Long-Term Results of Celiac Ganglia Block: Correlation of Grade of Tumoral Invasion and Pain Relief

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OBJECTIVE. We evaluated the long-term results and response rates of celiac ganglia block to the level of tumor invasion of the celiac region.

SUBJECTS AND METHODS. Forty-one patients each with an inoperable intraabdominal carcinoma who were referred to our department for celiac ganglia block were included in this study. Tumor invasion of the celiac ganglia region was graded on a four-point scale according to CT features (grade I = no invasion, grade II = invasion < 50%, grade III = invasion > 50%, and grade IV = complete invasion). Subjective pain levels (0 = no pain, 10 = worst pain) were obtained from the patients, and objective criteria (change in daily analgesic doses) were noted before the procedure and during the follow-up to determine effectiveness of the celiac ganglia block.

RESULTS. Celiac ganglia block was successfully performed in all 41 patients (100%). In 39 (95%) of 41 patients, pain decreased significantly after the procedure, and the pain level did not change in the remaining two patients. Major complications were not encountered in any of the patients. Minor complications were observed in 35 patients (85%). Mean pain intensity and mean daily analgesic consumption significantly decreased after the procedure in all four groups. The amount of pain decrease for these two parameters was inversely related to degree of invasion. Responses of the patients were obtained at the end of the first week after the procedure and remained unchanged during long-term follow-up.

CONCLUSION. Percutaneous celiac ganglia block, particularly when performed in earlier stages of ganglia invasion, is an effective, easy, and safe procedure with successful long-term results.

Pain in cancer patients is a frequent chronic symptom that decreases the quality of life and restricts activity of the patient. Pain occurs in 90% of patients with advanced cancers, but it also occurs frequently (60–70%) in the early stages of the disease [1, 2]. Control and palliation of pain are the principal aims of therapy in patients with inoperable cancer. Tumors originating from upper abdominal viscera, such as pancreas, stomach, duodenum, proximal small bowel, liver, biliary tract, and compressing enlarged lymph nodes can cause severe abdominal pain that does not respond satisfactorily to medical treatment or radiotherapy [3]. Medical treatment can control pain in 70–90% of chronic cancer patients [2]. Percutaneous celiac ganglia block is a good alternative for patients with inoperable abdominal malignancy who need high doses of analgesics. Celiac ganglia block is advocated for these patients because side effects caused by high doses of narcotic analgesics are commonly encountered [2, 3].

The results of celiac ganglia block can vary from patient to patient. After celiac ganglia block, an inverse relation occurs between the degree of celiac ganglia invasion and the degree of pain relief; with greater invasion, pain is relieved less [4]. However, to our knowledge, no article in the literature discusses this relation in the long-term follow-up. The aim of this study was to assess the effectiveness of pain control with celiac ganglia block up to the death of the patients.

Subjects and Methods
Patient Group

Forty-one patients (18 women, 23 men) between 18 and 82 years old (mean, 52 years) with intraab-
A total of 33 patients with abdominal cancers who were referred for celiac ganglia block from 1998 to 2000 were included in this study. No patients were omitted from the study during this period. Twenty-three patients had pancreatic carcinoma, four had biliary tract carcinoma, nine had gastric carcinoma, two had colon carcinoma, two had hepatocellular carcinoma, and one had jejunum carcinoma.

**Technique**

In all the patients, celiac ganglia block was performed via an anterior approach under CT guidance on an inpatient basis. Informed consent was obtained from all patients. Oral intake was stopped 1 night before the procedure. All patients had venous access before the procedure, and no conscious sedation was performed. IV bolus injection of iohexol (Omnipaque, Nycomed) was given to identify the origins of the celiac and superior mesenteric arteries. Upper abdominal CT examination was performed with 5-mm slice thickness with the patient in the supine position. The entry site was determined, and the distance from skin to preaortic fat was measured. Antiseptics were applied to the skin, and the entry site was infiltrated by 5–10 mL local anesthesia (Citanest [prilocaine hydrochloride], Eczacibasi). A 22-gauge Chiba needle was introduced through a small incision at the entry site and advanced perpendicular to the CT slice and the long axis of the patient to a predetermined distance (Fig. 1). Stomach, liver, pancreas, or bowels were transgressed in different patients without any complications. The tip of the needle was located on a repeated CT examination (Fig. 2).

