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Epidural Anesthesia in Patients with Coronary Artery Disease

To the Editor:—Epidural anesthesia and combination epidural-general anesthesia are becoming increasingly popular techniques. Potential advantages include decreased blood loss and decreased incidence of deep venous thrombosis for some procedures,[1-5] decreased general anesthetic requirements, pain-free emergence from general anesthesia, and use of epidural opioids postoperatively. In critically ill patients, there is evidence that epidural-general anesthesia with postoperative epidural analgesia may decrease duration of intubation, hospital and physician costs, and postoperative morbidity.[6] Therefore, the recent study by Saada *et al.*[7] examining the effects of epidural blockade on cardiac function in patients with and without coronary artery disease (CAD) was both informative and timely.

The investigators' showed that administering relatively large fixed doses of local anesthetic in order to achieve rapid onset of epidural blockade may be detrimental to patients with CAD. Clinicians who routinely administer a bolus dose of local anesthetic based on a prescribed number of ml per segment of analgesia desired now have evidence to reconsider this practice in patients with CAD. Perhaps a more gradual extension of sympathetic blockade by titration of local anesthetic would allow time for intravascular volume infusion and activation of reflex mechanisms to compensate for vasodilatation in resistance and capacitance vessels.

Indeed, Baron *et al.*[8] have shown that volume loading patients with CAD is effective in restoring blood pressure to control values while left ventricular ejection fraction and segmental wall motion are maintained at preblockade levels. In fact, there was a trend (not statistically significant) toward fewer hypokinetic sectors in Baron's patients after epidural blockade and volume loading compared with the control state (11 hypokinetic sectors *versus* 19).

Therefore, when precautions are taken to minimize hemodynamic alterations, patients with CAD may be able to benefit from epidural anesthesia without aggravating the potential for myocardial ischemia. Clearly, further studies are necessary to fully address this topic.

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Capnography or Capnometry?

To the Editor:—With today's frequent monitoring of oxygen saturation and end-tidal CO_2 in clinical anesthesia practice, both monitoring modalities are quite often mentioned or discussed in the literature. The process of measuring blood oxygen saturation is rightfully called pulse oximetry, because determination of S_{pO_2} is the main purpose of using a pulse oximeter in the operating room or in other clinical settings, despite the added capability available in many oximeters of producing a plethysmographic display that has been found useful in a number of clinical situations.[1] The measurement of end-tidal CO_2, on the other hand, is variably referred to as capnometry or capnography, with the latter term seemingly having become the one used most often in current literature. Is the term capnography, however, really an apt description of the process of end-tidal CO_2 monitoring in the operating room? In measuring P_{ETCO_2}, instruments in clinical use determine the value of a spot sample derived by various methods from phase III of the expired CO_2 level. It reflects the alveolar CO_2 level and usually is

coincident with the highest CO_2 value in the respiratory cycle. All instruments generate numerical values of P_{ETCO_2}, while many devices also record a continuous CO_2 waveform.

For the sake of scientific clarity and uniformity of usage, the measuring, display in numerical form, and clinical interpretation of P_{ETCO_2}, values should be called capnometry (from the Greek word *metrein*, to measure) when such is the primary purpose of employing the monitor, while the term capnography (from the Greek word *graphein*, to write) should be reserved for situations in which the recording and analysis of a continuous CO_2 waveform is of primary importance.

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Problems and Innovations in Home-Based Patient-Controlled Analgesia with Epidural Opioids

To the Editor:—Our recent experience in a patient who had pain related to preterminal malignancy revealed two problems associated with chronic home-based PCA therapy that to our knowledge have not been reported. The patient identified these problems himself and proposed novel solutions that proved to be effective.

A 60-yr-old white male corporate executive with advanced rectal carcinoma confined to the pelvis was referred to the Cancer Pain Service. He had undergone two exploratory laparotomies, colon resection, colostomy, nephrostomy, and insertion of a Hickman catheter for the administration of parenteral alimentation. There was a draining perineal sinus, invasion of the bladder, and severe pain in the perirectal and genital regions. Early analgesic intervention consisted of serial saddle blocks with hyperbaric 10% phenol in 1–2 ml aliquots, supplemented by low-dose iv morphine (1–2 mg/h, prn) delivered on patient-demand by a Pharmacia Deltec infusion device.

Over a period of 9 months, pain increased in severity and the efficacy of further nerve blocks decreased, presumably due to a combination of extension of tumor and sheathing of the targeted nerve roots with fibrosis or tumor. As requirements for iv morphine increased to up to 60 mg daily, increased sedation and impaired gastrointestinal motility were observed. Hospitalization was required for intractable vomiting that persisted despite conservative management.

Epidural opioid therapy was elected in order to provide control of pain while limiting the patient's opioid intake. The epidural route was selected in preference to subarachnoid administration in order to limit the likelihood of central nervous system infection. After a successful trial with preservative-free morphine administered *via* a standard percutaneous epidural catheter, an indwelling silastic epidural catheter (Davol) with an externalized injection port was implanted. The patient's Pharmacia Deltec pump was used to provide a continuous infusion of 0.5 mg/h morphine for basal analgesia, and the pump was programmed to deliver 2-mg boluses of epidural morphine hourly on patient demand. Overall pain control was excellent and bowel function returned steadily during the first post-treatment week.

PROBLEM 1

In an effort to limit the absolute quantity of morphine administered, the patient resisted recommendations of the treatment team to increase the basal rate, and as a result required self-administered boluses of epidural morphine regularly during the night. On each of these occasions full arousal from sleep was necessary to illuminate the room and orient himself so he could accurately locate the bolus button (one of six similar controls).

Solution. The patient resolved this problem independently by simply applying a narrow strip of textured adhesive tape to the unit's bolus button (fig. 1). This facilitated location of the button in the dark without the necessity for full arousal and prolonged interruption of sleep.

PROBLEM 2

On three occasions the patient experienced undesirable sedation and confusion when boluses were demanded sooner than truly needed for pain control. The patient explained that in these instances, he appropriately self-administered an initial bolus in response to pain. Mildly confused, he "forgot" the first intervention and, thus, followed it sooner than necessary with a repeat demand. This additional dose heightened

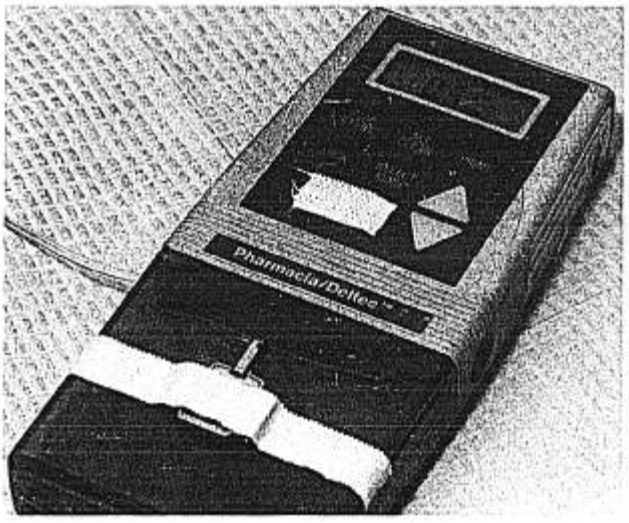

FIG. 1. Portable drug infusion pump used for combined continuous and patient-controlled epidural opioid analgesia. Note upper strip of adhesive tape (center) placed (by patient) over bolus button to facilitate operation during nighttime hours.