Artículo:

Continuous regional analgesia
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The management of pain plays an important role in postoperative rehabilitation and surgical outcome. Numerous analgesic options are available including opioid and non-opioid systemic analgesics, central neuraxial as well as peripheral regional anesthetic techniques, as well as various physical modalities. The goal is to alleviate pain and improve quality of care, to attenuate the harmful effects of pain, to reduce morbidity, and to facilitate rehabilitation. Chung et al. quantified the failure of outpatient pain management by noting that after some orthopedic, urologic, and plastic procedures, the incidence of severe postoperative pain varied between 40% and 70%(1). This lecture will explore the value of continuous regional analgesia (CRA) in meeting the goals of optimal pain management.

Opioid analgesics are effective in controlling moderate to severe pain, however, their use is associated with numerous side effects that may prolong hospital stay and result in unanticipated admission of ambulatory patients. The result includes an increase in cost and a decrease in patient satisfaction. Intravenous patient-controlled analgesia is more effective than intermittent intramuscular or intravenous boluses but its benefits need to be balanced against those of opioid-related side effects as well as operator and mechanical errors.

Central neuraxial analgesia is effective but is also limited by opioid as well as local anesthetic associated side effects, technical issues, and is labor intensive. In addition, epidural analgesia is not commonly used for upper extremity surgery and may be contraindicated in certain situations. In particular, the risk of spinal hematoma in patients receiving low-molecular-weight heparin has led to a search for alternate techniques of providing postoperative analgesia.

Peripheral nerve blocks provide an attractive alternative as they are not associated with opioid-related side effects nor are they contra-indicated in patients receiving anticoagulants with the exception of certain sites(2). The primary limitation of these techniques is related to the limited duration of a single injection technique (10-24 hours) and the moderate to severe pain may follow resolution of the block(3). This problem has been overcome by the introduction of CRA. These techniques are being used to provide prolonged site-specific surgical anesthesia, postoperative analgesia, as well as in the management of chronic pain and upper extremity ischemia. The success and safety of CRA has resulted in patients being discharged home with a perineural catheter in situ(4,5). Placement of the catheter is determined by the operative procedure and includes upper and lower extremity perineural placement as well as intra-articular, incisional, and paravertebral catheters.

The current availability of equipment (needles and catheters) to facilitate catheter placement, disposable infusion pumps for ambulatory patients, and studies demonstrating the advantages and safety of these techniques has resulted in an upsurge of interest in the use of CRA(3,6-9).

Borgeat et al.(10) studied 40 patients undergoing major shoulder surgery using a combined technique. The patients received an interscalene block with ropivacaine 0.75%, an interscalene catheter was secured, followed by a standardized general anesthetic. Postoperatively the patients were randomized into two postoperative analgesia groups: Group 1 received intravenous patient-controlled analgesia and Group 2 received patient-controlled regional analgesia (bupivacaine 0.15% at 5 ml/h plus patient-controlled boluses of 3-4 ml q 20 minutes). On postoperative day-1 the PCRA group reported significantly less pain, less use of supplementary medications and greater satisfaction with their pain control than Group 1. The authors concluded that PCRA provided superior analgesia with few side effects, and with the added advantage of the ability to reinforce the block prior to physical therapy. In a randomized, double-blinded, placebo-controlled study, Ilfeld et al(6) studies 30 patients undergoing surgery at or below the elbow under regional anesthesia. All patients received infracavicular block with ropivacaine 0.5% plus epinephrine. Postoperatively, half the patients received a continuous infusion of ropivacaine 0.2% at 10 ml/h, while the other half received an infusion of nor-
mal saline. Patients were discharged home and the catheter remained in situ for 3 days. The ropivacaine group reported significantly less pain at rest and with movement as well as significantly less oral narcotic use for the entire 3-day period. In addition, the patients reported a decrease in sleep disturbance as well as an increase in overall satisfaction. Numerous additional studies have confirmed the success rates (75% to 100%), as well as the benefits of upper extremity CRA(11-17). Complications, while rare, have been reported(16,18-23).

