ORIGINAL ARTICLE

A comparison of patient-controlled epidural pethidine vs. nurse-administered epidural pethidine for analgesia after caesarean section

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ABSTRACT

Patient-controlled epidural analgesia with pethidine for post-caesarean section patients has been shown to be efficacious. However, no studies to date have compared it with intermittent nurse-administered epidural pethidine. The aim of this study was to compare the analgesia efficacy, pethidine requirement, side effects, and nurses' and patients' satisfaction with these two techniques in post-caesarean section patients. After obtaining informed patient consent, we recruited 34 patients undergoing elective lower-segment caesarean section. A combined spinal epidural technique was used to provide anesthesia for all patients, and 50 mg pethidine was given epidurally at the end of the operation. Patients were assigned to two groups: group P (n = 17) received patient-controlled epidural analgesia with pethidine (25 mg of five mg/ml solution, lockout of 10 minutes and maximum dose of 150 mg/four hours), and group N (n = 17) received nurse-administered epidural pethidine (bolus of 50 mg and maximum dose of 50 mg/two hours) when required. We collected data at six, 12, 24, 36, and 48 hours following initiation of anesthesia. Visual analogue pain scores (median) were lower in group P than in group N, both on movement and at rest, at six, 12, 24, 36, and 48 hours postoperatively ($p < 0.05$). Total pethidine consumption (median) and frequency of side effects were similar in both groups. Patients in group P exhibited a trend toward earlier return to activities of daily living and care for the newborn; however, this did not reach statistical significance, and there was no difference in maternal satisfaction between the two groups. Satisfaction scores of nurses caring for patients in group P were higher than for those in group N (median 100 mm, interquartile range [IQR] 90 to 100, vs. median 90 mm, IQR 80 to 90, $p < 0.05$). Patient-controlled epidural analgesia with pethidine improved patients' pain scores after caesarean section when compared with intermittent nurse-administered epidural pethidine. Regarding the mode of delivery of postoperative analgesia, we noted a higher satisfaction score among nurses caring for group P than among those caring for group N.

Key words: post-caesarean section analgesia, epidural analgesia, patient-controlled analgesia, pethidine

INTRODUCTION

Patient-controlled epidural analgesia (PCEA) with pethidine for post-caesarean analgesia was first described and evaluated in a study in 1992.[1] Since then, several studies have compared its efficacy with PCEA fentanyl, epidural morphine, and patient-controlled intravenous analgesia (PCIA) with morphine.[2-4] However, no study to date has compared its analgesia efficacy with intermittent nurse-administered epidural pethidine in post-caesarean section patients.

In our center, parturients routinely receive intermittent nurse-administered epidural pethidine for post-caesarean analgesia in the first 24 hours. This method has several pitfalls. It presents a major workload for the nursing staff in the ward, and there are occasional delays in the administration of pain relief when the ward staff is busy. Advantages of the PCEA include giving patients greater autonomy over the amount of analgesic they require, potential improvement in pain scores and patient satisfaction, and potential improvement in nurses' satisfaction with patient care due to a decrease in workload.[1]

The primary aim of our study was to compare maximum pain scores at rest and on movement in the first 48 hours in patients who received either PCEA or nurse-administered epidural pethidine after caesarean section. We also compared side effects, total pethidine consumption, time to return to activities of daily living and care of the newborn, and patients' and nurses' satisfaction.

METHODS

After institutional review board approval, we recruited

Table 1. Patients' demographic profile			
	Group P (n = 17)	**Group N (n = 17)**	**p value**
Age (years)	35 (3.6)	33.3 (3.8)	0.187
Weight (kg)	73.2 (12.1)	81.4 (12.5)	0.061
Height (cm)	166.6 (9.6)	165.2 (3.9)	0.577
Bupivacaine dose (mg)	10.5 (0.5)	10.5 (0.5)	0.187
Fentanyl dose (mcg)	16 (2)	16 (2)	0.385
Lignocaine supplementation (mg)	60 (60)	30 (45)	0.116
Duration LSCS	74.1 (24.2)	66.6 (15.3)	0.279
Previous LSCS	12/17 (70.6)	11/17 (64.7)	0.714
Values are mean (SD) or proportion of patients (percent).			

34 ASA Grade I patients presenting for elective caesarean section under regional anesthesia. Informed written consent was obtained. Patients who did not understand or refused the use of PCEA; who had contraindications to regional anesthesia; or who had an allergy to pethidine, paracetamol, or diclofenac were excluded. Patients were randomized, using sealed opaque envelopes, into two groups; group P received epidural pethidine via a patient-controlled analgesia pump (GemStar® Ambulatory PCA Infusion Pump), and group N received epidural pethidine via nurse-administered bolus when required.

All patients received combined spinal epidural anesthesia for caesarean section with intrathecal heavy bupivacaine 10 mg to 12.5 mg and fentanyl 15 mcg to 25 mcg. A bolus dose of epidural pethidine 50 mg in 10 ml of normal saline was administered to all patients at the end of the surgery, along with paracetamol 1 g and diclofenac 100 mg suppository.

Postoperative analgesia for group P was maintained using PCEA with pethidine. The PCEA pump was set to administer a 5-ml bolus of pethidine 5 mg/ml (25 mg) with each demand, with a 10-minute lockout interval and a four-hour maximum dose of 150 mg. This setting was to ensure that each patient would not receive a dose exceeding the maximum safe dose of 900 mg over 24 hours. Group N received postoperative analgesia via intermittent epidural boluses of pethidine administered by a nurse when required. Pethidine solution of 5 mg/ml concentration was administered in 50-mg boluses each time the patient experienced postoperative pain, with a two-hour maximum dose of 50 mg. This was the standard protocol in our center for patients after caesarean section. All patients received postoperative paracetamol 1 g every six hours for 48 hours and diclofenac suppository 100 mg every 12 hours for the first 24 hours; following this, diclofenac was administered orally 50 mg every eight hours for the next 24 hours.

The investigators assessed the:

1. pain scores at rest and on movement (supine to sitting position) using visual analogue scores (VAS) of 0 to 100 mm, 0 = no pain and 100 = severe pain, at six,12, 24, 36, and 48 hours postoperatively;

2. amount of epidural pethidine (mg) used at 24 hours;

3. number of doses of rescue opioid needed in the first 24 hours;

4. number of doses of opioid required after epidural pethidine was ceased at 48 hours;

Table 2. Pain scores (VAS) at rest 48 hours post-caesarean section			
Time post-caesarean section (hours)	**Group P (n = 16)**	**Group N (n = 17)**	**p value**
6	0 (0 – 10)*	0 mm (0 – 30)	0.433
12	0 (0 – 10)*	20 mm (5 – 40)	0.004
24	0 (0 – 5)	10 mm (2.5 – 30)	0.003
36	0 (0 – 10)	10 mm (10 – 20)	0.001
48	0 (0 – 0)	10 mm (5 – 20)	0.001
Data in median (interquartile range) and VAS in mm; * Patients analyzed, N = 17.			

5. presence of side effects experienced at 24 hours postoperatively;

6. patient's ability to care for herself and the baby at 24 hours and 48 hours postoperatively, using the following criteria:

(i) initiate diaper change without assistance;

(ii) lift and hold baby without assistance;

(iii) initiate breast-feeding without assistance;

(iv) ambulate without assistance; and

(v) shower without assistance;

7. time of removal of epidural catheter;

8. patient's satisfaction with the mode of analgesia using a 100-point scoring system (0 = very dissatisfied, 100 = very satisfied) (the patient satisfaction score was obtained from the patient 24 hours postoperatively by the acute pain team); and

9. nurses' satisfaction with the mode of delivery of postoperative analgesia (information collected by the acute pain relief team at 24 hours from the nurses attending to the patient; using a 100-point scoring system, 0 = very dissatisfied, 100 = very satisfied) (nurses' satisfaction scores were obtained from the three nurses attending to the patient over a 24-hour period; average nurses' satisfaction score was then calculated for each patient).

