J Anesth (2005) 19:328–332
DOI 10.1007/s00540-005-0342-0

Journal of
Anesthesia

Combined neurolytic block of celiac, inferior mesenteric, and superior hypogastric plexuses for incapacitating abdominal and/or pelvic cancer pain

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Abstract
Thirty-five patients with extensive abdominal or pelvic cancer who suffered uncontrolled, diffuse, extensive, and incapacitating pain were treated with a combination of neurolytic celiac plexus block (CPB), inferior mesenteric plexus block (IMPB), and superior hypogastric plexus block (SHGPB). The combination of neurolytic CPB, IMPB, and SHGPB was performed with alcohol, mainly using a transintervetebral disc approach. The combination neurolysis produced effective immediate pain relief in all the patients (visual analog scale (VAS), reduced from 8.8 ± 0.2 to 0). This pain relief persisted during the first 3 months (VAS, 2.3 ± 0.5) or until death. Morphine consumption was significantly decreased for the first 1 month (from 96 ± 29 mg to 31 ± 10 mg per day) after the neurolysis and thereafter continued to be lower than before the surgery, though not significantly so. No serious complications were observed to have been caused by the neurolytic procedure on the three sympathetic plexuses. Our preliminary clinical results suggest that the combination of neurolytic CPB, IMPB, and SHGPB improves the quality of life of patients who have incapacitating cancer pain, by reducing both the intensity of the pain and their opioid consumption, without serious complications. This combination procedure may provide a new therapeutic option for pain relief in patients with advanced cancer.

Key words Neurolysis · Celiac plexus · Inferior mesenteric plexus · Superior hypogastric plexus · Incapacitating cancer pain

Introduction

Neurolysis of the sympathetic plexus has been applied to prevent visceral pain and improve the quality of life of patients with cancer [1,2]. Celiac plexus block (CPB), one of the neurolytic sympathetic plexus blocks, has been used for malignant and chronic nonmalignant pain in the upper abdomen [3–5]. Inferior mesenteric plexus block (IMPB) for left-sided abdominal pain, and superior hypogastric plexus block (SHGPB) [6–8] for pelvic pain due to cancer have also been applied. The effectiveness of these neurolytic sympathetic plexus blocks is approximately 70%–80% for immediate pain relief [3,4,6–8]. Some patients do not benefit from neurolysis blockade. It is possible that nociceptive impulses from the abdominal and/or pelvic viscera cannot be interrupted by only one neurolytic sympathetic plexus block in patients with a neoplasm that has expanded extensively in the abdomen and pelvis. We report the effects of a combination of neurolytic CPB, IMPB, and SHGPB (comb CPB-IMPB-SHGPB) on pain in patients with advanced abdominal and/or pelvic cancer using mainly the transintervetebral disc approach we have already reported [9].

Case report

After obtaining institutional approval and informed consent, we treated 35 patients (20 male, 15 female). All patients had chronic abdominal and/or pelvic pain with a prominent visceral component, secondary to unresectable cancer or metastasis. When the combination of the three blocks was planned, most patients had experienced diffuse and extensive visceral pain associated with advanced cancer. Exclusion criteria were: patients with coagulopathies, obvious poor general condition, and life expectancy less than 2 weeks. Patients were admitted to the hospital and taken to the operating room, where routine monitors were connected. Morphine use on the day was stopped, for precise pain assessment after the neurolytic procedure. Neurolysis was performed with the patients in the prone position

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Received: January 14, 2005 / Accepted: June 18, 2005

under sterile conditions, with the use of computed tomography (CT). Details of the transintervertebral disc approach for neurolytic sympathetic plexus block have been described previously [9]. A local anesthetic (1% lidocaine; 5 ml) was injected at the needle insertion sites, which were 2.5–5.0 cm from the midline at the intervertebral disc levels of T11–L1 for CPB, L2–L4 for IMPB, and L4–S1 for SHGPB. Under CT guidance, a 15-cm 23-G needle was then inserted through the predetermined insertion sites toward the intervertebral disc, in the predetermined direction. When the tip of the needle encountered the disc, the needle was advanced until the tip penetrated it. After confirmation of the needle placement with a CT scan, and confirmation of loss of resistance, and no aspiration of blood, 1 ml 10% lidocaine with 4 ml contrast medium was injected (Fig. 1). If the spread in the target area was sufficient and pain relief was satisfactory, 5–15 ml of 99.5% ethyl alcohol was injected through each needle 30 min after the injection of the lidocaine with contrast medium. If the spread of contrast medium and pain relief was insufficient, additional needles were inserted for satisfactory pain relief. The dose of alcohol was determined according to the general condition of the patient and the spread of the contrast medium. Ethyl alcohol injection via at least three needles was performed for CPB, IMPB, and SHGPB. When adequate placement of the needle tip was not possible because of anatomic anomaly of the vertebra, neurolysis was performed by a transaortic approach [4,10] for CPB and IMPB and by a transthecal approach [11] for SHGPB (Fig. 1c).

