



## Continuous regional anesthesia vs. single shot technique for acute postoperative pain treatment

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### ABSTRACT

Acute postoperative pain is a great concern to the patients and the surgical team. Pain can contribute to increased morbidity and mortality, health care costs, chronic pain, and patients' life quality. Many adverse effects are related to inadequately treated postoperative pain as cardio-respiratory complications, deep venous thrombosis, water and salt retention, hyperglycemia, proinflammatory and procoagulation states, and finally chronic pain. Aggressive treatment includes patients' evaluation, multimodal regimen, and pain killers in the discharged period. Regional analgesia and especially peripheral nerve block are gaining popularity in pain treatment. This editorial view is focused on the comparison of continuous vs. single shot technique.

**Key words:** Postoperative pain; Multimodal analgesia; Nerve blocks

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Acute postoperative pain (APP) presents one of the major challenges, which the anesthesiologist must deal with in his daily practice. It has been recently reported that APP after day surgery has an incidence of 25-30%.<sup>1</sup> Orthopedic, urological, general, and plastic surgical procedures have been reported as major predictors of acute postoperative pain. Several authors concluded that pain was not adequately treated in 40-70% of the patient undergoing.<sup>2</sup>

Postoperative pain consequences are important for patient's outcome reflected in his morbidity and mortality. Postoperative pain management is of great importance. Being such a big problem, many institutions developed specific programs and protocols in order to increase the efficacy of APP treatment. These programs begin with pain evaluation systems, treatment regimens, and finally multimodal analgesia,<sup>2</sup> improving APP treatment and patients' satisfaction during postoperative period.<sup>3</sup>

The multimodal pain management<sup>4</sup> consists of combining different analgesic drugs and different administration techniques, in order to improve

treatment efficacy and to reduce drug side effects. Systemic analgesia, neuraxial analgesia, and peripheral nerve blocks have been included in multimodal pain management.<sup>4</sup>

### Pathophysiological importance of APP treatment

It is well known that APP is associated with an increased neuroendocrine stress response, which is mediated by inflammatory substances due to tissue damage, the activation of hypothalamic-pituitary-adrenocortical axis, and sympathetic response. These pathophysiologic changes can lead to increased catecholamine levels and catabolic hormones (cortisol, antidiuretic hormone, aldosterone, renin, etc). These hormonal changes can induce water and salt retention, hyperglycemia, increased fatty acids, and lactate production. Other important detrimental effects are immunosuppression, increased coagulation and poor wound healing. The control of preexisting diseases, e.g. diabetes, coronary artery disease, hypertension, or another end-stage organ dysfunction, can be further deteriorated.

## regional anesthesia for postoperative pain

Chronic postoperative pain is associated with immobility, decreased patient recovery and rehabilitation, higher public service costs and poor life quality. Poor acute postoperative pain control can dramatically induce chronic postsurgical pain.

The features of multimodal approach consist on adequately pain control, fewer side effects, and early patient mobilization. Major advantages of a multimodal pain control are: better pain control, fewer side effects, less stress response, decreased morbidity, shorter hospital stay, and increased patient satisfaction.

Neuraxial blockade and peripheral nerve blocks can blunt the local and systemic stress response and provide adequate pain control. There exist controversies on the potentially advantages of continuous regional anesthesia/analgesia to the single shot technique.

### **Regional anesthesia/analgesia a suitable choice**

Neuraxial blockade and peripheral nerve blocks are suitable choices in routine anesthesia practice as well as for postoperative pain control,<sup>5</sup> as the same offer several advantages, such as reduced cardiovascular and respiratory complications, decreased rate of deep venous thrombosis and pulmonary embolism, and an excellent postoperative pain control. However, several controversies exist regarding the epidural approach and there is much current literature as a proof of its efficacy in pain control. Thoracic epidural anesthesia / analgesia seems to be much more effective than lumbar approach in reducing postoperative complications, although adequate pain control is the major advantage of both techniques. The anesthesiologist's experience is important in reducing side effects associated with the epidural / spinal analgesia, e.g. hypotension, bradycardia, and respiratory depression. Systemic administration of anesthetics / analgesics is effective, but is associated with many side effects including hemodynamic instability, respiratory depression, over-sedation, reduced intestinal motility, increased incidence of postoperative nausea and vomiting, and urinary retention. It has recently been reported that neuraxial route can reduce the opioid requirements providing excellent analgesia. Neuraxial route can be single shot or continuous administration through catheter insertion.

