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ORIGINAL ARTICLE

Combined neurolytic block of celiac and superior hypogastric plexuses for incapacitating upper abdominal cancer pain

Lixia Huang, Fan Tao, Zhen Wang, Haifang Wan, Pisheng Qu, Hanguang Zheng

Department of Anesthesiology, Integrated Chinese and Western Medicine Hospital of Zhejiang Province, Hangzhou 310003, China

Summary

Purpose: *To evaluate the efficacy of a combined neurolytic block of the celiac and superior hypogastric plexuses for incapacitating upper abdominal cancer pain.*

Methods: *Fifty-two patients with advanced upper abdominal malignancies and incapacitating pain were equally randomized to receive a combined neurolytic block of the celiac and superior hypogastric plexuses (combined group) or a neurolytic celiac plexus block alone (NCPB group) using a 90% ethanol trans-intervertebral disk approach under CT guidance. Visual analogue scores (VAS), morphine consumption, and quality of life (QoL) were assessed before the procedure and 24 hrs, 1 week, 1 month, and 3 months after the procedure. The complications and side effects were also recorded.*

Results: *The amount of ethanol used was 30 ± 5 ml in the combined group and 21 ± 3 ml in the NCPB group. VAS scores and morphine consumption decreased significantly pre- compared to post-procedure in both groups ($p<0.05$). QoL significantly improved 24 hrs, 1 week, and 1 month after the procedure compared with each group pre-procedure ($p<0.05$), but not after 3 months ($p>0.05$). The combined group had significantly lower VAS and morphine consumption than the NCPB group ($p<0.05$). QoL scores were significantly higher in the combined group 24 hrs, 1 week, and 1 month post-procedure than the NCPB group ($p<0.05$), but not after 3 months ($p>0.05$).*

Conclusion: *A combined neurolytic block of the celiac and superior hypogastric plexuses is more effective than neurolytic celiac plexus block alone in pain relief for patients with advanced upper abdominal cancer.*

Key words: *cancer pain, celiac plexus, neurolytic block, superior hypogastric plexuses, upper abdomen*

Introduction

NCPB is used for the treatment of incapacitating upper abdominal cancer pain. In recent years, the use of ultrasound, CT and MRI guidance has improved the safety and accuracy of this procedure, but the immediate efficiency is only 80% [1–3]. The nociceptive impulses caused by extensive metastases of upper abdominal malignancies may not be effectively blocked by NCPB alone [3]. The pelvic organs are predominantly innervated by the superior hypogastric plexuses.

This study aimed to determine the efficacy of NCPB combined with neurolytic superior hypogastric plexus block (NSHPB) in the treatment of cancer pain in patients with advanced upper abdominal malignancies.

Methods

Patients

Fifty-two patients with advanced upper abdominal cancer and incapacitating cancer pain were included in this study. All patients received the three-step treatment with oral analgesics, as recommended by the World Health Organization. However, the pharmacologic treatment failed because of poor efficacy or severe side effects from oral or intramuscular morphine use. Patients with the following conditions were excluded from this study: very poor general health; infection; coagulopathy; paralysis; extensive distant metastasis; severe spinal deformity; vertebral metastasis; and severe heart, lung, and liver dysfunction.

The study was approved by our hospital Ethics Committee and informed consent was obtained from

Correspondence to: Fan Tao, MD. Department of Anesthesiology, Integrated Chinese and Western Medicine Hospital of Zhejiang Province, Huanchengdong Road No.208, Hangzhou 310003, China. Tel: +86 0571 56108418, Fax: +86 0571 56108418,
E-mail: fantao896@163.com
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all patients or their families. Patients were randomized to receive a combined neurolytic block of the celiac and superior hypogastric plexuses (combined group, N=26) or a neurolytic celiac plexus block alone (NCPB group, N=26).

Technical details of the procedures

All analgesics were stopped on the day of the procedure. Intravenous infusion of Ringer's lactate (10ml/kg) was given pre-procedure. Blood pressure, heart rate, and pulse oximetry were monitored during the procedure. The procedure was performed under CT guidance in prone position with a trans-intervertebral disk approach. Ethanol dose was determined according to each patient's condition and the spread of contrast medium. Patients returned to the ward if no complications were noticed within 30 min post-procedure and remained in prone position for an additional 6 hrs. Prophylactic antibiotics were administered for 3 days. Controlled-release tablets of morphine sulfate were given to relieve pain.