The intensity of pain was evaluated using a visual analog scale (VAS), consisting of a 10-cm line in which 0 means "no pain", and 10 means "the worst possible pain". Morphine consumption and VAS values were presented as means ± SE. Differences were examined with Wilcoxon's matched-pair rank-sum test, and statistical significance was assigned as $P < 0.05$.

The primary sites of malignancy were the pancreas in 9 patients, stomach in 7, uterus in 6, rectum in 5, colon in 4, gallbladder in 3, and ovary in 1. A total amount of 30.5 ± 1.4 ml ethyl alcohol was injected, via three to five needles, for neurolytic CPB, IMPB, and SHGPB. After the comb CPB-IMPB-SHGPB, all patients had effective immediate pain relief, as shown by the VAS score of 0 (Table 1). This pain relief persisted for the first 3 months after the procedure or until death. Morphine consumption was significantly decreased for the first 1 month after the neurolytic procedure, and thereafter continued to be lower than before the procedure, though not significantly so. The total number of patients gradually decreased because of their demise due to malignancy.

We encountered some adverse reactions and complications of minor importance after the neurolytic procedure. Seventeen patients had transient diarrhea (corrected with intravenous rehydration) and 13 patients had orthostatic hypotension. In addition, 12 patients showed acetaldehyde syndrome-like reaction, which is characterized by facial or whole-body flushing, palpitation, hypotension, tachycardia, vomiting, and dizziness [12]. These adverse reactions disappeared within a few days. No other serious side effects and complications

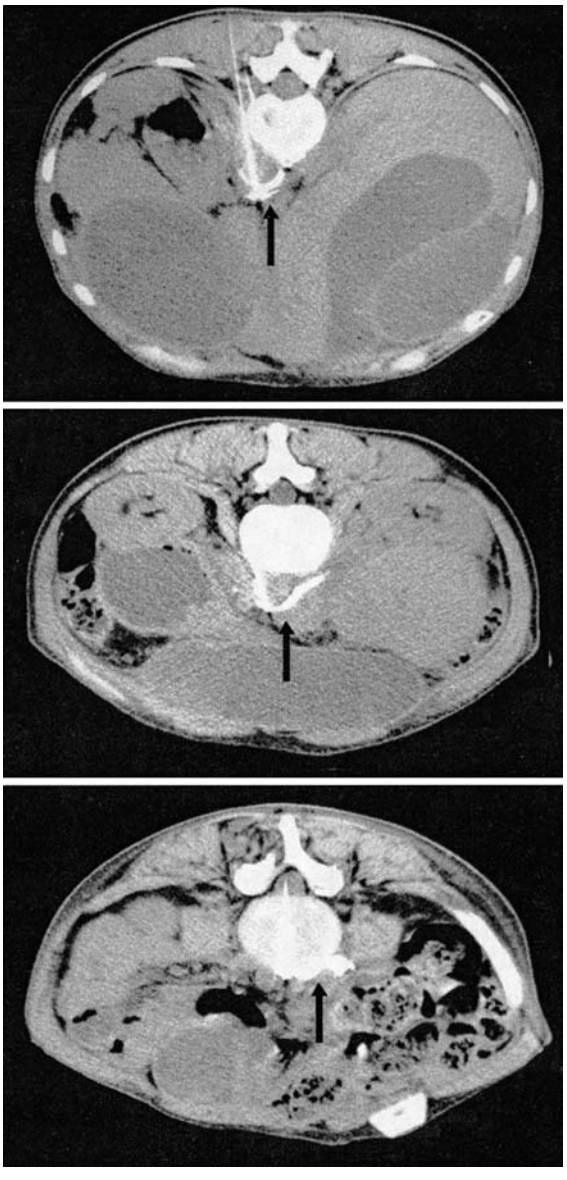

Fig. 1. Computed tomography (CT) images at the level of T12–L1 for celiac plexus block (**a** transintervertebral disc approach), L2–L3 for inferior mesenteric plexus block (**b** transintervertebral disc approach), and L4–L5 for superior hypogastric plexus block (**c** transthecal approach) in a 62-year-old female patient with unresectable uterus cancer who suffered uncontrolled, incapacitating pain. Axial CT scans show appropriate placement of the needle tip and adequate spread of the contrast medium (*arrows*) around the target plexus

Table 1. Daily doses of oral morphine, and visual analog scale (VAS) before and after the combination of neurolytic CPB, IMPB, and SHGPB

Case number	Age (years)	Sex	Primary site of malignancy	Ethyl alcohol (ml)	Morphine (mg/day)					VAS					Side effects
					Before the block	Immediately after the block	1 Week later	1 Month later	3 Months later	Before the block	Immediately after the block	1 Week later	1 Month later	3 Months later	
1	39	F	Uterus	30	320	0	150	270	270	8	0	0	0	0	H, Al
2	44	F	Uterus	30	100	0	30	30		10	0	0	0		H, Al
3	53	F	Uterus	24	888	0	96	192		8	0	1	1		H, Al, D
4	53	F	Ovary	30	330	0	0	20		8	0	0	0		H, Al, D
5	66	F	Pancreas	30	120	0	20	20	20	8	0	2	2	2	H, Al, D
6	49	M	Pancreas	30	480	0	180	180		8	0	3	5		H, D
7	74	F	Pancreas	30	80	0	20	20		10	0	3	3		H, Al
8	63	M	Stomach	40	36	0	0	20		8	0	3	3		H, Al, D
9	62	F	Uterus	30	0	0	0	0		9	0	1	1		
10	50	M	Rectum	25	60	0	0	0	0	9	0	2	2	2	
11	62	M	Rectum	40	80	0	0	0	0	10	0	5	1	1	
12	65	F	Rectum	30	30	0	0	30		9	0	2	4		
13	42	M	Colon	50	30	0	0	0	0	10	0	4	2	0	H, Al, D
14	59	F	Stomach	27	90	0	0	0	60	10	0	2	1	9	D
15	66	M	Colon	45	80	0	0	0		10	0	1	0		H, Al, D
16	77	M	Pancreas	34	100	0	0	0		10	0	1	0		H, Al, D
17	53	M	Colon	36	60	0	0	0		10	0	1	1		D
18	53	M	Pancreas	50	30	0	0	30		9	0	0	3		H, Al, D
19	67	M	Stomach	40	0	0	0	0	30	9	0	0	1	4	D
20	72	M	Pancreas	20	30	0	30	30		6	0	3	3		D
21	60	M	Gallbladder	35	60	0	0	40		9	0	0	3		
22	49	F	Colon	35	10	0	0	0		9	0	0	0		
23	65	M	Rectum	24	10	0	0	0		10	0	2	0		
24	83	F	Gallbladder	17	10	0	0	0		7	0	0	0		
25	41	F	Uterus	35	60	0	0	60		9	0	1	3		
26	73	F	Pancreas	30	10	0	0	0		9	0	2	0		Al
27	50	F	Uterus	30	10	0	0	0		8	0	0	0		
28	68	M	Gallbladder	35	60	0	0	0		8	0	1	3		
29	71	M	Stomach	20	10	0	0	0		7	0	1	1		
30	34	M	Pancreas	29	60	0	0	20		10	0	1	1		D
31	60	F	Stomach	26	60	0	0	60		10	0	2	3		D
32	71	M	Pancreas	20	10	0	0	0		9	0	0	0		D
33	63	M	Stomach	20	20	0	10	60	90	8	0	0	2	1	
34	57	M	Rectum	20	0	0	0	0	60	8	0	1	1	2	H, D
35	78	M	Stomach	20	30	0	0	0		7	0	0	0		
Mean ± SE				30.5 ± 1.4	96 ± 29	0*	15 ± 7*	31 ± 10*	59 ± 14	8.8 ± 0.2	0*	1.3 ± 0.2*	1.4 ± 0.2*	2.3 ± 0.5*	

*Significant difference compared to the value before the block

H, hypotension; Al, acetaldehyde syndrome-like reaction; D, diarrhea; CPB, celiac plexus block; IMPB, inferior mesenteric plexus block; SHGPB, superior hypogastric plexus block

related to the transintervetebral disc approach for the neurolytic procedure, such as motor paralysis, pneumothorax, organ puncture, disc herniation, or discitis were observed in this study. Hemorrhage from the abdominal aorta and pseudoaneurysm, due to the transaortic approach, and cauda equina syndrome and meningitis, due to the transthecal approach, did not occur.

Discussion

Cancer pain relief and maintenance of the quality of life in preterminal patients is still a therapeutic challenge. Pharmacologic management is regarded as the mainstay of care in most patients with cancer pain. Despite pharmacologic intervention, variable proportions of patients do not achieve adequate pain control and experience intractable side effects associated with analgesics [2]. Therefore, several different techniques of neurolytic blockade of the sympathetic plexus have been developed [1]. Studies that have investigated the effects of CPB on pain from the upper abdominal viscera show significant success [3–5]. Particularly, patients with cancer in the upper abdomen who have a significant visceral pain component have responded well to CPB [4]. In addition, pelvic pain associated with cancer may be alleviated by neurolytic SHGPB [6–8]. The effectiveness of these neurolytic sympathetic plexus blocks is approximately 70%–80% for immediate pain relief.

