ICU MANAGEMENT & PRACTICE

ICU Volume 5 - Issue 2 - Summer 2005 - Product Comparison

Continuous Regional Analgesia

Authors

Andrea Casati *MD*

Staff Anaesthesiologist

Marco Baciarello *MD*

Anaesthesia Fellow

Augusto Fioro *MD*

Anaesthesia Fellow, University of Parma

Dept of Anaesthesia and Pain Therapy

Italy

Correspondence: acasati@ao.pr.it

Dr Casati and colleagues review the potential of regional analgesia in the management of trauma and post-surgical patients in the ICU.

Regional Anaesthesia/Analgesia Techniques

Regional analgesia (RA) techniques (including spinal, epidural and peripheral nerve block techniques) are effective not only in optimizing pain control, but also in reducing stress responses associated with surgery, and with clinically relevant effects on short- and long-term recovery after major surgery (Carli et al. 1995; Carli and Halliday 1996; Holte and Kehlet 2002). Routine use of a protocol-driven light sedation results in better physical and psychological outcomes in ICU patients, especially when daily awake times are granted (Kress et al. 2000). Moreover, although large randomized controlled trials are still ongoing, there is increasing evidence of the benefit of early tracheotomy in patients estimated to require intermediate to long-term ventilation, while noninvasive ventilation is increasingly used both inside and outside the ICU (Keenan et al. 2004). Guidelines from the Society of Critical Care Medicine (SCCM) recommend pain control and sedation to improve psychological and physiological variables ranging from sleep deprivation to myocardial oxygen consumption (Jacobi et al. 2002). Regional analgesia techniques have been excluded from analysis, although the adverse effects of systemic opioids and other analgesics are acknowledged. As changes in critical care practice are introduced in the daily clinical routine, clinicians may be faced with the problem of providing effective pain control in a lightly sedated or even fully awake patient.

Route of Administration for Prolonged RA Techniques

All RA techniques can be performed using either bolus or continuous drug administration, although safety of continuous intrathecal anaesthesia has not yet been demonstrated for continuous administration (Denny and Selander

1998). Prolonged RA techniques usually involve the insertion of catheters for repeated or continuous drug administration at the selected site, and may therefore be considered as “minimally” invasive techniques.

Central nerve block techniques, including epidural analgesia, may potentially increase the risk of spinal haematoma, which may be increased during anticoagulation therapy and/or in conditions affecting coagulation, such as trauma or sepsis. Consensus statements for the general surgical population have been published by both the American and European societies for regional anaesthesia (Horlocker et al. 2003). In general, abnormalities of prothrombin time, activated partial thromboplastin time and/or platelet count are risk factors for epidural haematoma. Practice parameters are suggested for patients undergoing anticoagulant therapy, such as placing the central block 12 hours after and 2 hours before a dose of low-molecular weight heparin. Continuous peripheral nerve blocks (CPNBs), where

applicable, could represent a safer alternative in patients with intractable coagulation abnormalities.

Multiple drug-resistant pathogens are often found in ICUs, so that the risk of contamination of the entry site and subsequent soft-tissue with indwelling catheters must be considered, and the risk of infection of peripheral or the central nervous system. In an analysis of 75 ICU patients receiving epidural analgesia for a median of 4 days, Darchy and colleagues (1996) reported that 36% developed local signs of inflammation (erythema and/or local pus discharge), and 12% had positive cultures at the insertion site (Darchy et al. 1996). No neurological or systemic complications were seen, and there was no significant association between local erythema and subsequent infection, suggesting that erythema alone is not an indication for catheter removal. Interestingly, the colonization rate in ICU patients was lower than that reported in the general hospital population (15% versus 20-28%) as reported in large series (McNeely et al. 1997; Simpson et al. 2000). This might be related to the extensive use of antibiotic prophylaxis reported in the ICU setting.

Peripheral nerve catheters seem to be associated with a lower risk of local infection, at least in the general hospitalized population. The incidence of signs and symptoms of local infection in two large series of axillary and brachial plexus block ranges from 0.2% to 0.8%, with no systemic infection reported (Bergman et al. 2003; Borgeat et al. 2003). From a theoretical viewpoint, a catheter placed for lower-limb blocks at the gluteal or inguinal level might be considered at higher risk of contamination and colonization. In an analysis of 208 femoral catheters placed for postoperative analgesia in orthopaedic patients, Cuvillon and colleagues found a colonization rate of 57.0% at 48 hours (Cuvillon et al. 2001). Local infection was investigated by ultrasonography, and no abscesses or cellulitis were found. The authors report three (1.4%) “signs” of sepsis, which spontaneously resolved after catheter removal.