In the NCPB group, patients were in prone position with a pillow underneath the abdomen. The T12-L1 intervertebral disc levels were identified using CT. The skin was marked 2.5–5 cm left or right of the midline, disinfected, and locally anesthetized. A 10–15 cm (22-G) needle was inserted toward the intervertebral disc until loss of resistance was appreciated when the tip penetrated the anterior longitudinal ligament. The tip was then lateral or lateroanterior to the abdominal aorta. If necessary, the tip was advanced to penetrate the abdominal aorta. The position of the tip was confirmed with no aspiration of blood or cerebrospinal fluid. Then, iohexol solution (10 ml containing 0.25% bupivacaine) was injected (Figure 1). Pain relief and other abnormal conditions were observed. Thirty minutes later, 15–25 ml of 90% ethanol were injected. A contralateral puncture was performed, as indicated.

In the combined group, the NCPB procedure was performed as mentioned above. Patients maintained the prone position after the first procedure. The branch of the abdominal aorta into the common iliac arteries was located using CT. The skin was marked 5–7 cm left or right of the midline at the L4-L5 intervertebral disk level, disinfected, and locally anesthetized. A 10–15 cm (22-G) needle was inserted toward the caudal end with a 30° angle between the coronal plane and a 45° angle between the sagittal plane. The needle was advanced along the edge of the L5-S1 intervertebral disc to the junction of L5 and S1 (sacral promontory). The position of the needle tip was confirmed with loss of resistance, and no aspiration of blood or cerebrospinal fluid. Then, iohexol solution (10 ml containing 0.25% bupivacaine) was injected (Figure 2). Thirty minutes later, 10–15 ml of 90% ethanol were injected if the spread of the contrast medium was satisfactory and the pain was well-controlled. Contralateral puncture was performed if the pain persisted.

Quality of life assessment

This assessment included 11 fields, each with its own point as follows: daily diet (10), family affection (10), sleep (5), destroyed body shape (10), pain (10), family care and understanding (10), social support (10), disease response and prognosis (10), attitude to treatment and care (5), patient's activity (10), treatment side effects (5), facial signs (5).

Outcome measurement

The VAS (0=no pain and 10=the most severe pain), QoL score [4] (≤40, very poor; 41–55, poor; 56–70, moderate; 71–85, good; and 86–100, very good), and morphine consumption were recorded before the procedure and 24 hrs, 1 week, 1 month, and 3 months post-procedure. Post-procedure complications and side effects were also recorded.

Statistics

The CS2000 (10.34) software (School of Public Health, Shandong University Concise Statistical Software) was used for data analysis. Continuous data were expressed as mean±standard deviation (SD). Comparisons within groups were made using the ANOVA method and comparisons between the groups were made using paired t-tests. Categorical data were analyzed using x^2 test. A $p<0.05$ was considered statistically significant. Analgesic efficacy was assessed using the VAS-weighted method [5].

Results

General health of the patients

The two groups did not differ with respect to general health and gender ($p>0.05$;Table 1). All procedures were successfully performed under CT guidance. There were 4 deaths in the combined group and 6 deaths in the NCPB group within 3 months of the procedure.

Treatment efficacy

The ethanol dose was 30±5 ml in the combined group and 21±3 ml in the NCPB group. The two groups showed significantly decreased VAS and morphine consumption post-procedure ($p<0.05$). Four and 6 patients in the combined and NCPB groups, respectively, achieved satisfactory analgesia until death. The effective rate of analgesia 24 hrs post-procedure was 95% in the combined group and 80% in the NCPB group ($p=0.17$). The QoL scores were significantly higher in both groups 24 hrs, 1 week, and 1 month post-procedure ($p<0.05$), but not after 3 months ($p>0.05$). The combined group had significantly lower VAS

Table 1. Comparison of general conditions of the combined and the NCPB groups

Group	*N*	*Male/female*	*Age, years*±SD	*Primary disease (N)*			
				Pancreatic cancer	*Liver cancer*	*Gastric cancer*	*Colon cancer*
Combined group	22	13/9	64±18	6	6	5	5
NCPB group	20	11/9	66±17	7	5	4	4

Table 2. Comparison of VAS, QoL, and daily morphine consumption between the combined and the NCPB groups (mean±SD)

Parameters	*Group*	*N*	*Pre-procedure*	*24 hrs post-procedure*	*One week post-procedure*	*One month post-procedure*	*Three months post-procedure*
VAS	Combined group	22	8.8±0.4	0.6±0.2*#	1.5±0.4*#	1.7±0.6*#	2.6±0.5*#
	NCPB group	20	8.6±0.5	1.2±0.3*	2.1±0.5*	3.8±0.7*	4.9±0.6*
QoL	Combined group	22	45±7	70±11*#	67±8*#	60±6*#	46±8
	NCPB group	20	43±6	60±8*	58±10*	50±7*	42±10
Morphine (mg)	Combined group	22	116±27	12±6*#	18±7*#	29±12*#	40±12*#
	NCPB group	20	120±24	20±8*	26±6*	39±10*	55±15*

*p<0.05 vs pre-procedure, #p<0.05 vs the NCPB group

and morphine consumption than the NCPB group (p<0.05). The QoL scores were significantly higher in the combined group 24 hrs, 1 week, and 1 month post-procedure than in the NCPB group (p<0.05), but not after 3 months (p>0.05).