However, a certain proportion of cancer patients treated with neurolytic sympathetic plexus blocks do not have satisfactory pain relief. The causes of post-block residual pain may depend on technical failure or on the pre-block coexistence of undiagnosed nonvisceral pain caused by neoplastic invasion of muscle and connective tissue [2,4]. In addition, it is possible that nociceptive impulses from the abdominal and/or pelvic viscera cannot be interrupted by only one neurolytic sympathetic plexus block when a neoplasm has expanded extensively in the abdomen and pelvis. Autonomic nervous supply to the liver, pancreas, spleen, kidney, intestines, and adrenal glands arises in the celiac plexus [2]. Hence, CPB is indicated for visceral pain from cancer in the upper abdomen. IMPB is used for left-sided abdominal pain and SHGPB has been applied for pelvic pain [6,7]. We hypothesized that pain relief in patients in advanced stages of disease might be achieved by comb CPB-IMPB-SHGPB, because extensive nociceptive impulses from the abdomen and/or pelvis could thus be interrupted. Besides, we expected that their general condition would become poor soon because they were already in the preterminal, or terminal stage. In other words, if pain relief with one plexus block only was not satisfactory, an additional and/or another plexus block might not be able to be performed because the general condition of the patients might have deteriorated during a short period. Therefore, we planned to perform the comb CPB-IMPB-SHGPB at the same time in consideration of efficacy and safety.

In this series, neurolytic sympathetic plexus blocks were performed mainly using the posterior transdiscal approach [8,9] in patients diagnosed with abdominal and/or pelvic cancer pain. As shown in Table 1, comb CPB-IMPB-SHGPB reduced the intensity of pain in all the patients immediately after the blocks, and the pain relief, as judged by a decrease in the VAS, persisted for at least 3 months. Moreover, significant reductions in oral opioid intake were observed for 1 month. The success rate in the present study, showing pain relief in all the patients, was relatively high compared to that in earlier reports that have investigated the effect of one neurolytic block of the CP [4,5] or SHGP [6–8]. A possible explanation is that the comb CPB-IMPB-SHGPB may have interrupted extensive visceral afferents that covered the area into which neoplasms had invaded.

It is important to note that no increase in adverse effects associated with the neurolytic procedure was observed in this report, compared with the incidence of adverse effects in previous reports [1,9], even though we performed three neurolytic sympathetic plexus blocks. The total amount of 30.5 ± 1.4 ml ethyl alcohol solution that we injected to the three sympathetic plexuses was not a large volume compared with that in other reports describing the effect of one neurolytic sympathetic plexus block [1,13]. Therefore, it appears that alcohol-related side effects were not increased in the present study. No other serious complications due to the neurolytic procedure such as motor paralysis [14,15], pneumothorax [16], disc herniation, or discitis were observed in the present study. The efficacy, safety, and precision of the neurolytic procedure were enhanced by CT guidance in the hands of skilled clinicians. Consequently, it appears that neurolysis with low-volume neurolytic agents [17] may provide good pain control, without an increase in neurolytic agent-related side effects such as tissue destruction, the potential for neurologic injury, or systemic rises in plasma alcohol concentrations [18]. In addition, the transdiscal approach may have possible advantages, including ease of use, minimal risk of organ puncture, low risk of intravascular injection, and a single-needle technique [8].

It is likely that the comb CPB-IMPB-SHGPB procedure led to the reduction of the visceral component of extensive cancer pain, compared to findings with only one neurolytic sympathetic plexus block, because the comb CPB-IMPB-SHGPB procedure could interrupt visceral afferents extensively. However, we did not

compare the efficacy of the comb CPB-IMPB-SHGPB and that of only one plexus block in this clinical study. Therefore, it is not clear to what extent patients in the present study may have achieved satisfactory pain relief with only one neurolytic sympathetic plexus block, rather than the comb CPB-IMPB-SHGPB. The results are therefore tentative and should be viewed with caution. Further studies are needed to define the effect of the comb CPB-IMPB-SHGPB procedure in patients with incapacitating cancer pain.

Our preliminary clinical results suggest that comb CPB-IMPB-SHGPB improves the quality of life of patients who have advanced cancer pain by reducing both the intensity of pain and their opioid consumption, without serious complications. This combination procedure may provide a new therapeutic option for patients with advanced cancer in the abdomen and/or pelvis.

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