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Original contribution

The frequency and timing of respiratory depression in 1524 postoperative patients treated with systemic or neuraxial morphine

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Abstract

Study Objective: To describe the frequency and timing of intravenous patient-controlled analgesia (IV-PCA) or neuraxial morphine–induced postoperative respiratory depression.

Design: Audit of data captured by routine quality assurance of the acute pain protocols that were implemented by nurses performing routine postoperative care.

Setting: The surgical wards of a university-affiliated, 700-bed, tertiary hospital.

Patients and Interventions: In real time, the data of all patients enrolled into our Acute Pain Service (APS) were entered and stored in the APS database. Thereafter, patients who had received IV morphine via a PCA device or neuraxial morphine between January 1999 and December 2002 were isolated. From this subset, all patients in whom a respiratory rate (RR) less than 10 breaths per minute was recorded were retrieved.

Measurements and Main Results: From a total of 4500 patients, IV or neuraxial morphine was administered to 1524 patients. Eighteen (1.2%) cases of an RR less than 10 breaths per minute were recorded (13 patients, 4 patients, and 1 patient in the IV-PCA, daily epidural morphine, and single-dose intrathecal morphine groups, respectively). A direct correlation between intraoperative fentanyl administration and postoperative respiratory depression was demonstrated between the IV-PCA (P = 0.03) and epidural groups (P = 0.05). The time from IV-PCA initiation or last neuraxial morphine

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administration until the diagnosis of respiratory depression ranged between 2 hours and 31.26 hours and 2 hours and 12.15 hours, respectively. Ten (55.6%) patients received naloxone.
Conclusion: Morphine-induced respiratory depression may occur at any time during the APS admission. However, the optimal frequency of intermittent RR monitoring is unknown. Furthermore, because multiple variables (age, sex, prior opioid administration, site of operation) may affect morphine-induced respiratory depression, further investigation must be performed to determine the ideal monitoring protocol.

1. Introduction

Despite the availability of various nonopioid analgesic drugs, opioid drugs remain the mainstay of most postoperative analgesic regimens for patients whose pain intensity is expected to be moderate to severe [1]. However, because opioids may induce respiratory depression, their safe administration must be accompanied by postoperative respiratory monitoring [2,3]. Despite monitoring protocols, fear of respiratory depression, whether realistic or exaggerated, constitutes a major limitation to the widespread administration of opioids in the management of acute postoperative pain [1].

Although the incidence of opioid-induced bradypnea is widely described, the chronological timing of this potentially life-threatening event is poorly documented. Consequently, the interval after opioid administration during which close respiratory monitoring is mandatory remains unknown. Thus, using our acute pain database, we identified patients in which respiratory depression had been documented. Then the dosage and route of opioid administration, as well as the time between the initiation of intravenous patient-controlled analgesia (IV-PCA) or the last neuraxial opioid administration and the occurrence of respiratory depression, were assessed.

2. Materials and methods

To manage postoperative pain, a nurse-based, anesthesiologist-supervised acute pain service (APS) was established. As part of their routine responsibilities, nurses managed postoperative pain according to predefined protocols [3] The data of all patients under APS care between January 1999 and December 2002 were recorded. Having received institutional review board approval for data collection and publication, we analyzed our APS database to identify all patients who had received IV or neuraxial morphine. From this subset of data, we isolated all patients in whom a respiratory rate (RR) less than 10 breaths per minute (breaths/min) was recorded. Because of the effect of progesterone on respiratory function [4-6], parturients recovering from cesarean section were excluded from the audit.

According to our APS protocols, all patients received diclofenac and ranitidine postoperatively. Intravenous or neuraxial morphine was administered in the following analgesic regimens:

1. Intravenous patient-controlled analgesia
   In the postanesthesia care unit (PACU), patients were connected to a PCA device programmed to deliver 1-mg bolus doses of morphine with a 10-minute lockout interval and no basal infusion. Throughout the postoperative period, a patient-generated visual analog score (VAS) greater than 30 mm was treated with "rescue" morphine (2 mg IV). Fifteen minutes thereafter, the VAS was repeated. This cycle was repeated until a VAS less than 30 mm was recorded.
2. Epidural morphine–single daily dose
   Epidural morphine (4 mg/10 mL saline) was administered 1 hour before the end of surgery. Thereafter, according to protocol, epidural morphine (4 mg/10 mL saline) was administered once in 16 to 24 hours until 3 days postoperatively, when the epidural catheter was removed. During the postoperative period, a patient-generated VAS greater than 30 mm was treated with epidural lidocaine 0.5% (6-12 mL) or bupivacaine 0.125% (6-12 mL) administration. The exact dose was dictated by the protocol and dependent on the number of dermatomes to block.
3. Spinal analgesia
   Intrathecal morphine 0.2 mg was added to the local anesthetic administered. During the postoperative period, a patient-generated VAS greater than 30 mm was treated with oral paracetamol (1 g) or dipyrone (1 g).

In all cases, patients received 3 L/min supplemental oxygen via nasal prongs. All opioids and other drugs with central nervous system depressant properties were contraindicated until 24 hours after the neuraxial morphine administration. In the IV-PCA treatment group, except for rescue morphine, drugs with central nervous system depressant properties were contraindicated until 4 hours after cessation of IV-PCA morphine administration.

Monitoring and event-response algorithms were standardized for all analgesic regimes. Standardized assessment forms were used to document pain and treatment responses. On admission to the surgical department and hourly for