Revista Mexicana de Anestesiología

CONFERENCIAS MAGISTRALES
Vol. 33. Supl. 1, Abril-Junio 2010
pp S229-S232

Acute pain service

Merlin D. Larson, M.D.*

* Professor of Anesthesiology
UCSF

INTRODUCTION

The concept of an Acute Pain Service was first promoted by L. Brian Ready in 1988[1]. The idea was to promote a more knowledgeable surveillance by anesthesiologists of epidural and intravenous analgesics (PCA) for postoperative pain control. Within a few years most academic departments in the United States had established Acute Pain Services and usually they were directed by one or two anesthesiologists with either residents or nurse practionters to provide assistance in seeing patients once or twice daily.

By the year 2001 the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) required U.S. hospitals to have established protocols for measuring pain and also to have dedicated personnel allocated for treatment of severe pain[2]. JCAHO noted that «Pain» was the 5th vital sign and if severe and untreated it would delay hospital discharge, result in increased morbidity, and deleteriously alter immune function. Because accreditation is required to remain as a viable institution, Pain Services have now been established in all hospitals in the US. Most hospitals and academic centers chose to delegate the responsibility of acute pain to the anesthesia departments, even though the reimbursement for this increase in service has not always been forthcoming. Some institutions fulfill the requirements for an Acute Pain Service by specialized nurses and pharmacists trained to evaluate and treat pain without nerve blocks.

The concentrated effort to control acute pain initially resulted in an overenthusiastic approach that led to overmedication that ultimately had undesirable consequences. Posters on view within hospitals alerted visitors and relatives of patients to the fact that pain was not tolerated in this hospital and should be reported to the nursing staff. Recovery room nurses were not allowed to discharge patients to the ward unless VAS scores were below three. The result was to overly medicate patients so that they arrived in their hospital rooms lethargic and obtunded. Several cases of respiratory arrest and increased morbidity resulted from this over aggressive approach to pain control. The anesthesiology community was well positioned to take advantage of this problem because of their expertise in controlling pain without the dangerous side effects of excessive opioid therapy. A dedicated team that actually listened and sympathized with patient concerns about their level of pain was one of the factors that have led to the continuing success of Acute Pain Services[3,4].

MECHANISMS

The physiologic mechanisms involved in acute postoperative pain have been studied for several decades. Although the neural pathways that transmit the nociceptive signal to the brain have been known for over 75 years, only recently has it been shown that powerful descending pathways exist that suppress pain at the spinal level. This central descending suppression of the nociception can in extreme situations completely ablate the conscious experience of pain. Several case reports testify that during near death experiences from traumatic events, subjects are often completely conscious but have no painful sensations. Acupuncture and hypnosis have been used to activate this descending pathway, but the results are variable and cannot be used consistently as modalities to treat acute postoperative pain. Our therapies can therefore be divided neatly into two categories: local anesthetic nerve blocks and pharmacological therapy.

LOCAL ANESTHETICS

Neuraxial block: The primary reason anesthesiologists are so prominently involved in Acute Pain Services is that one of their areas of expertise is nerve blocks, on both neuraxial

and peripheral nerves. Epidural block has been used for surgical anesthesia for over 75 years[5,6]. However, it was not until the early 1980s that reliable epidural catheters and infusion pumps were available that would allow patients to receive a continuation of the epidural block into the first few days after surgery. The introduction of epidural opioid therapy in 1979 provided an additional impetus to place epidurals for major abdominal and thoracic surgery. Today this modality of acute pain control is widely used for extensive surgery on the abdomen and thorax. Lumbar epidural catheters were once popular for knee and hip surgery and would provide prolonged pain relief but the technique has fallen into disfavor because of concomitant use of anticoagulation therapy for DVT prophylaxis[7]. Prolonged catheterization of the bladder also is necessary with the lumbar epidural technique but is not required after peripheral nerve blocks. Prostatic and cervical cancer treatment often involves placement of perineal templates for radiation therapy. Lumbar epidural catheters provide very effective pain control when these templates remain in place for 24 hours. The patients can then be discharged on the first postoperative day, after the lumbar catheters are removed.

Selection of an epidural solution to be used for postoperative pain relief is a controversial issue. Several institutions use hydrophilic opioids such as morphine and hydromorphone without local anesthetics. More commonly, dilute solutions of local anesthetics are mixed with various low concentrations of opioids. Fentanyl is widely used as an opioid at 2-5 μg/cc in combination with 0.1 to 0.2% bupivacaine or ropicicaine. Local anesthetics can be used as epidural infusions without any opioid added. At UCSF, the lung transplant surgeons advocate the use of only local anesthetics for pain relief, without any opioids, either in the epidural solution or by systemic administration. Lung transplant patients that have bilateral thoracotomy incisions with two or three chest tubes have adequate pain relief with thoracic epidural infusions of 0.1% ropivacaine.