Side effects and complications

One patient in the combined group developed lower limb weakness, which improved 2 weeks after the intravenous administration of neurotrophic drugs, including sodium aescinate and neurotrophin. Four patients had diarrhea, which was managed with an intramuscular injection of atropine. Three patients had symptoms of intoxication and 4 patients had hypotension. In the NCPB group, 6 patients had diarrhea, 5 had symptoms of intoxication, and 3 had hypotension. All side effects were relieved within 3 days of the procedure. No severe complications occurred, such as paralysis, internal organ injury, disc herniation, or discitis.

Discussion

Patients with advanced upper abdominal malignancies often suffer of incapacitating pain or whole abdominal pain if widespread peritoneal metastases occur, which significantly affect the QoL [1,2]. Meta-analyses have shown that NCPB has an immediate efficiency of approximately 80% in the treatment of incapacitating upper abdominal cancer pain [1,2]. Kitoh et al. [4] performed a combined neurolytic block of the celiac, inferior mesenteric, and superior hypogastric plexuses in 35 patients with incapacitating abdominal and/or pelvic cancer pain, which resulted in an immediate decrease in the VAS from 8.8±0.2 to 0. The rate of pain relief was > 90% 1 month post-procedure. Pain relief persisted throughout the first 3 months or until death. Given that the celiac and inferior mesenteric plexuses are very close anatomically, we combined NSHPB and NCPB rather than using neurolytic block of the three plexuses. We performed this procedure with a trans-intervertebral disk approach under CT guidance to reduce the risk of puncture injuries. The efficacy and safety of combined NCPB and NSHPB were compared with NCPB alone.

We speculate that the combination of NSHPB and NCPB can block nociceptive impulses from the abdominal and pelvic viscera. If NCPB cannot effectively relieve pain alone, a second NSHPB procedure is often not possible because of the poor health of the patient. Therefore, we used combined NSHPB and NCPB for better safety and efficacy in this study.

The two groups had significantly decreased VAS scores and morphine consumption post-procedure (p<0.05), which was significant at 24 hrs, 1 week, and 1 month. The effective rate of analgesia 24 hrs post-procedure was 80% in the NCPB group, which was similar to previous reports [1,2]. The combined group had significantly lower VAS and morphine consumption than the NCPB group post-procedure (p<0.05). The effective rate

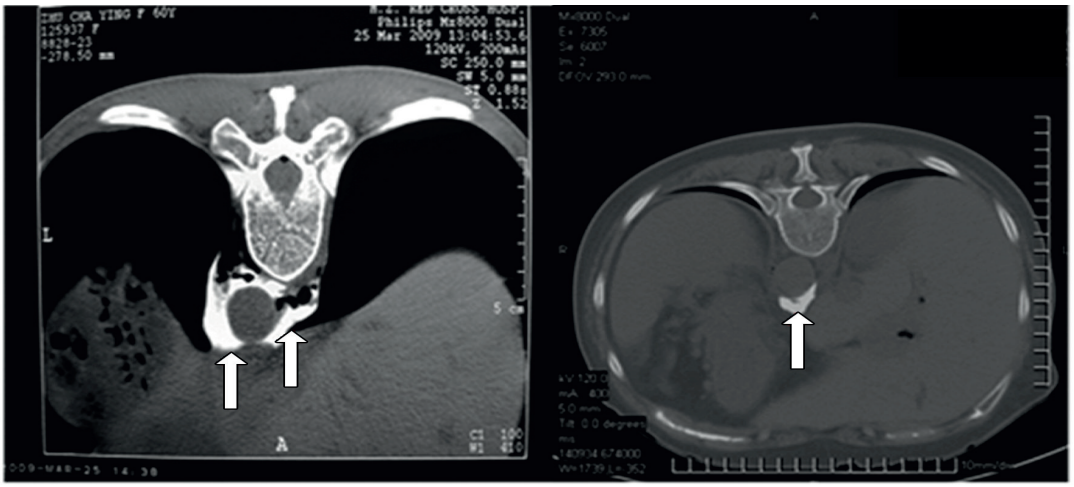

Figure 1. Computed tomography images. Contrast medium spread during the celiac plexus block through the T12-L1 intervertebral disc. CTs show adequate spread of contrast medium (arrows) around the target plexus. Left, double needles. Right, single needle.

