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Research Article

Postoperative analgesia after major abdominal surgery: Fentanyl–bupivacaine patient controlled epidural analgesia versus fentanyl patient controlled intravenous analgesia

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KEYWORDS

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Abstract *Background:* Major abdominal surgeries induce neurohumoral changes responsible for postoperative pain, various organ dysfunctions and prolonged hospitalization. Inadequate pain control is harmful and costly to patients thus an appropriate pain therapy to those patients must be applicated.

Methods: One hundred patients (ASA I or II) of either sex aged from 20 to 60 years were scheduled for elective major abdominal surgery. Patients were allocated randomly into two groups (fifty patients each) to receive: patient-controlled epidural analgesia with bupivacaine 0.125% and fentanyl (PCEA group), or patient controlled intravenous analgesia with fentanyl (PCIA group). Postoperative pain was assessed over 24 h using Numerical Pain Rating scale (NPRS). The frequency of rescue analgesia, sedation score and overall patient satisfaction were recorded. Any concomitant events like nausea; vomiting, shivering, pruritus or respiratory complications were recorded postoperatively.

Results: There was a significant less pain in PCEA group at 2, 8 and 12 h. postoperative but PCIA group had less pain at immediate postoperative time. As regard sedation scale, patients of the PCEA group were significantly less sedated than PCIA group at immediate postoperative only. Overall patient satisfaction was significantly more in PCEA group.

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Conclusion: This study concluded that both PCEA and PCIA were effective in pain relief after major abdominal surgery but PCEA was much better in pain relief, less sedating effect and overall patient satisfaction.

1. Introduction

Major abdominal surgeries induce neurohumoral changes responsible for postoperative pain, various organ dysfunctions and prolonged hospitalization. Inadequate pain control is harmful and costly thus an appropriate pain therapy must be used to those patients [1].

Patient-controlled analgesia (PCA) enables patients to self-titrate bolus doses of analgesics to their desired level of pain relief by using a programmable infusion pump. This individualizes the dose required to maintain adequate analgesia according to the patient's needs [2]. Opioids are commonly used epidurally but fentanyl, unlike morphine, is highly lipophilic and rapidly diffuses out of the epidural space. Respiratory depression is therefore, unlikely when fentanyl is given epidurally. However, much of fentanyl analgesic effect is mediated by systemic rather than spinal receptor binding [3].

Patient controlled analgesia (PCA) with intravenous opioids and patient-controlled epidural analgesia (PCEA) using an opioid either alone or in combination with a local anesthetic, are two methods in the management of pain after major surgery. PCA has been proposed as safe and effective technique for postoperative analgesia and is considered to be the "gold standard" for pain relief after major surgery [4].

In comparison with opioid analgesia by either intravenous or epidural routes, epidural administration of a local anesthetic and opioid mixture improved pain relief [5].

This study compares the analgesic effects of patient controlled epidural (fentanyl–bupivacaine) versus patient controlled intravenous fentanyl for postoperative analgesia in major abdominal surgery.

2. Patients and methods

This prospective randomized study was carried out on one hundred patients (ASA I or II) of either sex aged from 20 to 60 years. They were scheduled for elective major abdominal surgery at Gastroenterology surgical center, Mansoura University. The protocol was approved by responsible local research ethical authorities and written informed consent was obtained from all patients.

Preoperative exclusion criteria included patients under chronic treatment with analgesics or corticosteroids, with contraindications to epidural analgesia (coagulopathy, local infection), allergy to local anesthetic solutions or opioids. Patients whose ability to communicate was impaired were also excluded from the study.

Patients were allocated randomly (via closed envelop) into two groups (fifty patients each) to receive: patient-controlled epidural analgesia with fentanyl–bupivacaine (PCEA group), or patient controlled intravenous analgesia with fentanyl (PCIA group).

The day before surgery, all patients were instructed to describe pain on Numerical pain Rating scale (NPRS) and how to use the PCA device (Abbott Pain Management Provider. S. No: 96450292. Abbott Laboratory, North Chicago. IL: 60064, USA).

Patients of both groups were premedicated with fentanyl 1.5 μg/kg and midazolam 0.05 mg/kg.

In PCEA group, under complete aseptic technique; 18G epidural catheter (Perifix, B. Braun Melsungen AG, Germany) was inserted through a midline approach in the lateral decubitus position at the T10-12 interspace using the loss of resistance technique (with air) after skin wheal of lidocaine local anesthetic 2%. The catheter was introduced approximately 5 cm into the epidural space. Appropriate catheter placement was confirmed by injection of a test dose of 3 ml lidocaine 2%.

General anesthesia was induced to all patients with propofol 2–2.5 mg/kg and rocuronium 0.9 mg/kg to facilitate tracheal intubation. Anesthesia was maintained with isoflurane (1–2%) in 50% oxygen air mixture. Controlled ventilation was achieved by (Drager-model (Primus), S. No: 5370893, Germany, 2006) ventilator to maintain end tidal carbon dioxide tension around 35 mm Hg.

ECG, noninvasive blood pressure, pulse oximetry and end tidal carbon dioxide (ETCO2) were monitored throughout surgery by (Datex-Omeda model (S/5) AN. S. No: 3422715, Finland, 1998) monitor. All patients received continuous intravenous fentanyl infusion 1 ug/kg/hr intraoperatively along with a bolus dose of fentanyl 0.5 μg/kg and 0.15 mg/kg rocuronium when needed. Fentanyl infusion was continued until shifting the patient to post anesthesia care unit (PACU).

At the end of surgery neuromuscular block was antagonized in all patients with neostigmine 0.04 mg/kg and atropine 0.02 mg/kg and trachea was extubated in the operating room and all patients were observed in the PACU for 24 h.

When the patients were awake enough to follow instructions after extubation, Patients in PCEA group received mixture of fentanyl 5 μg/ml along with bupivacaine 0.125% (1.25 mg/ml) and patients of PCIA group received fentanyl 20 μg/ml solutions through PCA pump.

PCA device was programmed to give a bolus dose 2 ml/dose with a minimal lockout interval of 10 min in both groups with no background infusion. Rescue analgesia of 0.5 μg/kg intravenous fentanyl was given to patients in both groups when NPRS > 3 at rest, despite three consecutive PCA boluses.

Postoperative pain was assessed over 24 h. using 10-cm Numerical Pain Rating scale (NPRS) where 0 = no pain and 10 = unbearable pain [6]. NPRS was recorded at times (immediate, 2, 8, 12, and 24 h postoperative). The frequency of rescue analgesia was also recorded.

Sedation was assessed postoperatively by 5 points Sedation score (at the same time intervals of NPRS) as follows 0 = aware-1 = drowsy-2 = asleep/easily respond to verbal command-3 = asleep/difficulty responding to verbal command-4 = asleep/no respond to verbal command [7].

Any concomitant events like nausea; vomiting, shivering, pruritus or respiratory complications were recorded postoperatively. The overall patient satisfaction with postoperative pain