Once the tip of the needle was localized between the origins of the celiac trunk and superior mesenteric artery just anterior to the abdominal aorta, a 50-mL mixture composed of 45 mL of 95% ethanol and 5 mL contrast material was prepared. Five milliliters of this mixture was mixed with 3 mL of local anesthetic, and a test injection was made. CT images were obtained to see the distribution of mixture at the needle tip (Fig. 3). If the patient’s pain decreased after the injection, contrast material was seen to disperse to the paraaortic retroperitoneal space, and if not much resistance was encountered, the rest of the mixture was injected. Lower thoracic and upper abdominal CT examinations were performed to assess the final distribution of the mixture (Fig. 4). CT fluoroscopy was not used for any of the procedures. Vital signs of the patient were monitored for 30 min after the procedure in the CT suite.

**Subjective and Objective Criteria of Pain Relief**

The degree of pain relief was analyzed using subjective and objective criteria. For the subjective criteria, all patients were interviewed before the procedure to obtain a baseline pain score based on

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**Fig. 1**—Line drawing shows location of celiac ganglia and needle placed for blockage. IVC = inferior vena cava.

**Fig. 2**—Axial CT scan of 51-year-old man shows tip of Chiba needle in preaortic space in retroperitoneum between origins of celiac trunk and superior mesenteric artery.

**Fig. 3**—Axial CT scan of 61-year-old woman was obtained after injection of alcohol and contrast material mixture to check dissemination in celiac ganglia.

**Fig. 4**—Axial CT scan of 82-year-old man was used as control image at procedure end.
a previously described visual analog scale (range, 0–10) with zero corresponding to no pain and 10 corresponding to the worst pain. For the objective criteria, patients were asked the name, dose, and quantities of pain medication being taken [5–7].

These values for subjective and objective criteria were obtained 1 day before the celiac ganglia block and 1 day, 1 week, and 1 month after the procedure. The criteria were also noted every month during each patient’s total survival period. Subjective pain levels (0 = no pain, 10 = worst pain) were obtained from the patients, and objective criteria (e.g., change in the daily analgesic doses) were noted to determine the effectiveness of the celiac ganglia block.

CT Grading

Tumoral invasion of celiac ganglia was determined because the celiac ganglia itself was not visible on CT. Tumor invasion of celiac ganglia was classified into four grades according to the tumoral invasion of the paraaortic and paracaval fat planes at the level of the celiac ganglia (Figs. 5–8). In grade I, fat planes were almost completely preserved. In grade II, most (> 50%) of the fatty tissues were preserved with some invaded areas. In grade III, most (> 50%) of the fatty tissues were invaded with minimally preserved fatty areas. In grade IV, the fatty tissues were always almost completely invaded [7].

Statistical Analysis

Values of subjective and objective criteria obtained from 41 patients were analyzed with Wilcoxon’s paired sample test to determine effectiveness of the procedure. Wilcoxon’s paired sample test was also used to determine pre- and postprocedure differences of subjective and objective values in each group. Mann-Whitney U test was used to evaluate the relationship between grade of celiac ganglia invasion and effectiveness of the procedure.

Results

Celiac ganglia block was successfully performed in all 41 patients (100%). No major complications, such as death or paraplegia, occurred. Self-limiting diarrhea was the most common complication and occurred in 30 patients (73%). The complication was transient, and these patients recovered in 48 hr without any treatment. Orthostatic hypotension was encountered in five patients (12%) and lasted less than 12 hr. This condition was managed with IV hydration.
TABLE 1: Mean and Range of Pain Scores Before and After Celiac Ganglia Block

<table>
<thead>
<tr>
<th>Time of Score</th>
<th>Mean Pain Score (range)</th>
<th>No. of Living Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before celiac ganglia block</td>
<td>8.19 (6–10)</td>
<td>41</td>
</tr>
<tr>
<td>After celiac ganglia block</td>
<td></td>
<td></td>
</tr>
<tr>
<td>First day</td>
<td>3.63 (0–10)</td>
<td>41</td>
</tr>
<tr>
<td>First week</td>
<td>3.22 (0–8)</td>
<td>39</td>
</tr>
<tr>
<td>First month</td>
<td>3.00 (0–8)</td>
<td>34</td>
</tr>
<tr>
<td>Second month</td>
<td>2.43 (0–7)</td>
<td>20</td>
</tr>
<tr>
<td>Third month</td>
<td>2.07 (0–7)</td>
<td>12</td>
</tr>
<tr>
<td>Fourth month</td>
<td>1.78 (0–5)</td>
<td>8</td>
</tr>
<tr>
<td>Fifth month</td>
<td>1.50 (0–3)</td>
<td>3</td>
</tr>
</tbody>
</table>

Two patients were in the grade I celiac ganglia invasion group, 12 patients were in the grade II group, 15 patients were in the grade III group, and 12 patients were in the grade IV group. Mean time from the procedure to the patient’s death was 10.9 weeks (range, 1–24 weeks).