The investigators were notified when patients experienced inadequate pain relief. The investigators were informed if patients in group N requested analgesia less than two hours after the last pethidine dose or when the pain score remained higher than 40 after two doses of epidural pethidine (50 mg/two hours) had been administered. For group P, investigators were informed when pain scores remained higher than 40 and pethidine used was at doses greater than 100 mg in two hours. After reviewing the patients, rescue analgesia would be given if necessary. Rescue analgesia of intravenous (IV) tramadol 100 mg/six hours PRN for 48 hours was made available for the patients. If the pain score remained higher than 40 despite institution of rescue analgesia, the study protocol was aborted and the patient would be given subcutaneous morphine.

Patients who had moderate or severe respiratory depression (respiratory rate < eight breaths/minute) would be reviewed by the investigator, given supplementary oxygen, treated with IV naloxone 100 mcg, and monitored for the next four hours with a pulse oximeter.

Patients had the epidural catheter removed 24 hours postoperatively. However, if the patients had required two or more doses in the last four hours, the option to keep the catheter for another four hours was available to the patients. IV/PO tramadol 100 mg/six hours and PO oxycodone 5 to 10 mg/four hours were available to provide analgesia for patients after cessation of epidural pethidine.

Table 3. Pain scores (VAS) on movement 48 hours post-caesarean section			
Time post-caesarean section (hours)	**Group P (n = 16)**	**Group N (n = 17)**	**p value**
6	0 (2.5 – 35)*	22.5 (11.3 – 50)	0.127
12	20 (10 – 40)*	40 (20 – 65)	0.014
24	10 (10 – 30)	40 (30 – 50)	0.001
36	20 (10 – 35)	40 (20 – 55)	0.014
48	15 (10 – 20)	40 (20 – 50)	0.001
Data in median (interquartile range) and VAS in mm; * Patients analyzed, N = 17.			

The power of the study was calculated based on a previous study done using PCEA with pethidine for post-caesarean analgesia.[2] A difference of 20 in pain scores at 24 hours between the two groups was assumed to be clinically significant in our project. Thirty-two patients were required to detect this difference, with a power of 80 percent and a significance level of 0.05. Data was entered and analyzed with SPSS version 11.5. Nonparametric data (pain scores, amount of pethidine used, patients' and nurses' satisfaction), parametric data (patients' demographic profiles), and dichotomous data (presence of side effects and ability to care for oneself and the newborn) were analyzed using the Mann-Whitney U test, t-test, and χ^2 test, respectively.

RESULTS

Data were analyzed from 34 patients who completed the study. There were no failed blocks, and all patients had successful regional anesthesia for caesarean section. One patient in group P had disconnection of the epidural catheter from the filter, resulting in early termination of epidural analgesia 14 hours after caesarean section. Data from this patient were included until the time of withdrawal. There were no differences in patients' demographic profiles or amounts of bupivacaine and fentanyl used for regional anesthesia (Table 1). Group P had significantly lower visual analogue pain scores, both at rest and on movement, for the 48-hour period following caesarean section (Tables 2 and 3). The amount of epidural pethidine used in group P was similar to that used in group N (median 250 mg, interquartile range [IQR] 200 to 300 mg, vs. 225mg, IQR 200 to 250mg, $p > 0.05$). The number of doses of oral opioid required after the epidural pethidine was ceased in the first 48 hours was similar in groups P and N (median 3, IQR 2 to 3, vs. 4, IQR 2 to 4, $p > 0.05$). Incidence of side effects was similar in both groups (Table 4).

There was a trend toward earlier ability to care for oneself and the baby at 24 hours postoperatively, but this did not reach statistical significance. All patients were able to care for themselves and their newborns by 48 hours (Table 5). Time to epidural catheter removal was similar (group P: mean 25.7 hours, SD (5.8); group N: mean 25.2 hours, SD (1.8); $p = 0.72$).

Patients' satisfaction with the mode of analgesia at 24 hours post-operation was not significantly different (group P: median 95, IQR 87.5 to 100; group N: median 90, IQR 80 to 100; $p = 0.085$). Satisfaction scores of nurses caring for patients in group P were higher than for those in group N (median 100 mm, IQR 90 to 100, vs. median 90 mm, IQR 80 to 90; $p < 0.019$). The decrease in nursing workload resulting from the use of PCEA with pethidine may have contributed to the higher satisfaction scores among nurses caring for group P.

