British Journal of Anaesthesia **87 (4)**: 633–5 (2001)

Comparison of patient-controlled epidural analgesia with and without night-time infusion following gastrectomy

H. Komatsu[1]*, S. Matsumoto and H. Mitsuhata

[1]Department of Anesthesiology, Akita University School of Medicine, [2]Department of Anesthesiology and Pain Clinic, Hiraka General Hospital and [3]Department of Anesthesiology, Juntendo University School of Medicine, Hondo 1-1-1, Akita City, Akita 010-8543, Japan

**Corresponding author*

To assess the analgesic efficacy and side effects of a supplemental night-time infusion in patient-controlled epidural analgesia (PCEA) after gastrectomy, we carried out a randomized, double-blind study. The number of requests were lower ($P<0.005$) in the PCEA plus night-time infusion group than in the PCEA alone group during the postoperative nights. Patients who had a PCEA plus night-time continuous infusion, slept with fewer interruptions than those who had only the PCEA. VAS pain scores on coughing were significantly lower ($P<0.05$) in the PCEA plus infusion group than in the PCEA alone group during the night following postoperative day 1. In conclusion, a night-time infusion in PCEA following gastrectomy decreases the incidence of post-operative pain, provides a better sleep pattern, and reduces the degree of the pain associated with coughing during the night.

Br J Anaesth 2001; **87**: 633–5

Keywords: analgesia, postoperative; analgesia, patient-controlled; analgesia, night-time infusion

Accepted for publication: April 10, 2001

In a study of patients' experiences of pain and sleep, pain was the most common cause of night-time sleep disturbance and the use of analgesics was the effective method of restoring sleep in most patients. Analgesics were given most often during two time intervals: between 08:00 and 12:00, and between 20:00 and 00:00.[1] Patients who use a demand-only patient-controlled epidural analgesia (PCEA) may have to demand analgesia frequently during the post-operative nights and a night-time infusion from 20:00 to 08:00 may improve the incidence of night-time pain and sleep disturbance. However, to our knowledge, no reports have compared the analgesic efficacy of PCEA alone with that of PCEA with a supplemental night-time infusion following gastrectomy. We carried out this randomized, double-blind study to evaluate the efficacy of night-time infusion in PCEA with a mixture of fentanyl and bupivacaine after gastrectomy.

Methods and results

After obtaining institutional ethics committee approval and written informed consent, we undertook this prospective, randomized, double-blind study in 40 patients undergoing distal or total gastrectomy. We explained the operational aspects of the PCA pump to each patient preoperatively. Exclusion criteria included ASA >3, preoperative opioid administration, clinical or laboratory contraindications to epidural catheter insertion, inability to use the PCA device, and/or allergy to any of the medications.

An epidural catheter was inserted through the T9–10 interspinous space into the epidural space. Anaesthetic induction and intubation was performed with i.v. fentanyl, thiopental, and vecuronium bromide. Anaesthesia was maintained with a propofol infusion, sevoflurane, and oxygen in air. Additional intraoperative epidural analgesia was provided with mepivacaine or bupivacaine. No opioids were used during intraoperative anaesthesia.

A PCA pump containing fentanyl 5 μg ml^{-1} and 0.1% bupivacaine was connected to the epidural catheter and started as soon as the patient was extubated. The PCEA alone group received 5-ml bolus on demand, with a lockout interval of 15 min. In addition to the intermittent bolus doses, the PCEA plus infusion group received 2 ml h^{-1} of the bupivacaine/fentanyl mixture during the nights (from 20:00 to 08:00 on the day of surgery and on the first postoperative day (POD1)). During the night or if the patient's oxyhaemoglobin saturation by pulse oxymetry (Sp_{O_2}) was less than 94%, the patient received oxygen via nasal cannula. When the patients complained of unsatisfactory pain relief, 1% mepivacaine 3–5 ml was injected via the epidural catheter until they were pain free. The anaesthestist and nurse investigators were blinded with respect to the mode of administration.

The number of patient requests for analgesia (demand) was recorded from the pump hourly during the time from the start of the study to 14:00 on the second postoperative day (POD2). We calculated the average hourly consumption that includes the infusion and patient demands during the time from the start of the study to 20:00 on the day of surgery, during the night, and in each 6-h interval during the daytime. VAS pain scores both at rest and on coughing were recorded on a 100-mm linear scale, nausea and pruritus were assessed using a 4-point rating scale (0: none; 1: slight; 2: moderate; 3: severe) and objective motor block was assessed using the Bromage score, at 20:00 on the day of surgery, at 8:00, 14:00, and 20:00 on POD1, and at 8:00 and 14:00 on POD2. Sedation was assessed using a 4-point scale (0: eye open spontaneously; 1: eye open to speech; 2: eye