Changes in Subjective Criteria

The mean and range of pain scores irrespective of tumoral invasion are shown in Table 1. In 39 (95%) of 41 patients, pain decreased significantly after the procedure, and the pain level did not change in two patients. In 39 patients (95%), responses obtained 1 week after the procedure did not change in the next 5 months if they were still alive. Furthermore, no patient had increased pain level during the follow-up period.

Decreases in pain score between pre- and postprocedure follow-ups were statistically significant in the study group (Wilcoxon’s paired sample test, p < 0.05).

The percentages of decrease in subjective pain level after the procedure and during the follow-up period were 75% in grade I patients, 62–100% in grade II patients, 20–100% in grade III patients, and 0–71% in grade IV patients. When the pain levels reached a stable point (first week in 39 patients, first month in two patients), the mean percentages of decrease in the pain level were 75%, 81%, 69%, and 37% in grade I, II, III, and IV patients, respectively. Before stabilizing, pain levels decreased in 39 patients. Except for grade I patients, the decrease in pain level was statistically significant in all grades. Statistical analysis was not possible in grade I patients because the number of patients (n = 2) was insufficient. However, the pain level was evaluated as 2 after celiac ganglia block by these two patients, whereas they rated pain as 8 before the procedure.

When the change in pain level was compared among groups, no statistically significant difference was apparent between groups II and III. However, statistically significant differences did occur between group IV and both groups II and III (Mann-Whitney U test, p < 0.05) (Fig. 9).

Changes in Objective Criteria

Because different agents such as morphine (in 27 patients) and nonopioid analgesics (in 14 patients) were used for pain management before and after the celiac ganglia block, the percentages of decrease in analgesic doses after the procedure were used in statistical analysis instead of analgesic dose values. The results until the end of the second month were included because of the decrease in the number of patients caused by cancer-related mortality after the second month.

Three patients in the grade II group and two patients in the grade III group no longer needed analgesics after the celiac ganglia block procedure. The two patients who did not respond to the procedure (no decrease in pain and analgesic doses) were in the grade IV group.

As the celiac ganglia invasion grade increased, the amount of decrease in analgesic doses declined. The amounts of decrease in analgesic doses after the procedure in all three invasion groups at the second month were found to be statistically significant (Wilcoxon’s paired sample test, p < 0.05). The group with grade I invasion was excluded because of the insufficient number (n = 2) of patients. In 41 patients, the percentages of decrease in analgesic doses were 47%, 60%, 61%, and 65% in the first day, first week, first month, and second month after the procedure, respectively (Fig. 10). In the group with grade I invasion, the percentages of analgesic dose decrease at the same time follow-ups were 64%, 71%, 71%, and 66%, respectively. In the group with grade II invasion, these percentages were 55%, 68%, 68%, and 67%, respectively. The percentages of 55%, 62%, 67%, 71% and 23%, 35%, 39%, 33% were encountered in the groups with grade III and IV, respectively (Fig. 10).

When the amounts of decrease in analgesic doses after the procedure among groups were analyzed, no statistically significant difference appeared between groups II and III, but statistically significant differences did appear between groups II and IV and between groups III and IV (Mann-Whitney U test, p < 0.05).

Discussion

Pain control requires a multidisciplinary approach, and the first step in the treatment is pharmacologic therapy. Medical treatment can
control pain in 70–90% of chronic cancer patients [2]. According to World Health Organization criteria, celiac ganglia block should be performed in patients with advanced stage cancer who do not respond to opioid analgesics. In patients who do not respond to pharmacologic therapy, neurolytic nerve blockage can be performed with improved results. Celiac ganglia and splanchic nerves are the best sites to obtain pain relief in patients with upper abdominal malignancies. In a meta-analysis by Eisenberg et al. [8], celiac ganglia block was shown to control 90% of pain in the first 3 months and 70–90% of pain afterward.

Although fluoroscopy and sonography can be used for guidance, CT-guided celiac ganglia block has been accepted as the most reliable technique because CT guidance almost completely eliminates the risk of inadvertent injection of the neurolytic agent into the vascular structures and abdominal viscera and allows precise needle positioning [3, 9–12]. Celiac ganglia block can be performed through anterior or posterior approaches under CT guidance. With the posterior approach, both sides of the aorta must be punctured to inject neurolytic agent into bilateral paraaortic regions. The anterior transaortic approach is performed with a single midline needle passing through the posterior and anterior walls of the aorta with a higher risk of retroperitoneal hemorrhage. The anterior approach has the advantages of a single puncture resulting in less discomfort to the patients, reduced procedure time, and use of a smaller volume of neurolytic agent. It also avoids puncture of the aorta and permits the patients to remain supine during the entire procedure [4, 13].

