



PRE-EMPTIVE ANALGESIA; SALVAGE FOR THE PATIENTS: AN OVERVIEW

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ABSTRACT

Pain from surgical procedures occurs as a consequence of tissue trauma and may result in physical, cognitive, and emotional discomfort. Almost a century ago, researchers first described a possible relationship between intraoperative tissue damage and an intensification of acute pain and long-term postoperative pain, now referred to as central sensitization. Nociception activation is mediated by chemicals that are released in response to cellular or tissue damage. Pre-emptive analgesia is an important concept in understanding treatment strategies for postoperative analgesia. Pre-emptive analgesia focuses on postoperative pain control and the prevention of central sensitization and chronic neuropathic pain by providing analgesia administered preoperatively but not after surgical incision. Additional research in pre-emptive analgesia is warranted to better determine good outcome measurements and a better appreciation with regard to treatment optimization.

INTRODUCTION

Pre-emptive analgesia (PEA), the concept of which originated during the time of growing appreciation of dynamic characteristics of pain pathway, is the administration of effective analgesia prior to the surgical trauma [1]. Recent understandings in pre-emptive analgesia have defined it as an intervention given before incision or surgery, given that it is more effective than the same treatment administered after incision or surgery [2,3]. It is important to remember the timing of pre-emptive analgesia in that it is an antinociceptive treatment given prior to incision or surgery. This helps to prevent the development of altered processing of afferent input, which would otherwise amplify postoperative pain [4]. Therapeutic options for PEA include virtually all analgesic modalities and drugs individually or in combination.

The underlying assumption is that a pretreatment strategy reduces acute pain scores and analgesic requirements more than post-surgical treatment [5]. Timing of the initiation and ability to prevent sensitization are central to the use of PEA. However results have been disappointing and controversial because intense pain during recovery period may still sensitize the nociceptive pathway counteracting the benefits of PEA. Moreover highly effective post-operative analgesic regimen may obviate the need of PEA.

Allodynia, hyperalgesia, and reflex hyper excitability- presumably all caused by sensitization of the nervous system-also occur in surgical patients, suggesting a potential for pre-emptive analgesia in humans [6].

MECHANISM OF PEA (PRE EMPTIVE ANALGESIA)

Central sensitization and wind up depend on the activity of N-methyl-D-aspartic acid (NMDA) receptors in the dorsal horn. Antagonism at this receptor can prevent and even abolish these changes, suggesting that antagonists

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have a place in preventing and treating this pathological pain. The only NMDA antagonist clinically available is the anaesthetic drug ketamine, but more useful agents with fewer undesirable effects on higher function are awaited with interest. Peripheral sensitisation may also occur. Injury may sensitize nociceptors, causing hyperalgesia at the site of injury and in surrounding non-traumatized tissue. The mechanisms include the activity of chemical mediators from damaged tissue such as leukotrienes, bradykinin, histamine, and metabolites of arachidonic and sympathetic activity. In addition a recently identified group of pain afferents (usually functionally dormant and called "sleeping nociceptors") has been shown to be activated by inflammation and may contribute to peripheral sensitization to pain after injury [8]. Agents able to interrupt these two mechanisms should be able to bring about pre-emptive analgesia.

USES OF PEA (PRE EMPTIVE ANALGESIA)

1. Local anaesthetic infiltration with bupivacaine before inguinal herniorrhaphy reduced wound hyperalgesia compared with GA alone. This effect was seen 10 days after surgery and was superior to Spinal anaesthesia [9].
2. Patients who underwent inguinal herniorrhaphy under GA with preincisional infiltration of the incisional site, with lignocaine requested for the first dose of the analgesic after a prolonged period and less frequently thereafter than those who received lignocaine infiltration at the time of closure [10].

DISCUSSION

Pre-emptive analgesia has, indeed, been said to have been shown to occur in several clinical studies. Both premedication with opioids and local anaesthetic block before incision delayed the request for analgesia after orthopaedic surgery when used individually and more impressively, in combination [11]. Various non-steroidal anti-inflammatory drugs given before surgery have been shown to have analgesic effects. Tverskoy et al [9] reported that patients treated by infiltration of a local anaesthetic and then given general anaesthetic for hemiorrhaphy experienced less pain and for shorter duration, than patients who received general anaesthetic alone. Spinal blockade produced intermediate results. Pre-emptive analgesia may be relevant to the management of chronic pain; a Danish study showed a reduction of phantom limb pain for up to one year when ischaemic pain was treated effectively with epidural analgesia before amputation [12]. McQuay pointed out that though such studies show clinical benefit from analgesic interventions before surgery the mechanism might not be pre-emptive analgesia because the study designs did not compare identical analgesic interventions after the surgical stimulus [13]. Studies designed to compare identical analgesic interventions before and after injury have now been published. Pre-emptive local anaesthetic field block for inguinal hemiorrhaphy resulted in reduced pain scores and

a delay in requests for analgesia during the six hours studied by Ejlersen et al [10] but similar work detected no pre-emptive effect over a longer period." Katz et al [14] found that patients given epidural fentanyl shortly before thoracotomy reported less pain and used less supplementary analgesic afterwards, while others found no equivalent effect of epidural bupivacaine and morphine before major abdominal surgery [15].

Woolf and Chong [16] and Wall [17] hypothesized that an antinociceptive intervention given pre-emptively, ie, before the start of surgery, would decrease the intensity of postoperative pain, decrease hyperalgesia, and prevent central sensitization when compared with the same intervention given after the start of surgery. However, subsequent clinical studies of the hypothesis of pre-emptive analgesia by comparing antinociceptive interventions given before incision versus after incision yielded contradictory results. Preventive analgesia encompassing multimodal antinociceptive interventions, started preoperatively and given for an increased duration including the postoperative period was found to be more effective in terms of decreasing postoperative pain and reducing analgesic consumption in the postoperative period. Preventive analgesia employing multimodal pain management for a longer duration and combining multiple analgesic treatments reduces untoward side effects, allowing more rapid recovery and earlier discharge from hospital [18]. These conflicting findings probably arise in part from differences in the effectiveness and time course of the afferent blockade of nociceptors by the different interventions. Furthermore, the sensitizing effect of extensive nociceptive stimulation from surgery may prove much more difficult to block than the limited chemical or thermal stimuli used in animal models of pain. Nor do we know how long afferent blockade must be continued during and after surgery to ensure that neuronal plasticity is prevented and not simply delayed. These considerations are important now that modern clinical anaesthesia uses low concentrations of volatile anaesthetics which abolish consciousness but may still allow sensitization of the cord unless nociceptive input is otherwise reduced-a concern voiced 80 years ago by Crile. Perhaps general anaesthesia should be combined with pre-emptive local and regional anaesthetic blocks more often [19].

CONCLUSION

Preincisional infiltration with long acting local anaesthetic agent provides effective PEA, especially when combined with other modalities of analgesia. Preventive analgesia is not time-constrained and involves the use of analgesic interventions perioperatively. Without a proper pain management plan, postoperative pain has the potential to result in chronic pain, with long-term negative consequences for the patient. Prevention of this pain has been dubbed as the "holy grail of anesthesiology", with more studies currently underway. "Preventive analgesia" may be a more appropriate term for all these efforts cov-



ering the perioperative period rather than the previously used term “pre-emptive analgesia” which has narrower connotations. As is so often the case, more work needs to be done. Some encouraging laboratory and clinical studies

suggest that preemptive analgesia does reduce pain after surgery, but the optimum choices of agents and timing required for a clinically useful effect remain to be established.

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