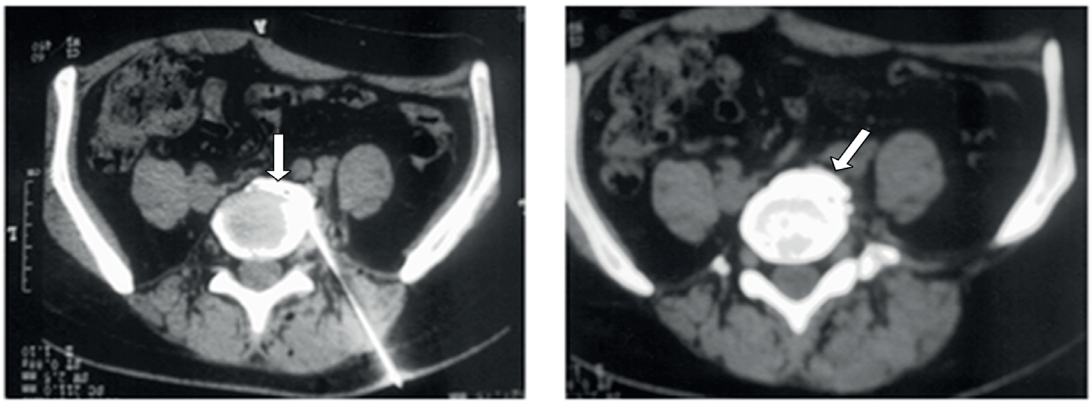

Figure 2. Computed tomography images. Contrast medium spread during the superior hypogastric plexus block through the L5-S1 intervertebral disc. CTs show appropriate placement of the needle tip and adequate spread of contrast medium (arrows) around the target plexus.

of analgesia 24 hrs post-procedure was 95% in the combined group, which was similar to that reported by Kitoh et al. [4] using a three plexus block, suggesting comparable efficacy of the combined procedure. Because of the possibility of pre-operative non-visceral pain or opioid dependence, some patients need analgesics even after a combined block to achieve satisfactory pain relief [6]. The QoL scores were significantly improved in both groups 24 hrs, 1 week, and 1 month post-procedure ($p<0.05$). The QoL scores were significantly higher in the combined group 24 hrs, 1 week, and 1 month post-procedure compared with the NCPB group ($p<0.05$), but not after 3 months ($p>0.05$). We speculate that this finding was caused by deteriorated health and metastasis during the late stage of disease.

Although this combined procedure involves the celiac and superior hypogastric plexuses, no additional side effects occurred in this study compared with previous reports [2,7,8]. The ethanol dose was higher in the combined group (30±5 ml) than the NCPB group (21±3 ml); however, the ethanol dose in the combined group was equivalent to the previously reported 30 ml [2]. A maximum ethanol dose of 70 ml has been reported [9]. In the current study, a minority of patients in the combined group achieved good pain control with only 25 ml of 95% ethanol, which is equivalent to 10–15 ml of pure ethanol, and approximates the 10 ml dose reported by Busch et al. [10]. Therefore, the ethanol dose used in the current study was safe and effective. Side effects, including diarrhea, symptoms of intoxication and hypotension, occurred in both groups. These side effects might be associated with the celiac plexus block and were relieved with symptomatic treatment. One patient in the combined group developed lower limb weakness, which improved after 2 weeks of intravenous administration of neurotrophic drugs,

including sodium aescinate and neurotrophin. All procedures were performed by experienced specialists under CT guidance, and were safe, effective, and accurate. Serious complications, such as paralysis, pneumothorax, and disc herniation, were not seen. In addition, the trans-intervertebral disc approach is easy to perform, with a low incidence of organ and vessel injury, and can be performed with a single needle when there are no lymph nodes around the sympathetic plexus [11]. Prophylactic antibiotics were administered for 3 days and no discitis or infection occurred.

In conclusion, the combined use of NCPB and NSHPB under CT guidance via a trans-intervertebral disc approach using 30±5 ml of 90% ethanol can effectively alleviate cancer pain in patients with advanced upper abdominal cancer, reduce morphine consumption, and improve the QoL. This procedure is safe for cancer pain relief in patients with advanced pelvic cancer.

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