A CT classification was described in 1997 that grades the degree of tumoral invasion of the celiac ganglia [4]. A significant relationship between subjective and objective criteria of pain relief and this classification was found. The researchers concluded that the greater the degree of celiac ganglia invasion, the less the rate of pain relief after the celiac ganglia block.

The development of endoscopic sonography—guided fine-needle aspiration and the ability of endoscopic sonography to visualize vascular structures has made possible endoscopic sonography—guided celiac ganglia block. Gress et al. [5] evaluated the efficacy of endoscopic sonography—guided celiac ganglia block versus CT-guided celiac ganglia block in chronic pancreatitis patients and showed more persistent pain relief with endoscopic sonography than CT-guided celiac ganglia block. That study differs from our study in terms of neurolytic agents (bupivacaine and triamcinolone), patient condition (chronic pancreatitis), and patient number (10 patients in the endoscopic sonography group and eight patients in the CT group). Wiersma and Wiersma [14] evaluated endoscopic sonography—guided celiac ganglia block in 30 patients with intraabdominal malignancy, 25 of whom had pancreatic cancer, using bupivacaine and 98% dehydrated absolute alcohol. They observed persistent pain relief in 79–88% of patients, with most patients having stable or decreased narcotic requirements (82–91%).

Because bone (T12–L1 vertebrae) and parietal peritoneal pain sensation has no relation with the celiac ganglia, patients who have metastasis to these sites will not benefit from celiac ganglia block. Some of the other causes of unsuccessful celiac ganglia block may be technical insufficiency such as poor placement of the needle tip and insufficient volume of neurolytic agent, alternative pain pathways, and anatomic variation [4]. However, we think that inadequate CT evaluation of the extent of tumor invasion in the celiac ganglia region should be added to the list of failure causes.

In 39 (95%) of the 41 patients, celiac ganglia block under CT guidance via an anterior approach provided pain relief in different degrees in this series. We obtained a mean of 62% decrease in subjective pain score and a mean of 60% decrease in analgesic doses when compared with preprocedure status during the follow-up period. The amounts of decrease were higher in patients with grade I, II, or III invasion, in which the celiac ganglia were not totally invaded. These results indicate that the effectiveness of the procedure decreases as the grade of celiac ganglia invasion based on the CT features increases.

Subjective pain decrease during the follow-up period was 75% in grade I, 81% in grade II, 69% in grade III, and 37% in grade IV. These results indicate that the rate of decrease in subjective pain criteria declined as the grade of celiac ganglia invasion based on the CT features increased (Fig. 9).

Decrease in the dose of analgesics after the procedure was parallel to the decrease in the subjective pain scale, although it was difficult to evaluate the analgesic doses because of the use of different kinds of medications. The doses of analgesics after celiac ganglia block decreased in the first week at the rates of 71%, 68%, 62%, and 35% in the patients in grade I, II, III, and IV groups, respectively. No statistically significant difference occurred between grade I, II, and III patients with respect to decrease in analgesic doses, but in the grade IV invasion group in which celiac ganglia were totally invaded, decrease in the analgesic dose was significantly less. These results indicate that the rate of decrease in the analgesic dose declined as the invasion grade increased (Fig. 10).

Patients were followed up until their death, and the effectiveness of the procedure during this time was evaluated. Pain level did not change after the first week of the procedure, so effectiveness of the procedure could be determined correctly after the first week and remained unchanged during the follow-up.
We conclude that celiac ganglia block under CT guidance is an easy and safe procedure with a high success rate because the celiac ganglia block procedure helped 95% of the patients, without serious complications. As the invasion grade increased, the effectiveness of the procedure decreased, especially when the celiac ganglia region was totally invaded. Therefore, performing the procedure in the early stages of celiac ganglia invasion can increase the effectiveness of the celiac ganglia block, which is contrary to World Health Organization criteria stating that celiac ganglia block must be performed in patients with advanced stage cancer who do not respond to opioid analgesics [2]. Responses of patients were obtained at the end of the first week after the procedure in our series, and no patient complained from increased pain level during the follow-up period. Therefore, we think that it is unnecessary to follow up and evaluate pain levels of patients more than 1 week after celiac ganglia block if pain relief is achieved.

References