An Improved Technique for Alcohol Neurolysis of the Celiac Plexus

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Neurolysis of the celiac plexus is performed to relieve intractable pain caused by carcinoma of the pancreas, liver, gall bladder, or stomach, and of upper abdominal metastases of tumors having more distant origins. It is also occasionally effective in controlling the pain of chronic pancreatitis. However, complications such as paralysis and dysesthesias may result from the spread of neurolytic solutions from the site of injection. As recently recommended by Moore et al., I have used the CT scanner for all cases of alcohol celiac plexus block to determine both the position of the needle tips and the spread of neurolytic solution. A posterior spread of neurolytic solution toward the lumbar plexus was noticed when the solution was injected using previously described techniques. This observation prompted an investigation of alternative methods of celiac block. In this report such a modification of the classic technique is described.

METHODS

Eleven patients with chronic upper abdominal pain underwent a diagnostic celiac block with 25 ml of 0.25 per cent bupivacaine, which was injected through each of two needles inserted according to the technique described by Moore. The group included six patients with either primary or metastatic upper abdominal carcinoma, three patients with chronic pancreatitis (one patient three months status-post Whipple procedure), one patient with longstanding Crohn’s disease, and one with diabetic sympathetic neuropathy. One to three days after diagnostic block produced significant relief of pain for the duration of local anesthetic effect (6–10 h), the patients were brought to the CT scanning suite and sedated with incremental intravenous doses of fentanyl and diazepam. In the prone position, CT scans were performed to locate the celiac artery as it leaves the aorta. If retroperitoneal metastases or surgical clips obscured the view of the celiac artery, a site for needle insertion was chosen at the level of the L1 vertebral body. Further sedation was then induced with an intravenous drip of meperidine.

In the first five patients, 20-gauge, 5-in needles were inserted according to the technique described by Moore. Using a point of entry no greater than 7 cm lateral to the midline, along the caudal margin of the twelfth rib, needles were directed anteromedially and slightly cephalad, so that their tips rested 1.5 cm anterolateral to the vertebral body of L1. Repeat CT scans were then made to verify needle position medial to renal parenchyma and behind the aorta and diaphragmatic crura.

The next six patients received injections using the following modified technique as follows (fig. 1). Using the initial CT scan, the most probable location of the celiac ganglia was determined by locating the celiac artery around which the celiac ganglia lay clustered. Measurements were then taken at this level to determine a straight-line path between the skin and the location of the celiac plexus which would avoid vertebral body, renal parenchyma and major vascular structures. Of necessity, the needles would pass through both diaphragmatic crura below the level of lung parenchyma. The plane of needle insertion most commonly lay at L1, but when the celiac artery was found to lie at a higher location, insertion of the needle was made between the eleventh and twelfth rib if lung parenchyma was not in evidence, or below the margin of the twelfth rib and directed slightly cephalad if higher insertion would result in impaling the lung. Regardless, both needles would, of necessity, pass through the diaphragmatic crura so that their tips would lie at the predicted location of the celiac ganglia.

In practice, the left needle was inserted about 4 cm lateral to the midline, and the tip was localized immediately adjacent to the anterolateral wall of the aorta. The point of insertion of the right needle was considerably more variable. In placing the needle tip between the vena cava and aorta immediately anterior to the diaphragmatic crus, it was necessary to take a point of entry anywhere from 5–10 cm lateral to the midline, constrained by the vertebral body medially and the renal
technique, but not with the classic technique. When injected classically, alcohol lies only posterior to the diaphragm at the level of the celiac ganglia.

I had previously observed that when the classic technique was used, alcohol occasionally spread posteriorly along the diaphragm, towards the psoas compartment containing the lumbar plexus. In this study, when 50 ml was injected as advocated by Moore, such spread occurred in two of five patients (fig. 4). One patient with apparently normal spread of alcohol noted numbness of the left hip for approximately six weeks. With the transcrural technique, no such posterior spread occurred.

Of the group injected using the classic technique, three patients (with carcinomas) had excellent relief of upper abdominal pain, one patient (with chronic pancreatitis) had moderate relief, and one (with chronic pancreatitis) had no relief when evaluated at one month after block.

Of the group injected using the transcrural technique, four patients (two with carcinomas, one patient with chronic pancreatitis, and one with diabetic neuropathy) had excellent relief; two patients (one patient with carcinomatosis and one with Crohn’s disease) had minimal relief of pain.

**DISCUSSION**

In 1919, Kappis† described a technique by which the splanchnic nerves of the upper abdomen could be anesthetized using a percutaneous injection. This technique, more fully investigated by Moore,‡ has been used with minimal modification ever since. However, every published report warns of the danger of major nerve damage following neurolysis. Jones§ advocates using roentgenographic techniques to verify needle position before injection of alcohol, while Bridenbaugh et al.¶ believe that such radiographic techniques do not significantly alter the incidence of complications. With the infrequent use of celiac neurolysis, statistical data on complications are rare. In a series of 100 neurolytic celiac plexus blocks over an 8-year period, Thompson et al.¶ found only one patient with neurologic sequelae.

Using the CT scanner with the classic technique, Moore’s⁵ observation that solution spreads primarily cephalad was confirmed: up to 12 cm or more cephalad from the needle tips and only 3–5 cm caudal. He has suggested that optimum results are obtained when the neurolytic solution completely encircles the aorta,‡ as the celiac plexus lies anterolateral to it. However, when us-


‡ Moore DC: Personal communication.
Fig. 2. CT scans demonstrating the spread of 50 ml of neurolytic solution injected using the classic technique. Fig. 2A. A scan 8 cm above the level of the celiac artery (T10) shows the first evidence of encirclement of the aorta with neurolytic solution (arrows), as recommended by Moore. Fig. 2B. Note that at the level of the celiac artery, at T12 in this patient, no prespinal contrast is seen, and, therefore, no neurolytic solution can be expected to rest among the celiac ganglia. Asterisks represent the position of needle tips before they were obscured by contrast.

