe enough to require frequent administration of intravenous .analgesics and narcotic agents.

Pain was rated by the patient according to a visual analog scale for pain (VAPS) ranging from 0 (minimum) to 10 (maximum) before and after the procedure to objectively assess response. Patient was kept off all analgesics (oral and intravenous analgesics, transdermal patches) for period of 24 hrs prior to the procedure to eliminate the contribution of pain relief from these analgesics. This allowed a more realistic assessment of pain relief solely from NCPB.

Informed consent was obtained with specific attention to complications associated with NCPB. The procedure was performed under supervision of qualified anaesthetist and under monitoring of vital parameters.The CT scans were performed on a spiral dual slice CT Scanner (Siemens Emotion Duo, Erlangen, Germany). Patient was placed prone on the CT table (Fig 1). After analyzing a previously acquired diagnostic CT scan to assess the overall extent of the disease and the approach, a limited guiding scan was performed with application of radio-opaque surface markers. The aorta and celiac artery origin were identified. Intravenous contrast was not considered necessary.

Under all aseptic precautions and after initial local instillation of anaesthetic agent in skin and subcutaneous tissue, a 22 gauge spinal needle was then introduced paraspinally at the chosen marker much like the procedure adopted for a CT guided biopsy. The needle tip was placed antero lateral to the aorta at

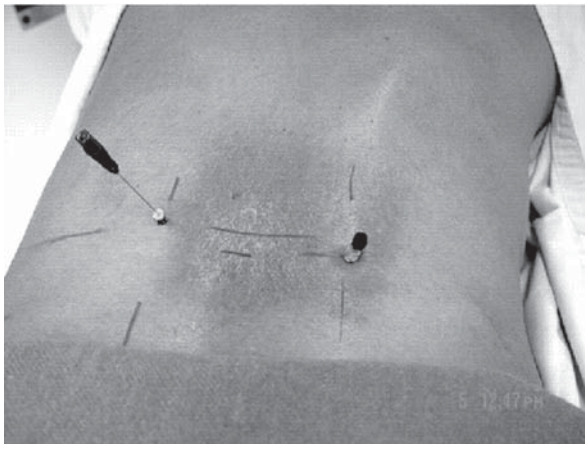

Fig 1. Patient position with needles

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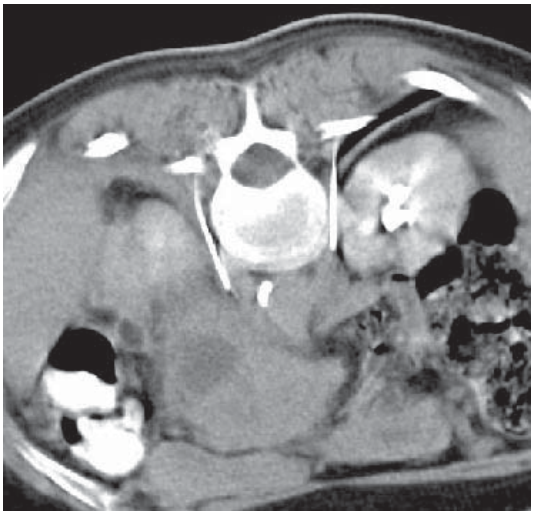

Fig 2. Final needle position

the level of the celiac artery (Fig 2). Needle trajectory was chosen to avoid the transverse process and medial margin of both kidneys. The right side entry point is usually somewhat more lateral than that on the left because optimal placement is between the vena cava and the aorta and requires an wider angle than that on the left.[2] The needle are to be positioned on the right and left sides immediately adjacent to the area of the ganglion. Since the pleura is to be avoided, the needle entry point is more caudal than needle tip. Optimal placement on the right is between the aorta and vena cava, but a tip location adjacent to the posterior margin of the cava is acceptable. For the left side, it is to be adjacent to the superior mesenteric artery, but placement adjacent to the aorta is acceptable[2]. Needle position in either case was confirmed by limited guiding CT scans. 2ml of nonionic intravenous contrast medium (Omnipaque,Iohexol, GE healthcare) mixed with equal amount of local anaesthetic agent (Lignocaine 2% with adrenaline 1:200000). Various workers including Haaga et al also recommend use of air instillation instead of radiographic contrast[2]. However air will not permeate in tissue like alcohol would. After allowing few minutes for the spread of contrast, another limited CT scan confirmed the permeation of contrast around the aorta on either side (Fig 3 and 4). In case the pattern of contrast spread was not as desired, the needle position was accordingly modified. But total non permeation of contrast into the paraaortic region in spite of attempts at changing needle position pointed to the non feasiblity of the procedure. As it happened in one of our patients who had substantial primary disease from carcinoma of pancreas encasing the abdominal aorta on all sides, providing no access for anaesthetic agent to the region of celiac plexus.