Sympathetic blockade by thoracic epidural local anesthetic agents has both advantages and disadvantages for pain control. Sympathetic activity arising from painful sensations increases the sensitivity of nociceptors through mechanisms that are poorly understood but underlie the rationale for sympathetic blocks in complex regional pain syndromes. Blockade of the reflex arc by epidural local anesthetics can ameliorate this contribution to acute pain as well as decrease muscle tone that has its own beneficial effect.

Although each anesthesiologist might prefer certain epidural solutions over others, the pharmacy that prepares the solutions for epidural use will advocate for a «standard» solution that most anesthesiologists can agree upon. Custom mixes are then used for selected patients depending upon the several factors. If the epidural is sited well below the level of the skin incision, it is more beneficial to use hydrophilic opioids such as morphine instead of fentanyl because the latter drug has only a mild segmental effect and it is limited predominately to dermatomes close to the epidural insertion site. Opioid-tolerant patients often require increased concentrations of opioid in the epidural solution or alternatively these patients need to have the option of receiving additional systemic opioids to avoid withdrawal symptoms[8].

A question that arises continually on the Acute Pain Service is whether the epidural catheter is actually delivering solution into the epidural space or whether it has migrated out into the subcutaneous tissue. A more basic question is often whether the epidural catheter ever was placed correctly into the epidural space from the beginning. Establishing a sensory level prior to anesthetic induction is one method to ensure that the epidural is properly placed. Absence of pupillary dilation during the skin incision affirms proper placement if the dose of local anesthetic is injected after induction of anesthesia but prior to incision[9]. During the early portion of the operative procedure, an effective local anesthetic epidural block will prevent dilation of the pupil during surgical manipulation but pupillary dilation can be observed by noxious stimulation above the block either by electrical current or with a skin clamp.

It is important to affirm proper placement of the catheter early in the case in order to avoid confusion in the PACU. Although it is often difficult to accept that the epidural catheter might be improperly placed, it is important to recognize that this can occur, and if it does, plans should be made either for other forms of analgesia or for replacement of the catheter after the procedure is completed.

Even if the catheter is properly sited at the beginning, it can migrate out of the epidural space in the first few days after the surgical procedure. Various methods have been used to test for a sensory level. An alcohol swab does not produce enough of an abrupt change in temperature to stimulate the cold receptors that are transmitted by the A delta fibers. The alcohol swab will therefore test primarily the function of the A beta fibers that transmit the sensation of touch. A sharp object will stimulate the A delta fibers that transmit sharp pain sensations but a pin or needle often leaves unsightly marks on the skin that can be objectionable to some patients. One useful technique is to test for cold sensation with ice. Placement of ice on the skin will directly stimulate the cold receptors that are transmitted to the spinal cord by A delta fibers, similar to those that transmit the fast, sharp component of painful sensations. However, the fact that there is a sensory level to ice sensation does not mean that the patient will not have painful sensations arising from the operative site. Recent evidence has shown that C fibers are the most resistant to local anesthetic block-

ade so that patients may have block of A delta-mediated painful sensations but still have some intact C fiber-mediated nociception.

PERIPHERAL NERVE BLOCK

Peripheral nerve blocks are used for knee, hip, and ankle surgery and for surgery on the upper extremity[10]. Ideally, blocks should be placed in a room separate from the operating room so as to not delay the surgical procedure. Ultrasound techniques or nerve stimulators are the universal standard today and have significantly improved the success of peripheral nerve blocks. However, problems still remain in placing the catheter tip in the appropriate position to obtain long lasting analgesia[11]. Although stimulating catheters have been available for several years, they have not completely solved the problem of catheter tips lying outside of the nerve sheath. Most patients that have long-term peripheral nerve infusions have additional analgesics available, either PCA or oral opioids.

PHARMACOLOGIC THERAPY

The systemic use of drugs for acute pain is essentially a fallback position when local anesthetic blocks are either contraindicated or if they fail to provide adequate pain relief. Pharmacological interventions for acute pain target specific locations in the central pathways that sub serve nociception. Thus for example, the NSAID's are thought to act primarily to decrease the production of prostaglandins and thereby decrease activation of the nociceptors following tissue injury. Anticonvulsant drugs[12] decrease the spontaneous sodium and calcium currents in nociceptors[13] that are responsible for continuous burning pain and paresthesias, dysesthesias, and allodynia. Both the NSAID's and anticonvulsants may also have effects in the dorsal horn of the spinal cord. The action of acetaminophen is poorly understood but presumably acts primarily in the spinal cord. Alpha 2 agonists accentuate the action of descending pathways from the rostral ventral medulla that are medicated by cathecholamines. Benzodiazapines and muscle relaxants are useful to minimize muscle spasms that can contribute to incisional pain by increasing tension on the suture lines.