Table 1 Hourly number of demands, hourly drug consumption, VAS at rest and on cough data are expressed as mean (SD). PCEA: patient-controlled epidural analgesia.*$P<0.005$; **$P<0.05$ compared with PCEA alone group. #Solution of 5 μg fentanyl and 1 mg bupivacaine in 1 ml

	Hourly number of demands		Hourly consumption volume (mL)#		VAS at rest (mm)		VAS on cough (mm)	
	PCEA alone	PCEA plus infusion	PCEA alone	PCEA plus infusion	PCEA alone	PCEA plus infusion	PCEA alone	PCEA plus infusion
20:00	0.7(0.4)	0.8(0.5)	3.5(1.6)	3.7(1.3)	25.2(14.1)	25.0(12.8)	41.6(18.9)	41.6(14.9)
8:00 on POD1	0.8(0.4)	0.4(0.3)*	4.1(2.3)	4.2(1.6)	24.3(13.9)	16.8(8.8)	39.2(19.1)	34.8(13.3)
14:00	0.9(0.4)	0.6(0.2)	4.5(2.0)	3.5(1.4)	19.9(7.9)	18.0(9.9)	39.1(15.8)	34.5(10.8)
20:00	0.8(0.4)	0.7(0.3)	3.9(2.0)	3.8(1.7)	20.1(10.1)	19.9(8.2)	37.6(15.6)	37.1(12.8)
08:00 on POD2	0.7(0.4)	0.3(0.3)*	3.6(1.7)	3.8(1.5)	19.9(10.8)	15.2(8.0)	42.5(15.2)	33.9(14.8)**
08:00–14:00	0.6(0.4)	0.5(0.4)	3.0(1.7)	3.1(2.1)	19.9(8.8)	19.5(11.8)	35.3(13.9)	34.8(12.7)

open to shaken; 3: unrousable) at 20:00 on the day of surgery, at 8:00, 14:00, 20:00 on POD1, at 8:00, 14:00 on POD2 and every 1–2 h during the nights. Verbal rating score for sleep pattern was assessed using a 3-point rating scale (0: slept well without PCEA button press; 1: slept well with PCEA button press; 2: could not sleep despite PCEA button press) at 8:00 on POD1 and POD2. Systolic arterial pressure and ventilatory frequency were measured every 1–2 h, and more frequently if the systolic arterial pressure was less than 100 mm Hg or the ventilatory frequency rate was less than 10 breaths min^{-1}.

Continuous data are reported as mean (SD) and analysed using the unpaired two-tailed *t*-test and two-way analysis of variance (ANOVA) for repeated measurements. Ordinal data were reported as incidences and analysed using the Mann–Whitney *U*-test. Patient characteristics were analysed using the unpaired two-tailed *t*-test for parametric variables and the chi-squared test for non-parametric variables. Values of $P<0.05$ were considered statistically significant.

Two patients in each group required additional pain relief and received supplemental epidural boluses of 1% mepivacaine 3–5 ml. However, hypotension did not occur in any patient after supplemental bolus injection. Patient characteristics and operative procedures were comparable between the two groups.

The mean time from the start of the study to 20:00 on the day of surgery was similar between the two groups. The average hourly demand was lower ($P<0.005$) in the PCEA plus infusion group than in the PCEA alone group during the night (Table 1). The average hourly consumption drugs did not differ between the two groups during the study period (Table 1). VAS pain scores on coughing were significantly lower ($P<0.05$) in the PCEA plus infusion group than in the PCEA alone group at 8:00 on POD2. The sleep scores on POD1 in the PCEA plus infusion group were significantly lower than those in the PCEA alone group ($P=0.018$).

The incidence of side effects did not differ between the two groups. No motor block and sensory disturbance were detectable in any patient during the 48-h post-operative period. A ventilatory frequency of less than 10 breaths min^{-1}, sedation score $\geqslant 2$ and haemoglobin oxygen desaturation were not recorded for any patient after commencement of PCEA. Hypotension occurred in two of 20 patients (10%) in each group during the study period.

Comment

The results of the present study indicate that the patients with a night-time infusion had fewer episodes of pain, sleep disturbed, and less pain on coughing than did patients in the PCEA alone group during the night.

We thought a night-time infusion to be more desirable than an all-day infusion, which had produced more itching than PCEA alone group in an earlier study.[2] The incidence of pruritus did not differ between the two groups in our study.

The use of a night-time infusion in a PCEA regimen caused no increase in the incidence of excessive sedation and respiratory depression in our small study; however, respiratory depression was possible during the periods in which the patients were not disturbed by measurements. This emphasizes the need for careful and repeated assessment by experienced staff.

References

1 Closs SJ. Patients' night-time pain, analgesic provision and sleep after surgery. *Int J Nurs Study* 1992; **29**: 381–92

2 Komatsu H, Matsumoto S, Mitsuhata H, *et al*. Comparison of patient-controlled epidural analgesia with and without background infusion after gastrectomy. *Anesth Analg* 1998; **87**: 907–10