DISCUSSION

PCEA pethidine has been shown to be superior to intramuscular pethidine and PCIA with pethidine.[4-6] Our study is the first study to compare PCEA to nurse-administered epidural pethidine, and it revealed that PCEA with small boluses of 25 mg of pethidine on demand gave lower visual analogue pain scores, both at rest and on movement, in the first 48-hour period post-caesarean section than intermittent nurse-administered boluses of pethidine.

Table 4. The side effects profile at 24 hours			
	Group P (n = 16)	**Group N (n = 17)**	**p value**
Nausea	5/16 (31.3)	5/17 (29.4)	0.603
Vomiting	1/16 (6.3)	4/17 (23.5)	0.187
Itch	2/16 (12.5)	4/17 (23.5)	0.374
Sedation	3/16 (18.8)	6/17 (35.3)	0.251
Respiratory depression	0/16 (0)	1/17 (5.9)	0.515
Data in proportion of patients (percent).			

Due to the obvious difference in the mode of delivery of epidural pethidine, it was not possible to blind the patient or the assessor for the trial. In a previous study comparing PCEA with PCIA pethidine, the median pain scores in the first 24 hours for the PCEA group were between 10 and 20 mm, comparable with our results.[4] The higher pain scores reported in the nurse-administered epidural pethidine group could be attributed to several factors. Some patients chose to wait until they experienced moderate to severe pain before requesting analgesia from the nurse, citing inconvenience and unwillingness to bother the nurses when they were busy. There could have been delays in pethidine administration, as it requires two registered nurses to sign out the controlled drug. This problem is compounded in wards that are understaffed.

PCEA with pethidine offers several advantages. There was an increase in nurses' satisfaction; they no longer needed to retrieve controlled drugs or administer them intermittently to patients, which may have decreased nursing workloads. While the nurses were trained and had to learn to manage the new PCEA pumps, as well as

Table 5. Ability to return to activities at 24 hours post-caesarean section			
	Group P (n = 16)	**Group N (n = 17)**	**p value**
Initiate nappy change without assistance	13/16 (87.5)	10/17 (58.8)	0.217
Lift and hold baby without assistance	14/16 (87.5)	11/17 (64.7)	0.118
Initiate breast feeding without assistance	15/16 (93.8)	14/17 (82.4)	0.335
Ambulate without assistance	14/16 (87.5)	11/17 (64.7)	0.118
Shower without assistance	14/16 (87.5)	11/17 (64.7)	0.118
Data in proportion of patients (percent).			

monitor the pumps for malfunction, this study revealed that these requirements did not appear to affect nurses' satisfaction adversely. The decrease in nurses handling the epidural filter while administering intermittent epidural pethidine potentially decreases the risk of breach of sterility and contamination. PCEA also gives patients a sense of control over the pain relief requirement and allows them to titrate the analgesia and balance it with the side effects they experience. Our study concurred with a previous study evaluating nurses' and patients' satisfaction with patient-controlled epidural pethidine after caesarean section.[7]

The amount of pethidine used in both groups was comparable and similar to previous studies involving epidural pethidine for post-caesarean section analgesia.[8,9] However, due to the smaller but more frequent dosing of pethidine (25-mg bolus), as opposed to the larger (50 mg) and intermittent boluses administered by the nurses, we saw a trend toward decreasing incidence of side effects, although this did not reach statistical significance. The parturients with PCEA also trended toward earlier return to activities of self-care and care for the new born. However, this was not statistically significant, and our study was not powered to detect this.

Maternal satisfaction is an important endpoint in most research; unfortunately, it is difficult to assess. Although some studies have reported greater satisfaction with PCEA than conventional analgesia, most other studies confirmed that patients generally do not like to criticize their own treatment and rate their satisfaction consistently high.[10-12] PCEA gave patients control over their pain relief and significantly decreased pain scores, but the lack in difference in satisfaction scores showed that other factors such as personal experience, support from caregiver, caregiver-patient relationship, and the inclusion of both parties in decision making affect patients' satisfaction.[13]

In conclusion, PCEA with pethidine, when compared with intermittent nurse-administered pethidine, resulted in improved pain scores both at rest and on movement in the first 48 hours following caesarean section. This was associated with an increase in nurses' satisfaction with the mode of analgesia provided.

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