Several techniques have been proposed to reduce colonization and infection rates, including specific disinfectants (Birnbach et al. 2003), entry-site dressings (Shapiro et al. 1990), tunnelling of perineural catheters (Boezaart 2002) and intensive nursing care of the catheter. In the absence of specific information on ICU patients, extensive colonization control should be weighed against a relatively low risk of clinically significant infection, increased patient discomfort and increased nursing workload.

Dosing Regimens

There has been much debate as to the most effective technique for administering RA in a variety of settings. Continuous thoracic epidural analgesia (TEA) and paravertebral blocks (PVB) have been evaluated in chest trauma

patients (Karmakar and Ho 2003). Only the use of central or peripheral nerve blocks with local anaesthetic (LA) has been demonstrated to improve respiratory variables (Karmakar and Ho 2003) and pain control (Worthley 1985), and reduce ventilation-dependent days and hospital stay (Karmakar and Ho 2003). Significant results have been obtained using either continuous infusions or intermittent boluses administration.

Patient-controlled RA (PCRA), with either a minimum infusion rate or only patient-controlled boluses, seems to be the most efficient approach to pain management in general surgical populations. Advantages include equivalent or improved pain control (Lubenow et al. 1994; Singelyn et al. 1999) with reduced LA consumption and complications (Eledjam et al. 2002; Standl et al. 2003). If an ICU patient is awake and able to understand and cooperate, he or she could effectively operate a PCRA device; however, in the routine ICU setting, patients usually need at least a light sedation to tolerate the endotracheal tube and/or synchronization with a mechanical ventilator, and this clearly interferes with accurate patient pump control.

An advantage of PCRA is the possibility of objectively weighting patient discomfort throughout the treatment by calculating the ratio between delivered and requested boluses. This index is less precise than direct scoring of pain intensity with visual analogue pain scales (VAS) or numerical rating scores (NRS); however, it does not depend on the patient’s ability to communicate. Pain measurement tools based on behavioural and physiological variables have also been developed and validated in the post-anaesthesia care unit population (Mateo and Krenzischek 1992; Puntillo et al. 1997), and are currently recommended by the SCCM in patients who are not able to communicate (Jacobi et al. 2002). Although they take longer to measure, these scales may be useful for patients who are not able to communicate or activate patient-controlled RA devices.

Cognitive dysfunction commonly occurs in the ICU, as a result of direct brain trauma or secondary to other conditions, and may prevent the patient from effectively understanding instructions, or performing even simple

purposeful actions, such as pressing the bolus release button. In these cases, when appropriate, the clinician can simply switch the patient to a continuous-infusion RA, titrated to the behavioural/physiological pain response. Nurse-controlled analgesia protocols have been successfully employed in the ICU setting in cardiac surgery patients, although studies are limited to intravenous analgesia. This technique has been shown to be inferior to patient-controlled analgesia (Pettersson et al. 2000), but may represent an alternative to continuous infusion for disabled patients. Existing protocols for nurse-controlled sedation could be modified to take into account patient pain, and to deliver RA. However, additional research is needed to assess efficacy and efficiency of this procedure, particularly as nurse-controlled analgesia increases staff workload.

It is our opinion that specific devices should be employed, whenever bolus modes are used. Patient-controlled infusion pumps are specifically designed to simplify the bolus delivery procedure, eliminating the requirement for the patient to be able to communicate with the nurse. Additionally, PCRA devices have lockout time and precise dose settings, decreasing excessive or imprecise dosage risks. They also reduce the need for catheter manipulation, reducing inadvertent removal or contamination risks.

Conclusions

Regional analgesia may be a valuable tool in the management of post-surgical or trauma patients in the ICU. Its benefits include improved comfort in the fully awake or lightly sedated patient, reduced opioid consumption with minimum effects on patient weaning, and reduced stress

response to injury. These advantages should be weighed against the risk of infection and haemorrhage, especially when performing central blocks. Plasma levels of absorbed LA in patients with alterations of capillary permeability (sepsis, burns) should also be investigated, since high concentrations may lead to brain and myocardial toxicity. Future research should focus on the net impact of effective pain and stress control on outcome.

Dosing regimens for RA should be individualized. Patients who are able to operate the bolus release button are likely to benefit from PCRA techniques. The role of continuous, low-rate background infusion remains unclear, but it might be useful, as lightly sedated patients may have decreased responsiveness.

PCRA devices may be useful even when nurse or physician controlled intermittent analgesia is used, as they are more easily and safely operated. Nurse controlled analgesia protocols may be safer and more effective than continuous infusions titrated “as needed”. However, these protocols are likely to increase staff workload, as effective pain assessment requires communication or the use of specific behavioural and physiological scales.

Published on : Wed, 20 Jul 2011