The celiac ganglia lie in variable locations adjacent to the celiac artery, anterior and lateral to the aorta. Ganglia that are cephalad to the celiac artery are separated from the aorta by the crura of the diaphragm. The branches of the splanchnic nerves that form the plexus arrive after perforating the crura. When found lateral and inferior to the celiac artery, the plexus may or may not be separated from the aorta by slips of muscle or loose areolar tissue. In any case, the crura of the diaphragm, where loosely bound to aortic adventitia along their inferior margins, form an anatomic barrier to flow of fluid from a prevertebral, retroaortic site of
injection to the celiac plexus itself. Indeed, for ganglionic
destruction to take place when using the classic tech-
nique, the solution must spread caudal, escape from
underneath the crura of the diaphragm as they divide
at the celiac artery, and then return cephalad to reach
the ganglia as they lie anterolateral to the artery and
crura. Contrary to Moore’s theory that this is a part of
the mechanism of action of the classic technique of celiac
plexus block, it was observed that such spread does not
occur.

If, instead, the crura are pierced by the needle and
injection is made immediately lateral to the aorta, the
solution can be expected to reach the plexus directly,
requiring smaller volumes. Preeaortic spread of alcohol,
as advocated by Moore et al., then occurs at the level
of the ganglia instead of above them. The use of smaller
volumes would reduce the possibility that solution would
spread to the psoas compartment and the lumbar plexus.
Although a posterior spread of alcohol occurred in two
of five patients when 50 ml were injected using the classic

Fig. 3. Spread of 40 ml of neurolytic solution injected using the
transcervical technique. This scan at L1 is 1 cm above the level of the
celiac artery and needle tips. Asterisks represent position of needle
tips relative to aorta and diaphragm as they would be seen in a scan 1
cm lower. Note the presence of preaortic contrast material (arrows) at
the predicted location of the celiac ganglia. This is not seen in a scan
at the level of the plexus using the classic technique (fig. 2B).

Fig. 4. CT scan at L1 showing the posterior spread of 50 ml of
neurolytic solution injected using the classic technique. Note the
proximity of alcohol to the area of the lumbar plexus (white arrows).
The black arrow indicates the location of the intervertebral foramen
through which nerves of the lumbar plexus pass. No complications oc-
curred in this patient.
Technique, no posterior spread was seen in six patients when the transcrural technique was used.

Boas, in a technique using fluoroscopy, was the first to note the difference between transcrural celiac block and retrocrural splanchic block. However, the precise needle positioning relative to soft tissue landmarks, necessary to ensure proper placement of the tips at the location of the celiac ganglia, was not described, and the necessarily asymmetric insertion of the left and right needles was not noted. While the difference in soft tissue definition between fluoroscopic and computed tomographic radiography is perhaps a minor additional advantage, it is one which may assume great importance when considering the proximity of the thoracic duct, aortic wall, inferior vena cava, and renal parenchyma to the site of injection of a tissue-destructive substance. In addition, tumor enlargement may significantly alter the anatomic relationship of soft tissue structures. The use of CT scans to delineate this anatomy may increase the incidence of successful blockade.

The transcrural path of the needle is the essential alteration of Moore's technique. This technique requires the use of computed tomography for determining needle depth and avoiding perforation of the aorta or vena cava, and, therefore, cannot be recommended as the method for routine blockade of the celiac plexus. The classic technique has worked well, and is still used for surgery and diagnostic blockade prior to neurolysis.

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Tracheomegaly

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Tracheomegaly, or tracheobronchomegaly, is a rare syndrome consisting of marked dilatation of the trachea and major bronchi usually due to a congenital defect of the elastic and muscle fibers of the tracheo-bronchial tree. The diagnosis follows roentgenological investigation and is associated frequently with chronic respiratory infection and partial airway obstruction. Most of the symptoms usually appear during childhood.1,2

In this report we present a case of adult onset tracheomegaly, probably secondary to intensive radiotherapy. This entity is of importance to anesthesiologists because of a predisposition to aspiration pneumonitis during general endotracheal anesthesia and to tracheal trauma by endotracheal tubes, suction catheters, and tracheal instrumentation.

REPORT OF A CASE

A 67-year-old man developed carcinoma of the base of the tongue approximately three years ago, and this was managed with a series of 37 radiotherapy treatments to his neck area. Although his cancer was controlled adequately, he developed radionecrosis of the mandible. A hemimandibulectomy was scheduled under general anesthesia. He was a heavy smoker with a chronic cough associated with production of copious purulent sputum and chronic pulmonary parenchymal changes as evidenced by both auscultation findings and chest radiographs (fig. 1). Pulmonary function tests were not obtained, but PEF was 7.43, PaO₂ 36 mmHg, and PaCO₂ 98 mmHg on room air. There were no other significant positive findings except enucleated appearance (weight 58 kg) due to the associated anorexia from the carcinoma.

Anesthesia was induced with 0.4 mg intravenous atropine, 3.0 mg d-tubocurarine, 150 mg thiopental, 5 mg diazepam, and 80 mg succinylcholine. The trachea was intubated with an 8.5-mm nasal endotracheal tube. Anesthesia was maintained with nitrous oxide, and halothane and ventilation was controlled. Besides the initial dose of succinylcholine, no other muscle relaxants were used. After securing