An interesting choice remains peripheral nerve blocks. These blocks have the advantages due to less side effects (cardiovascular, respiratory), but excellent analgesia by blocking peripheral afferent

pain transmission.<sup>6-8</sup> Peripheral blocks need absolute sterile technique, a skillful anesthesiologist, good anatomy and ultrasound knowledge, suitable supplies and patient sedation. This technique is also associated with minor complications as accidental vascular punctures, local bleeding, site infection, and rarely neurotoxicity.<sup>7,9</sup> Peripheral nerve blocks can also be given as a single shot or continuous infusion using a catheter placed in the region. The latter technique is preferred for their efficacy for anesthesia and for postoperative pain control, for its better pain control, reduction of parenteral analgesics, improved quality of life and early rehabilitation.<sup>10</sup> American Pain Society, the American Society of Regional Anesthesia & Pain Medicine, and the American Society of Anesthesiologists have established the guidelines on the management of postoperative pain.<sup>11</sup> Regarding regional anesthesia, use of continuous local anesthetic-based peripheral regional analgesic techniques are strongly recommended (with high quality of evidence) when prolonged duration of analgesia is required exceeding the time duration of a single shot technique. According to these guidelines neuroaxial analgesia is especially recommended in high risk patients for cardiac and pulmonary complications.<sup>11</sup>

### **Continuous vs. single shot approach**

Many authors have compared several anesthetic/analgesic regimens. Many of them concluded that continuous peripheral nerve blocks (CPNB) offer many advantages compared to single-shot peripheral nerve blocks due to prolonged analgesia, reduced opioid use, higher patient satisfaction, shorter time to be discharged, and better quality of recovery.<sup>10,12</sup>

Rodgers et al found a decreased mortality when general anesthesia was combined with regional anesthesia.<sup>13</sup> Cochrane review, however, could not find benefit of regional anesthesia over general one in orthopedic surgery.<sup>14</sup>), except that continuous peripheral regional anesthesia could improve functionality after surgery. During single-shot technique the anesthesiologists prefer to use long acting local anesthetic agents that might hide complications like compartment syndrome. So continuous technique seems more suitable and as it allows the use of even short acting agents and modulation of the dose/concentration and the interval of administration as well. This technique can reduce systemic toxicity and neurotoxicity. Regarding cost effectiveness, continuous block seems to reduce hospitalization length and patient treatment costs. Continuous nerve block may result in a decreased risk for hematoma formation compared to epidural route after anticoagulation begins,

especially in orthopedic surgery. Inadequately treated postoperative pain often results in chronic pain and reduced function of the extremity after orthopedic surgery.<sup>15</sup> Continuous approach offers an advantage to prevent chronic pain by ensuring better analgesia.

CPNB is also suitable for pain treatment at home, and helps reduce the opioid side effects. Opioid delivery at home is more human resource dependent, increasing the treatment cost. Single shot blocks look to be quicker and easier to perform, need little follow up, and may be cost effective, whereas continuous catheters insertion needs more time, require expertise, cost more, and are associated with more complications. Salinas et al. concluded that continuous femoral nerve block offered no advantage on hospital length of stay and long-term functional recovery after total knee arthroplasty compared to single shot technique.<sup>16</sup> Capdevila et al. published a multicenter prospective study on 1416 patients. They concluded that CPNB is an effective analgesic technique associated with rare and minor

complications.<sup>17</sup>

Nevertheless, an important issue remains the risk of catheter infection and bacterial colonization. In 2001, Cuvillon et al. reported bacterial colonization in 57% of 208 removed catheters. Their conclusion was that although the rate of colonization was high, the risk of infections was low.<sup>18</sup> In another interesting paper, Cadevilla et al. concluded that infectious complications related to catheter insertion tend to increase due to fact that continuous technique has gain popularity.<sup>19</sup> Some authors reported neck hematoma and postoperative sepsis due to *Staphylococcus aureus* after continuous interscalene block for shoulder arthroplasty.<sup>20</sup>

Every anesthesiologist has to deal with postoperative pain starting with the evaluation of the patient and his surgery, and to choose the most suitable pain management options available to him.

