Incidence of Nausea and Vomiting Associated with Epidural Buprenorphine for Postoperative Analgesia

An Analysis in Relation to its Analgesic Effect

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Epidural administration of buprenorphine is widely applied to relieve acute and chronic pain of various origins including postoperative pain (POP)[1-3]. However, this method is not free from side effects. Of all its associated complications, emetic reactions such as nausea, retching and vomiting are the most unpleasant for postoperative patients. On the other hand, it is well known that POP by itself causes nausea and/or vomiting[4]. Thus epidural narcotics have contradictory effects, causing emetic reactions by their narcotic effect, and preventing those reactions by suppression of POP. This study was done to clarify the relationship between the incidence of emetic complications and analgesic effect of epidural buprenorphine.

Methods

We retrospectively investigated 107 patients who underwent abdominal hysterectomy under continuous epidural anesthesia. We excluded from the study those patients under 20, over 70, those with psychotic or digestive diseases, those with ASA risk score 3 or more, and those suffering from nausea or vomiting before and during operation.

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Hydroxyzine 50 mg with atropine 0.3–0.5 mg was administered intramuscularly 45 min before induction of anesthesia. An epidural catheter was inserted through a 17-gauge Tuohy needle placed at L_{1-2} or L_{2-3} interspace and passed about 5 cm cephaladly. Analgesia was obtained with 12–15 ml of 2% lidocaine and with additional doses of 0.5% bupivacaine. In some cases, 5–10 mg of diazepam or 7.5–30 mg of pentazocine was given intravenously. In all cases, spontaneous respiration was maintained and nasogastric tubes were not inserted perioperatively.

At the end of operation, a dose of buprenorphine chosen randomly in the range of 0.5–3.0 $\mu g \cdot kg^{-1}$ was administered via epidural catheter with 4 ml of 0.25% bupivacaine. During the postoperative period, analgesics such as pentazocine or indomethacin were administered in the wards at the patients' request. The time from the end of operation to the first administration of postoperative analgesics was recorded as the duration of pain relief by epidural buprenorphine. If the duration was more than 24 hrs, it was regarded as 24 hrs for statistical analysis. When the duration was 12 hrs or more, patients were considered having no pain postoperatively. When patients were associated with nausea, retching or vomiting within 12 hrs after epidural administration of buprenorphine, they were considered to have postoperative emetic complications.

Table 1. Comparison of background data and of duration of analgesia with epidural buprenorphine

parameters	emetic complications (+) n=38	(-) n=69
age (years)	46.8 ± 2.1	46.5 ± 1.1
duration of operation (min)	98 ± 5.2	105 ± 8.1
dose of buprenorphine ($\mu g \cdot kg^{-1}$)	1.86 ± 0.12	1.75 ± 0.07
duration of analgesia (min)	11.8 ± 1.6	13.9 ± 1.1

Values are mean ± SEM.

Table 2. The incidence of postoperative emetic complications in the patients with and without postoperative pain

group	patients with pain	patients without pain	total
high dose ($\geqq 1.7\ \mu g \cdot kg^{-1}$)	40.9% (9/22)	28.1% (9/32)	33.3% (18/54)
low dose ($< 1.7\ \mu g \cdot kg^{-1}$)	41.7% (10/24)	34.5% (10/29)	37.7% (20/53)
total	41.3% (19/46)	31.2% (19/61)	35.5% (38/107)

Table 3. The time lag between the first administration of postoperative analgesics and the onset of emetic complications.

time lag (hours)	cases (%)
$-6 \leqq$ <-4*	2 (9.1)
$-4 \leqq$ <-2*	1 (4.5)
$-2 \leqq$ < 0*	6 (27.3)
$0 \leqq$ < 2	7 (31.8)
$2 \leqq$ < 4	3 (13.6)
$4 \leqq$ < 6	2 (9.1)
$6 \leqq$ < 8	1 (4.5)
total	22 (100)

*When nausea was observed earlier than the first administration of analgesics, the time lag was expressed as a negative value.

Statistical analysis was performed in the following way. First, the patients were divided into 2 groups according to the dosage of buprenorphine; high ($\geqq 1.7\ \mu g \cdot kg^{-1}$) and low dose group ($< 1.7\ \mu g \cdot kg^{-1}$). The groups were subdivided according to analgesic effect of buprenorphine and presence of nausea or vomiting. Incidence of emetic complications, age, dosage of buprenorphine, duration of operation and duration of analgesic effect were compared between the groups and the subgroups (Fisher's exact probability test and Student's t-test). Secondly, the onset time of nausea (Tn) and that of POP (Tp), in hours postoperatively, was compared in the patients who had both pain and nausea.

Results

The number of patients without POP

for 12 hrs postoperatively was 61 (57.1%) out of 107 patients. Age, duration of operation, dosage of buprenorphine, and duration of analgesic effect did not differ significantly between the groups with and without emetic complications (table 1). The incidence of postoperative emetic complications was higher in those patients with POP than in those without it (41.3% vs 31.2%, $P = 0.09$). The incidence of emetic complications was almost identical for high and low dose groups (table 2).

Tn in those patients with and those without POP was noted most frequently in 2–4 and 4–6 postoperative hrs, respectively. The time lag between Tn and Tp was less than 2 hrs in 59.1% of the patients with emetic complications (table 3).

Discussion

There are various causes for postoperative emetic complications, including anesthetic agents such as narcotics and nitrous oxide, gastric inflation resulting from manual ventilation, pharyngeal irritation due to nasogastric tube, perioperative hypotension or hypoxia, and postoperative analgesics. Factors which may affect the incidence of these symptoms include sex, age, predisposition to motion sickness, preanesthetic medication, site and type of operation, and duration of anesthesia[5–7].

POP is also known to be a common cause of emetic complications besides above mentioned factors. Uncontrolled pain induces elevation of catecholamine levels in serum and in cerebro-spinal fluid (CSF) resulting in excitement of vomiting center in the medulla. Therefore, incidence of these complications can be substantially reduced by effective pain treatment. Andersen R, et al. reported that systemically administered narcotics, which themselves have emetic effect, can treat both POP and nausea effectively[4].

This study was performed to determine the relationship between POP and emetic complications associated with epidural buprenorphine. To exclude the influence of various factors on postoperative emetic complications, we limited the sex (female), surgical procedure (abdominal hysterectomy), and type of anesthesia (continuous epidural anesthesia with sedation).

Our study showed that the incidence of postoperative emetic complications was higher in patients with POP and that emetic complications and POP were often observed simultaneously. These results suggest that postoperative emetic complications under epidural buprenorphine may be caused, at least in part, by POP, and that the incidence of emetic complications can be reduced when POP is managed with buprenorphine successfully.

According to our previous reports, analgesic effect of epidural morphine or buprenorphine was dose-related. However, the incidence of emetic complications associated with these drugs did not increase in a dose-related fashion[8,9]. Present study also showed that epidural buprenorphine decreased emetic complications regardless of the dosage within the range 0.5–3.0 $\mu g \cdot kg^{-1}$, if the POP treatment was successful. This indicates that a dosage of epidural analgesics sufficient for alleviating POP predominates over a dosage to avoid emetic complications.

In summary, the incidence of emetic complications after epidural buprenorphine for postoperative analgesia was related to the incidence of POP, and successful treatment of POP reduced the incidence of emetic complications.

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