After having confirmed needle position, 13 to 15 ml local anaesthetic (bupivacaine 0.25%) mixed with 2ml nonionic contrast (Omnipaque, Iohexol, GE healthcare) was injected slowly on either side through the spinal needles. The VAPS score was then assessed after an interval of around 10 minutes for the effect of bupivacaine to set in. Relief in pain upwards of 50% was considered as measure of adequate response justifying further definitive alcohol ablation. Patient was also shifted to postoperative ward for careful observation of immediate and delayed complications if any of the procedure. Our experience in this regard was largely uneventful, with only complaint of pain around the needle insertion site and needle tract in 2 patients.

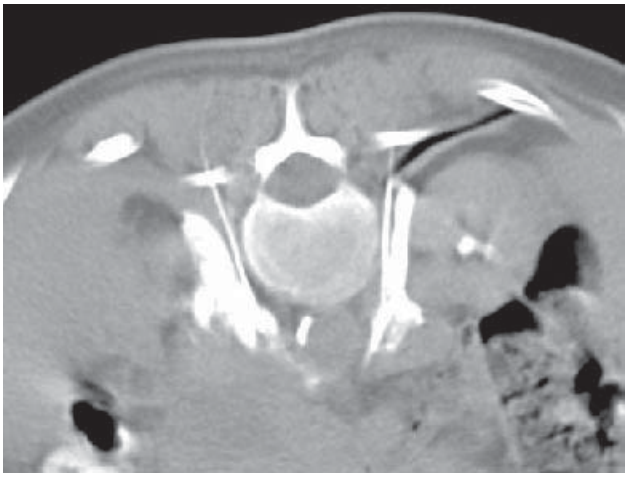

Fig 3. Spread of contrast

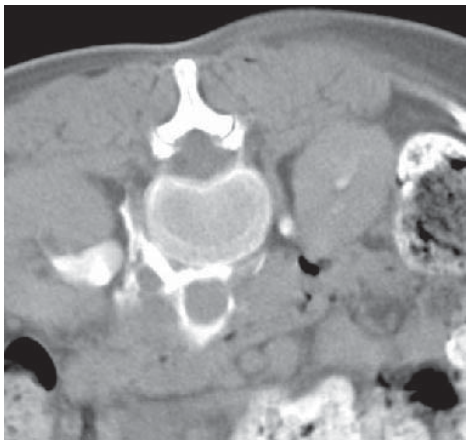

Fig 4. Note that the contrast outlines the aorta

All patients with significant subjective pain relief and no evidence of complications (8 out of 9) were taken up for definitive alcohol ablation within 24 hrs. This involved placement of needles in the same manner as above. Then 50% v/v of 100% ethanol with 0.25% bupivacaine (total 13 to 15 ml) on either side was instilled to complete the procedure. Patients were again kept under observation overnight to assess pain relief and complications.

RESULTS

Pain relief

Out of 9 patients under review, definitive procedure with alcohol neurolysis was not performed in one due to failure of pain relief after diagnostic block using local anaesthetic. This was due to extensive primary disease encasing the aorta and celiac plexus completely, thereby disallowing permeation of the anaesthetic drug in the vicinity of the plexus. Other 8 patients successfully underwent the procedure and had significant drop

in pain score (Table 1). The analgesic consumption of six patients dropped by more than 50% and the remaining two did not need analgesics. All these patients had stopped responding to analgesics prior to NCPB. Two patients died within three months due to progressive disease and hepatic metastases. One patient had recurrence of significant pain after 3 months owing to advanced disease, while on follow up. Another had recurrence of pain after 4 months. Remaining four patients continued to be relatively free of pain upto four months after which they were lost to follow up.

Complications

None of our patients had any significant complication. Transient postural hypotension can result from loss of visceral vascular tone, but was not noted in our experience. Neurologic complications (leg paralysis, sexual dysfunction, urinary difficulty) reported with blind and fluoroscopic techniques have not been reported with CT-guided coeliac ganglion block and were not seen in any of our cases. These encouraging results point to the high efficacy, versatility and safety of our technique.

Discussion

Celiac ganglion blocks have been performed by surgeons or anaesthetists using cutaneous and bony landmarks since the first description by Kappis in 1914. Radiographic guidance for this block was first reported in the 1950s by Bonica. Use of CT for guiding needle placement more specifically has been reported by various radiologists-Hegedus (1979), Haaga et al (1984) [2], Whitemore (1986) and others.