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## REFERENCES

- McGrath B, Elgandy H, Chung F, Kamming D, Curti B, King S. Thirty percent of patients have moderate to severe pain 24 hr after ambulatory surgery: a survey of 5,703 patients. *Can J Anesth* 2004;51:886–91. [PubMed]
- Faber P, Tharakan L. Pain management in day-case surgery. *BJA Education* 2015;15 (4):180–183. [Free full text] doi.org/10.1093/bjaceaccp/mku034
- Elvir-Lazo O, White P. The role of multimodal analgesia in pain management after ambulatory surgery. *Curr Opin Anesthesiol* 2010;23:697–703. [PubMed] doi: 10.1097/ACO.0b013e32833fad0a.
- Buvanendran A, Kroin J. Multimodal analgesia for controlling acute postoperative pain. *Curr Opin Anaesthesiol* 2009;22:588–593. [PubMed] doi: 10.1097/ACO.0b013e328330373a.
- Curatolo M. Regional anesthesia in pain management. *Curr Opin Anesthesiol* 2016, 29:614–619. [PubMed] doi: 10.1097/ACO.0000000000000353.
- Singelyn FJ, Deyaert M, Joris D, Pendeville E, Gouverneur JM. Effects of intravenous patient-controlled analgesia with morphine, continuous epidural analgesia, and continuous three-in-one block on postoperative pain and knee rehabilitation after unilateral total knee arthroplasty. *Anesth Analg* 1998;87(1):88–92. [PubMed]
- Ilfeld BM, Gearen PF, Enneking FK, Berry LF, Spadoni EH, George SZ, et al. Total knee arthroplasty as an overnight stay procedure using continuous femoral nerve block at home: a prospective feasibility study. *Anesth Analg* 2006;102:87–90. [PubMed] DOI: 10.1213/01.ane.0000189562.86969.9f
- Watson MW, Mitra D, McLintock TC, Grant SA. Continuous versus single injection lumbar plexus blocks: comparison of the effects on morphine use and early recovery after total knee arthroplasty. *Reg Anesth Pain Med* 2005;30:541–47. [PubMed] DOI: 10.1016/j.rapm.2005.06.006
- Wiegel M, Gottschaldt U, Hennebach R, Hirschberg Th, Reske A. Complications and Adverse Effects Associated with Continuous Peripheral Nerve Blocks in Orthopedic Patients. *Anesth Analg* 2007;104:1578–82. [PubMed] DOI: 10.1213/01.ane.0000261260.69083.f3
- Ilfeld B. Continuous peripheral nerve blocks: a review of the published evidence. *Anesth Analg* 2011;113:904–925. [PubMed] doi: 10.1213/ANE.0b013e3182285e01
- Chou R, Gordon DB, de Leon-Casasola OA, Rosenberg JM, Bickler S, Brennan T, et al. Management of postoperative pain: a clinical practice guideline from the American Pain Society, the American Society of Regional Anesthesia and Pain Medicine, and the American Society of Anesthesiologists' Committee on Regional Anesthesia, Executive Committee, and Administrative Council. *J Pain* 2016;17:131–157. [PubMed] [Free full text] doi: 10.1016/j.jpain.2015.12.008.
- Richman JM, Liu SS, Courpas G, Wong R, Rowlingson AJ, McGready J, et al. Does continuous peripheral nerve block provide superior pain control to opioids? A meta analysis. *Anesth Analg* 2006;102(1):248–57. [PubMed] DOI: 10.1213/01.ANE.0000181289.09675.7D
- Rodgers A, Walker N, Schug S, McKee A, Kehlet H, van Zundert A, et al. Reduction of postoperative mortality and morbidity with epidural

## regional anesthesia for postoperative pain

- or spinal anesthesia: results from overview of randomized trial. *BMJ* 2000;321(7275):1493-1497. [PubMed] [Free full text]
14. Parker M, Handoll H, Griffiths R. Anaesthesia for hip fracture surgery in adults. *Cochrane Database Syst Rev.* 2004 Oct 18;(4):CD000521. [PubMed] [Free full text] DOI: 10.1002/14651858.CD000521.pub2
  15. Blumental S, Borgeat A, Neufdr C, Bertolini R. Additional femoral catheter in combination with popliteal catheter for analgesia after major ankle surgery. *Br J Anaesth* 2011;106(3):387-393. [PubMed] [Free full text] doi: 10.1093/bja/aeq365.
  16. Salinas F, Liu S, Mulroy M. Continuous femoral nerve block after total knee arthroplasty on hospital length of stay and long-term functional recovery within an established clinical pathway. *Anesth Analg* 2006;102:1234-9. [PubMed] [Free full text] DOI: 10.1213/01.ane.0000198675.20279.81
  17. Capdevila X, Pirat Ph, Bringuier S, Gaertner E, Singelyn F, Bernard N, et al. Continuous peripheral nerve blocks in hospital wards after orthopedic surgery: a multicenter prospective analysis of the quality of postoperative analgesia and complications in 1,416 patients. *Anesthesiology* 2005;103:1035-45. [PubMed] [Free full text]
  18. Cuvillon Ph, Ripart J, Lalourcey L, Veyrat E, L'Hermite J, Boisson Ch, et al. The Continuous Femoral Nerve Block Catheter for Postoperative Analgesia: Bacterial Colonization, Infectious Rate and Adverse Effects. *Anesth Analg* 2001;93:1045-9. [PubMed]
  19. Capdevila X, Bringuier S, Borgeat A. Infection risk of continuous peripheral nerve blocks. *Anesthesiology* 2009;110:182-8. [PubMed] [Free full text] doi: 10.1097/ALN.0b013e318190bd5b.
  20. Clendenen S, Robards Ch, Wang D, Greengrass R. Continuous interscalene block associated with neck hematoma and postoperative sepsis. *Anesth Analg* 2010;110:1236-8. [PubMed] doi: 10.1213/ANE.0b013e3181cf03b4.



Just as the largest library, badly arranged, is not so useful as a very moderate one that is well arranged, so the greatest amount of knowledge, if not elaborated by our own thoughts, is worth much less than a far smaller volume that has been abundantly and repeatedly thought over.

*Arthur Schopenhauer (1788-1860) German philosopher.*

If we knew what we were doing it wouldn't be research.

*Albert Einstein (1879-1955) German-Swiss-U.S. scientist.*

By seeking and blundering we learn.

*Johann Wolfgang Von Goethe (1749-1832) German poet, novelist and dramatist.*