Postoperative epidural analgesia has been regarded as the gold standard following lower extremity surgery. However, contraindications to its use exist as do a number of disadvantages. Needle and catheter insertion are not risk-free, opioid and local anesthetic side effects are ever-present, appropriate monitoring is essential, and technical issues are not an uncommon problem. CRA provides a safe and effective alternative following lower extremity surgery. Singelyn et al(24) studied postoperative pain control and knee rehabilitation following total knee arthroplasty. Forty-five patients scheduled for TKA under general anesthesia were divided into 3 postoperative analgesia groups: Group A received IV morphine PCA, Group B received CRA via a femoral nerve catheter and Group C received epidural analgesia. Both groups B and C received the same infusion of bupivacaine 0.125% + sufentanil 0.1 µg/ml + clonidine 1 µg/ml at 10 ml/h. Groups B and C provided more effective pain control and, as a result, improved postoperative knee rehabilitation when compared with Group A. In addition, the CRA group reported less side effects and catheter problems than did the epidural group. As with the upper extremity, numerous recent reports have confirmed the advantages of CRA over conventional (IV-PCA and epidural analgesia) postoperative analgesic techniques(25-30). Continuous posterior lumbar plexus blocks have, however been associated with a number of complications including renal subscapular hematoma(31), psoas hematoma and lumbar plexopathy(32), extensive retroperitoneal hematomas(2), as well as total spinal anesthesia(33).

A number of authors have attempted to determine the “optimal” technique for providing prolonged CRA, i.e. continuous infusion, intermittent boluses, or continuous basal infusion plus patient-controlled boluses(13,27,34). In summary, these studies report that intermittent boluses provide absolute control at the cost of convenience and break through pain, continuous infusions are simple and convenient but may also suffer the disadvantage of break through pain after 12-24 hours, whereas a continuous infusion accompanied by patient-controlled boluses is the most titratable and results in the lowest consumption of local anesthetic. In addition, patients report improved rehabilitation, greater pain control with less side effects and increased satisfaction.

The placement of intra-articular, incisional, and paravertebral catheters have also been effective in providing prolonged postoperative pain relief(7,35-38). The benefit of placing and intra-articular over a perineural catheter is however questionable. While the former is a simpler process, the majority of studies report improved pain control with perineural catheters(39-43). On the other hand, both incisional as well as paravertebral catheter placement have been shown to be extremely effective and safe techniques of providing postoperative analgesia following a variety of surgical procedures(7,35-38).

The increased use of CRA has largely been a result of the availability of needle-catheter kits that facilitate catheter placement, disposable infusion pumps, and less toxic local anesthetic agents. A number of needle-catheter kits are available to which a peripheral nerve stimulator can be attached to aid needle placement. A further advancement is the availability of stimulating catheters that allow immediate confirmation of correct catheter placement(44,45). Numerous disposable as well as disposable infusion pumps are available. Ilfeld et al. reported on the accuracy of these pumps over a fixed time period and demonstrated that not all pumps are equal(46).

Bupivacaine has been the gold standard of long-acting local anesthetics for many decades. Its position is however being challenged by ropivacaine and levobupivacaine. Ropivacaine is less cardiotoxic and demonstrates greater sensory-motor dissociation(47). This latter property is of great benefit postoperatively as analgesia can be achieved with a lower incidence of unwanted motor blockade thus allowing the patient to actively participate in their postoperative rehabilitation(48). In addition, the offset of any motor blockade is more rapid. Levobupivacaine is virtually identical to bupivacaine with the exception that it too is less cardiotoxic(49). There are no published clinical trials that demonstrate that the addition of adjuvants (e.g. opioids, clonidine, etc.) offers any clear advantage over the use of local anesthetics alone for CRA. There are also no clear guidelines regarding the optimal infusion rate, bolus dose or lockout interval (Table I).

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<th>Continuous regional analgesia: Guidelines.</th>
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<td><strong>Local anesthetic</strong></td>
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Potential complications associated with the use of CRA are similar to those associated with peripheral nerve blockade, however, these have proven to be few and far between. This may be a reflection of the fact that in most cases these catheters are placed by individuals experienced in the use of regional anesthetic techniques. The potential for infection is an issue that has been raised and proven to be unfounded. Cuvillon et al. (50) analyzed 208 femoral catheters that were removed 48 hours after insertion as well as 6 weeks later. Bacterial colonization was positive in 57% of catheters (Staph. Epidermidis 71%, Enterococcus 10%, Klebsiella 4%). None of the patients demonstrated any evidence of cellulites or abscess formation. A similar lack of local or systemic infection following axillary catheterization was reported by Gaumann et al.(51). The antibacterial activity of aminomide local anesthetics may be partially responsible.(52)

