

A Review of the Efficacy of Pre-Emptive Analgesia in Mandibular Third Molar Surgeries

B. Nair^{[1]*}, V. Ebenezer^[2], B. Ramalingam^[3]

*Sree Balaji Dental College and Hospital,
Velachery Road, Narayanapuram, Pallikaranai, Chennai, Tamil Nadu, India -600100*

* bhagyasreenair.omfs@gmail.com

Abstract:

In daily dental practice, removal of teeth is one of the most common procedures. The surgery to extract the mandibular third molar is a relatively invasive procedure. It is often associated with postoperative pain, swelling and trismus, which are problematic for both the patient as well as the surgeon. Postoperative pain increases the patient's suffering and anxiety. Pre-emptive analgesia consists of a variety of methods used to manage postoperative pain by preventing central sensitization in advance to the surgical trauma. This concept has also been utilized for the reduction of pain after removal of teeth.

Pre-emptive analgesia can be provided through several methods:

1. Prevention of input to the nociceptors by local anaesthesia
2. Inhibition of inflammation and peripheral sensitization by NSAIDs
3. Prevention of central sensitization by narcotic analgesics [7—11]

An effective combination of these methods may be optimal to suppress postoperative pain.

The effect of pre-emptive analgesia on postoperative pain is more likely to be seen in thoracic, abdominal and orthopaedic surgery, in which, it is firmly established that central sensitization is due to surgical tissue damage. In the head and neck region, pre-emptive analgesia effects have been investigated in surgeries involving nociceptors of a relatively large areas like in the cases of tumor surgery, maxillary sinus surgery and orthognathic surgery. Central sensitization due to tissue damage can be inhibited by the presurgical administration of an analgesic. Subsequently in order to inhibit postsurgical peripheral sensitization, analgesia is administered again. This is considered to be a more successful method for suppressing postoperative pain.

INTRODUCTION

In daily dental practice, removal of teeth is one of the most common procedures. The surgery to extract the mandibular third molar is a relatively invasive procedure. It is often associated with postoperative pain, swelling and trismus, which are problematic for both the patient as well as the surgeon.

Postoperative pain increases the patient's suffering and anxiety, and may also disrupt the homeostasis of the circulatory and endocrine systems of the body [1— 3]. It is also reported that postoperative pain may have a negative influence on wound healing. Thus, analgesia that has a fast action and is reliable is desired. Nonsteroidal anti-inflammatory drugs (NSAIDs) are the drug of choice for post-operative pain management after exodontia. However, if severe pain occurs, it may be difficult to successfully manage the pain with solely the administration of NSAIDs. Moreover, given the potential for acid NSAIDs to precipitate serious side effects in some of the patients, the type and amount of drug must be carefully selected [4]. Pre-emptive analgesia consists of a variety of methods used to manage postoperative pain by preventing central sensitization in advance to the surgical trauma [7]. This concept has also been put to use for the reduction of pain after removal of teeth [8].

Concept of Pre-emptive Analgesia

Noxious stimuli that are strong enough to cause tissue damage may be the cause of hypersensitivity, hyperalgesia, allodynia or abnormal paraesthesia. This may lead to the onset of pain by non-invasive stimuli. This can be attributed to the combination of peripheral sensitization associated with the lowered threshold of nociceptors as

well as central sensitization linked to the increased excitability of central nervous system [5,6]. Local tissue damage and inflammation along with various sympathetic terminal- derived chemical mediators are the ones responsible for peripheral sensitization. They increase the excitability of dorsal horn neurons, which is followed by central sensitization.

Once central sensitization takes place, the body response to analgesics is inefficient [7]. The concept of pre-emptive analgesia minimizes postoperative pain by preventing central sensitization before the commencement of the surgery. After the establishment of central sensitization, postoperative hyperesthesia is prolonged due to surgical tissue damage. It takes additional time for improvement from this condition. However, if pre-emptive analgesia is given before surgery, central sensitization gets suppressed. Due to this, postoperative hyperesthesia will not occur. Alternatively, if only postoperative analgesic treatment is given, central sensitization is established. Hence, the postoperative hyperesthesia is only temporarily inhibited [7].

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Pre-emptive analgesia for postoperative pain

Many studies have confirmed the positive effects of pre-emptive analgesia and investigated various methods of application such as the presurgical administration of NSAIDs, or the presurgical administration of ketamine [13–16].

A relatively limited number of studies cover the effects of pre-emptive analgesia in oral surgery, other than removal of teeth [8,18–20]. Kato et al. compared presurgical versus end-of-surgery administration of flurbiprofen in patients undergoing oral surgeries like fixation of the fractured jaw bone under general anaesthesia and concluded that there was no significant difference in the intensity of postoperative pain between the two groups [18]. Nagatsuka et al. compared a group that received multiple analgesic treatments (rectal administration of diclofenac; intravenous administration of 0.1% butorphanol; block and infiltration anaesthesia with 1% lidocaine) before surgery versus a group that did not receive any pain-control medications, in patients undergoing orthognathic surgery (sagittal splitting ramus osteotomy) under general anaesthesia. They reported that analgesic effects were not observed in the post-anaesthesia care unit [19]. Incidentally, Abe et al. compared three groups: local anaesthesia; preoperative administration of ketamine; and preoperative administration of flurbiprofen, in patients undergoing maxillary sinus operation under general anaesthesia, based on the intensity of postoperative pain and time to the first rescue medication. In this study, all the three groups showed significantly lower postoperative pain when compared to the control group. Hence, they reached a conclusion that pre-emptive analgesia effects were observable and evident [20].

The reported data points towards the possibilities of preoperative analgesic treatment being effective against postoperative pain. For the timing of analgesic treatment, however, preoperative administration may not always be better or more efficient than post-operative analgesia. Therefore, it might not be possible to apply the concept of central sensitization in oral surgery.

DISCUSSION:

The effect of pre-emptive analgesia on postoperative pain is to be seen more evidently in thoracic, abdominal and orthopaedic surgery. This is because of the firmly established fact that central sensitization is due to surgical tissue damage.

In the head and neck region, pre-emptive analgesia effects have been investigated in surgeries involving nociceptors of a relatively large areas like in the cases of tumour surgery, maxillary sinus surgery and orthognathic surgery. It is considered that various chemical mediators that are associated with surgical inflammation act to continuously stimulate the local nociceptors and thus, induce peripheral sensitization. Secondly, the inflammatory reaction may provide a source of sensory signals. These signals may induce central sensitization.

For surgeries with a strong reactive postsurgical inflammation, sensitized and severe postoperative pain is likely to occur.

The level of difficulty of the surgical removal of a mandibular impacted third molar depends on the type of impaction of the tooth. Majority of patients reported to have undergone surgery that lasted approximately 30 min, in which a mucoperiosteal flap needed to be raised. Bone removal or tooth division were also needed based on the level of the tooth impaction, anatomy of the roots etc. These extractions can be considered to be of medium difficulty level.

In comparison to thoracic and abdominal surgery, the surgical area in minor oral surgery is limited. As a result, the level of surgical tissue damage is much smaller. On the other hand, since the surgical invasion is extended into the bone, it may be assumed that the surgical stimulations may induce peripheral sensitization due to postsurgical reactive inflammation, rather than direct central sensitization.

Many Randomized Controlled Trial studies confirmed the inhibition of postoperative pain through the administration of NSAIDs before the extraction of the tooth [21–29]. This is said to be due to the inhibition of the central sensitization resulting from tissue damage, at the time of removal of the impacted third molar and also the inhibition of peripheral sensitization resulting from inflammation after the removal of the tooth. