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Editorial

Regional analgesia as the core component of multimodal analgesia technique: Current controversies and future directions

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Optimal pain management facilitates ambulation and rehabilitation, and therefore is essential for enhanced recovery after surgery [1]. Because pain is a complex and multifactorial phenomenon, multimodal analgesic strategy is recommended; however, it is inadequately and inappropriately applied in day-to-day clinical practice [2]. This is likely due to broad and conflicting guidelines that do not always reflect rapidly changing perioperative care and consequently may not have current clinical relevance [1].

While optimal analgesic combinations remain elusive, a multimodal regimen would include at the minimum efficacious, safe, and inexpensive non-opioid analgesics ('basic analgesics') such as acetaminophen, nonsteroidal anti-inflammatory drugs (NSAIDs), cyclooxygenase (COX)-2 specific inhibitors, and corticosteroids. Thus, unless contraindicated, all patients should receive a combination of acetaminophen and NSAIDs or COX-2 specific inhibitors administered either preoperatively or intraoperatively and continued as scheduled dosing postoperatively (Table 1). In addition, unless contraindicated, a single intraoperative dose of dexamethasone 8–10 mg, IV should be administered because of its well-documented antiemetic and analgesic properties and safety profile.

In addition to systemic 'basic analgesics', regional analgesia techniques and/or surgical site infiltration (local infiltration analgesia), are considered core components of an optimal multimodal analgesia regimen [1]. Despite well documented benefits, the use of local/regional analgesia techniques in clinical practice remains variable and low [2–4]. The possible reasons for continued underuse of regional analgesia include system factors such as lack of resources, time pressures, and institutional constraints. Other factors that might deter their use include the lack of training, perception of limited benefits, and unfounded concerns of adverse effects. Also, the surgeon may deem regional analgesia inappropriate due to concerns of inability to perform neurological evaluation, fear of masking compartment syndrome, falls, or delayed mobilization, and preference to surgical site infiltration. These factors can be addressed through anesthesiologist and surgeon education and implementation of a multidisciplinary patient- and procedure-specific pain management pathways.

When considering regional analgesia, it is first necessary to determine if the block would further improve pain relief when combined with basic analgesics and surgical site infiltration. For example, in patients undergoing laparoscopic or robotic surgery, adding interfascial plane blocks to basic analgesics plus port-site infiltration may not be beneficial [1]. Similarly, although epidural analgesia and intrathecal morphine have been shown to improve pain relief after laparoscopic colorectal surgery, they are unnecessary because pain can be adequately managed with basic analgesics and surgical site infiltration [1]. Nevertheless, regional analgesia may be appropriate if basic analgesics are not administered or contraindicated. Also, regional analgesia may offer benefits to patients at high risk of postoperative pain, although evidence for this is lacking.

A critical factor in selection of a regional technique is the potential for adverse effects (i.e., higher risks versus benefits) and its invasiveness (i.e., neuraxial versus peripheral blocks). Thus, although neuraxial blocks (e.g., epidural analgesia, paravertebral blocks, and intrathecal morphine) provide excellent pain relief, they may be inappropriate because they are more invasive and have a greater potential for adverse effects (e.g., delayed ambulation, nausea, vomiting, pruritus, urinary retention, and respiratory depression). Given these concerns, neuraxial blocks are increasingly being replaced with more peripheral techniques such as interfascial plane blocks and/or surgical site infiltration which provide similar postoperative pain outcomes. Similarly, femoral nerve blocks provide excellent pain relief after knee surgery; however, they can cause muscle weakness and delay ambulation, and are therefore being replaced with adductor canal blocks.

In recent years a plethora of interfascial plane blocks is emerging–many differ minimally. Often these novel techniques are advocated despite lack of high-quality evidence. Given the burgeoning options,

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Table 1
Optimal comprehensive multimodal analgesic strategy.

- Preoperative screening and optimization of patients at high risk of postoperative pain
- Patient and caregiver education
- Acetaminophen and non-steroidal anti-inflammatory drugs (NSAIDs) or cyclo-oxygenase (COX)-2 specific inhibitors, administered either preoperatively or intraoperatively and continued postoperatively, PLUS intraoperative dexamethasone 8–10 mg, IV, unless contraindicated
- Regional analgesia ± surgical site infiltration (procedure-specific and patient-specific)
  - o Torso surgery (e.g., thoracic or abdominal wall and intra-thoracic or intra-abdominal surgery): interfascial plane blocks (e.g., erector spinae plane blocks) ± surgical site infiltration
  - o Major upper extremity surgery: brachial plexus blocks (interscalene or axillary approaches)
  - o Major hip surgery: surgical site infiltration ± fascia iliaca block
  - o Major knee surgery: surgical site infiltration ± adductor canal block
  - o Major ankle surgery: adductor canal block + popliteal sciatic blocks
- Opioids, immediate release, as rescue ('as needed')
- Non-pharmacological interventions (procedure-specific and patient-specific)
  - o Physical modalities: transcutaneous electrical nerve stimulation, acupuncture, continuous passive movement, cryotherapy, and lifestyle improvement (e.g., exercise, yoga, etc.)
  - o Psychological modalities: stress reduction, attentional strategies, behavioral therapies (e.g., music therapy, cognitive-behavioral therapy [e.g., relaxation, distraction, imaging, virtual reality], biofeedback [e.g., therapeutic touch], peer-to-peer or other peer support, case management, psychotherapy)

selecting the best technique can be challenging in day-to-day clinical practice. To overcome this issue, a smaller number of versatile, efficacious, and easy-to-perform procedure-specific blocks have been suggested (Table 1) [5]. Of the interfacial place blocks, erector spinae plane blocks are emerging as the best option for thoracoabdominal wall and cavity surgery [6].