In summary: Continuous regional analgesia has few, if any contraindications, provides excellent localized analgesia with minimal side effects, requires no specific monitoring (compared with central neuraxial analgesia), is associated with minimal risk, and results in excellent patient satisfaction and rehabilitation. The feasibility and safety of CRA in ambulatory patients has been established (3,6-8,30). Patient selection, clear verbal and written instructions, follow-up telephone call, and 24-hour access to anesthesia services are prerequisites for PCRA at home (3,7,53).

TIPS ON CATHETER PLACEMENT FOR CONTINUOUS REGIONAL ANESTHESIA

(Kayser Enneking, Gainsville, Florida – modified)

Orient the bevel of the introducing needle along the same axis as the nerve. Then approach the nerve at the least acute angle.

With the needle ideally placed, inject a mass of local anesthetic, or normal saline to open up the fascial compartment (This author’s preference is to achieve complete blockade at this point). This maneuver can also be tried if the catheter is not threading easily after passing the tip of the needle. Inject 3-5 ccs of fluid through the catheter to open up the space then try again to advance the catheter.

Introduce the catheter firmly, however if it does not thread don’t force and kink the catheter. Instead, try to lower the angle of the introducing needle, or change the orientation of the bevel of the introducing needle.

After the catheter has been successfully threaded secure it! Numerous methods have been described including sutures, steri-strips and/or tunneling under the skin.

Make sure to inject additional fluid (This author prefers a local anesthetic solution) through the catheter after it is placed to ensure its patency. It is much easier to adjust the catheter when you first place it than later.

The patient should be given an appropriate loading bolus of local anesthetic to initiate the block (either initially through the needle, or later via the catheter).

The continuous infusion is usually started 2-4 hours after the initial loading bolus depending on the initial local anesthetic used. The local anesthetic solution (0.25% bupivacaine, 0.2% ropivacaine, or 0.25% levobupivacaine) is infused at a rate of 4-6 cc/hour with a 2 cc patient controlled bolus every 30 minutes. If patient controlled bolus mode is not available, a higher basal infusion rate will be a required.

INSTRUCTIONS FOR CONTINUOUS CATHETER PATIENTS

(Kayser Enneking, Gainsville, Florida)

You are receiving local anesthetic through a small catheter near your nerves to help with your pain after surgery. This may not take away all of your pain but should help greatly. You may take your pain medicines as prescribed by your doctor. The nurse will review this with you. The local anesthetic will initially make your arm or leg very numb. Over time, this degree of numbness will decrease but usually your arm/leg is not normal until the catheter is removed. Because your arm or leg won’t function normally, YOU SHOULD NOT DRIVE.

The doctors and nurses will review the pump instructions with you. If you have any problems with the pump call the technical support number or the number the doctor has given you.

Complications that could potentially occur include:
- The catheter may fall out. If this occurs make sure to take some of your pain medicine and turn the pump off.
- Fluid may leak around the catheter. You can change or reinforce the dressing if necessary. This is usually not a problem.
- The catheter may migrate into a blood vessel and cause high levels of local anesthetic. Symptoms of high levels of local anesthetic may include:
  - Drowsiness
  - Dizziness
  - Blurred vision
  - Slurred speech
  - Poor balance
  - Tingling around lips/mouth
  - Other
  - If you have a leg catheter you
    - Should not walk without crutches or someone helping
    - Should keep your immobilizer or splint on unless doing therapy.
  - If you have an arm catheter you should keep your arm in a sling unless doing therapy.
  - Call your physician for medical assistance if any of the following symptoms occur:
    - Unusual drowsiness
    - Uncontrollable pain
    - Uncontrollable vomiting.
REFERENCES

2. Weller RS, Gerancher JC, Crews JC, Wade KL. Extensive retroperitoneal hematoma without neurologic deficit in two patients who underwent lumbar plexus block and were later anticoagulated. Anesthesiology 2003;98:581-5.
44. Boezaart A. Nerve stimulator assisted catheter placement for continuous plexus and nerve blocks. Hospital Supplies 2000:4-11.