The coeliac block is an established pain relief procedure [3]. The celiac plexus contains the major ganglia for sympathetic and parasympathetic nerves. The coeliac ganglia are the largest of the three pairs of sympathetic ganglia making up the celiac plexus, others being the superior mesenteric and aortico-renal ganglia. The coeliac ganglia are located anterolateral to the aorta at the level of the L1 vertebral body, but may be found from T12 to L2. The celiac ganglia have a more consistent relationship to the origin of the coeliac artery. The right ganglion is an average of 0.6 cm. inferior to the celiac artery origin, and the left is 0.9cm inferior to the coeliac artery origin. Efferent pain fibers serving the pancreas, liver, bowel, and mesentery pass through the plexus. By injecting a neurolytic medication, the plexus or splanchnic nerves are defunctionalised and the pain pathway interrupted.

The unguided method uses the midline, twelfth rib, and needle contact with the vertebral body as landmarks. An unguided technique cannot consider the variations in anatomy that may be encountered. In cases with severe distortion in anatomy making unguided or fluoroscopy guided procedures risk prone, CT provides the only reliable approach. There are case reports where a successful block was performed when the celiac plexus was approachable from one side only due to extensive tumor infiltration[4]. In case of unguided needle placement, there are complications related to improper needle placement, which including paraplegia and transient motor paralysis[5,6], retroperitoneal hemorrhage, adominal aortic dissection[7,8], malposition of the needle into a vessel ,peritoneum or an abdominal viscera.

The test block has been proven useful in establishing the grounds for the definitive alcohol ablation. It can help eliminate three groups of patients who would not benefit from the permanent block – patients with anatomic variations in the location of the ganglia, with disease spread beyond the innervation area of the ganglia (as in one of our patients) and identification of patients with psychogenic pain. Moreover it instills confidence in the patient and attendants about the procedure and reassures the treating interventional radiologist.

There are various approaches to the celiac plexus –the posterior approach (classic retrocrural approach), the anterior approach and transaortic approach. Various workers have shared their experiences with all these approaches[9,10]. All have advocated individual merits and demerits. As per Lee et al.[10], patients with severe pain find the anterior approach more comfortable because they can lie supine on the CT table. The disadvantage of the anterior approach includes the possibility of traversing the stomach or pancreas to reach the celiac ganglia. When the posterior approach is used, there is no danger of traversing the stomach or the pancreas, but the kidney

Table 1: *Visual Analog Pain Scale (VAPS)*
[Maximum pain10, No pain 0]
Pain scores in patients prior to and post test procedure with local anaesthetic (n=9) and following definitive alcohol neurolysis (n=8).

VAPS score	10	9	8	7	6	5	4	3	2	1	0
Pre -procedure	3 (2 Ca pancreas,1 Gastric Ca)	6 (5 Ca pancreas,1 Gastric Ca									
Post test block	1						4	3		1	
Post alcohol neurolysis							4	2	1	1	

may be traumatized. We performed all our procedures using the posterior approach that possibly was the reason for lower complications.

The success of the neurolytic celiac plexus block, despite different approaches and methods used, depends on adequate spread of the injectate in the coeliac area. To evaluate CT patterns of neurolytic (mixed with contrast) spread, the coeliac area was divided on the frontal plane into four quadrants, upper right and left and lower right and left, as related to the coeliac artery. Results were expressed as the number of quadrants into which contrast spread, *i.e.*, four, three, two, or one quadrants with contrast. The patterns of contrast spread according to the number of quadrants with anatomic distortion were analyzed. Findings suggest that, using the single-needle anterior approach, the neurolytic spread in the coeliac area is highly hampered by the regional anatomic alterations. It also appears that only a complete (four quadrants) neurolytic spread in the coeliac area can guarantee long lasting analgesia, and that this picture may be obtained in a very limited fraction of patients with regional anatomic alterations[11].Regardless of the technique used to improve the spread of the injectate in the plexus area, failures are common due to regional infiltration by cancer tissue and anatomy distortion by either previous surgery or radiation therapy-induced fibrosis.

Workers have also gone further to compare conscious sedation with and without coeliac plexus block in patients undergoing thermal ablation of liver metastasis. (Alexander Beck, RSNA 2004). Results reveal that percutanous coeliac plexus block in addition to conscious sedation is a safe and reliable method to significantly decrease the need of pain medication and intervention time. So the future for CT guided coeliac plexus block holds a lot of promise.

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