NMDA antagonists have become an integral part of acute pain management[14]. Patients often arrive or surgery taking enormous doses of potent opioids and have already developed the syndrome known as opioid induced hyperalgesia. Although several mechanisms have been proposed to explain this phenomenon, one explanation is that activation of opioid receptors on the WDR neurons will amplify transmission across the NMDA glutamate receptor, thus increasing transmission from the primary afferent to the spinothalamic tract neuron. To make matters worse, it seems that activation of the NMDA receptor decreases the sensitivity of the mu opioid receptor, thus resulting in less analgesic effect from the same dose of opioid.

The last topic of discussion is the opioids. These are the drugs we all hope to avoid but are unfortunately they are required in the vast majority of cases.[15] The side effects of opioids are traditionally listed as respiratory depression, nausea and vomiting, ileus, and obtundation. However, we now know that the opioids have other deleterious effects that include possible suppression of the immune system, interference with REM and natural sleep, hyperalgesia, and development of acute tolerance. Opioids in the perioperative period are usually presented in the form of PCA but this regimen has to be fashioned correctly in order to manage pain effectively. An opioid-tolerant patient, for example, will quickly abandon the use of PCA if no benefit is forthcoming[8]. Additionally, some consideration must be made for analgesia when the patient falls asleep. Some long-acting agent should also be included in any perioperative opioid therapy or patients will awaken in severe pain that is difficult to control with standard PCA orders.

In summary, the Acute Pain Service is here to stay but several institutions still have difficulty in making the transition to neuraxial and peripheral nerve blocks that result in reducing the requirements for opioid therapy. With full cooperation of the nursing and surgical staff, a gradual transition to opioid sparing techniques can result in improved pain control and an accelerated recovery.

REFERENCES

1. Ready LB, Oden R, Chadwick HS, Benedetti C, Rooke GA, Caplan R, Wild LM. Development of an anesthesiology-based postoperative pain management service. Anesthesiology 1988;68:100-6.
2. Phillips DM. JCAHO pain management standards are unveiled. Joint Commission on Accreditation of Healthcare Organizations. JAMA 2000;284:428-9.
3. Miaskowski C, Crews J, Ready LB, Paul SM, Ginsberg B. Anesthesia-based pain services improve the quality of postoperative pain management. Pain 1999;80:23-9.
4. Apfelbaum JL, Chen C, Mehta SS, Gan TJ. Postoperative pain experience: results from a national survey suggest postoperative pain continues to be undermanaged. Anesth Analg 2003;97:534-40, table of contents.
5. Dogliotti A. Anesthesia. Chicago, SB Debour, 1939.
6. Bromage P. Epidural analgesia. Philadelphia, WB Saunders, 1979.
7. Horlocker TT, Burton AW, Connis RT, Hughes SC, Nickinovich DG, Palmer CM, Pollock JE, Rathmell JP, Rosenquist RW, Swisher JL, Wu CL. Practice guidelines for the prevention, detection, and management of respiratory depression associ-

ated with neuraxial opioid administration. Anesthesiology 2009;110:218-30.
8. Mitra S, Sinatra RS. Perioperative management of acute pain in the opioid-dependent patient. Anesthesiology 2004;101:212-27.
9. Larson MD, Sessler DI, Ozaki M, McGuire J, Schroeder M. Pupillary assessment of sensory block level during combined epidural/general anesthesia. Anesthesiology 1993;79:42-8.
10. Ilfeld BM, Le LT, Meyer RS, Mariano ER, Vandenborne K, Duncan PW, Sessler DI, Enneking FK, Shuster JJ, Theriaque DW, Berry LF, Spadoni EH, Gearen PF. Ambulatory continuous femoral nerve blocks decrease time to discharge readiness after tricompartment total knee arthroplasty: a randomized, triple-masked, placebo-controlled study. Anesthesiology 2008;108:703-13.
11. Morin AM, Eberhart LH, Behnke HK, Wagner S, Koch T, Wolf U, Nau W, Kill C, Geldner G, Wulf H. Does femoral nerve catheter placement with stimulating catheters improve effective placement? A randomized, controlled, and observer-blinded trial. Anesth Analg 2005;100:1503-10, table of contents.
12. Ho KY, Gan TJ, Habib AS. Gabapentin and postoperative pain—a systematic review of randomized controlled trials. Pain 2006;126:91-101.
13. Mathiesen O, Moiniche S, Dahl JB. Gabapentin and postoperative pain: a qualitative and quantitative systematic review, with focus on procedure. BMC Anesthesiol 2007;7:6.
14. Schmid RL, Sandler AN, Katz J. Use and efficacy of low-dose ketamine in the management of acute postoperative pain: a review of current techniques and outcomes. Pain 1999; 82:111-25.
15. Kehlet H. Postoperative opioid sparing to hasten recovery: what are the issues? Anesthesiology 2005;102:1083-5.