Surgical site infiltration, which is easy to perform, safe, and inexpensive can be an alternative to interfascial plane blocks. However, it is imperative to meticulously infiltrate all the layers of the surgical wound under direct visualization prior to closure of the incision [7]. For example, in patients undergoing abdominal surgery the peritoneal, musculofascial, and subdermal planes should be infiltrated. Similarly, for patients undergoing joint surgery periarticular infiltration of every tissue plane that is incised should be infiltrated. This requires large volumes of local anesthetic depending upon the size of the incision, although the maximum dose of local anesthetic administered is based upon the patient's weight. Local anesthetic solutions are often combined with additives such as epinephrine, morphine, clonidine, ketorolac, and methylprednisolone; however, the evidence for their benefits is lacking.

Ideally, the regional analgesic technique should match the anticipated pain trajectory (patterns of pain regression and resolution). Pain after resolution of the block (i.e., rebound pain) can influence patient satisfaction and willingness to have future blocks [8]. Similarly, it can cause surgeon dissatisfaction and reluctance to use blocks. Furthermore, rebound pain can lead to post-discharge emergency room visit and hospital admission. The duration of regional analgesia can be prolonged with the use of catheters, but their use is limited due to technical difficulty in placement, the need for resources, and relatively high failure rate. Alternatively, additives (e.g., dexamethasone and clonidine) may be combined with local anesthetic solution. However, duration of prolongation with the additives is limited and there are concerns of adverse effects (e.g., bradycardia and hypotension from clonidine). Given these concerns, the primary question remains whether it is appropriate to perform single injection regional blocks. Current evidence suggests that with optimal multimodal analgesia regimens, single injection blocks may be appropriate. For example, pain after total knee arthroplasty can be adequately managed with basic analgesics and surgical site infiltration ± single injection adductor canal block [9]. However, it is necessary to optimize scheduled non-opioid analgesics and as needed opioids, as well as follow-up patients appropriately and educate them about realistic expectations and management strategies.

Although the benefits of regional analgesia are well recognized, there are several areas where evidence is lacking or insufficient. Most studies assess single modality analgesic therapies (i.e., one technique versus placebo or another technique), and they do not include basic analgesics within the analgesic regimen [10]. Future studies should compare regional analgesic techniques against basic analgesics. Also, it is necessary to compare individual regional techniques as components of optimal multimodal analgesic regimens. Furthermore, the optimal regional analgesic technique (i.e., the type and dose of local anesthetic with or without additives) needs to be critically evaluated. With the move towards a minimally invasive surgical approach, which reduces postoperative pain, there is a need to compare analgesic efficacy, adverse effects, and costs of interfascial plane blocks and surgical site infiltration with both groups receiving basic analgesics. Most importantly, there is an urgent need to identify optimal analgesic regimens that would allow improved pain relief and ambulation while avoiding adverse side effects in this challenging population (e.g., high pain responders).

It is important to recognize that most regional analgesia studies are performed by experienced practitioners, and therefore, the challenges in block placement, the success rate, and the incidence of adverse events observed in these studies may not reflect those in day-to-day clinical practice. Thus, there is a need to perform well-designed, standardized prospective cohort studies, with minimal confounding factors with blocks performed by everyday practitioners.

Most studies assess pain intensity at rest, but it imperative to also measure movement-evoked pain as well as measure procedure-specific functional outcomes (e.g., ability to ambulate or breathe deeply), psychological outcomes (e.g., psychological responses to pain experiences), and other patient-centered outcomes. Importantly, these outcomes should be evaluated for a prolonged period (ideally one year).

Characterization of pain resolution and pain progression (pain trajectory) is critical in optimizing postoperative pain. However, most studies evaluating postoperative pain resolution are flawed or inadequately designed as they do not consider factors that influence pain trajectories. Pain trajectories are dependent on a complex interplay between the surgical procedure (e.g., minimally invasive versus open approach) and patient characteristics (e.g., low risk versus high risk of postoperative pain) as well as the use of basic analgesic regimen. Furthermore, integration of optimal multimodal analgesia regimens within a multidisciplinary enhanced recovery pathway can also influence pain trajectories [1].

In summary, an optimal multimodal analgesic technique should be patient-specific and procedure-specific (Table 1). In addition to basic analgesics, regional analgesia and/or surgical site infiltration should be administered when possible (Table 1). In fact, for several surgical procedures, surgical site infiltration is now included as basic analgesic [9]. The decision on the type of regional analgesic technique, local anesthetic type and dose, the use of additives or the mode of application (i.e., single shot versus continuous infusion) are typically based on the risks and benefits and the experience of the anesthesiologist as well as the availability of resources. Opioids should be administered only as rescue on an 'as needed' basis to achieve pain comfort and promote return of function within the framework of goals at each stage of recovery (e.g., deep breathing/coughing and ambulation), but not to achieve a certain pain score. The analgesic regimen should be adjusted based on patient characteristics (i.e., low-risk versus high-risk patients), adequacy of pain relief, and presence of adverse events. Multimodal analgesia regimens along with non-pharmacological modalities should be integrated within a multidisciplinary enhanced recovery pathway. Finally, it is necessary to update multimodal analgesic regimens when new evidence becomes available.

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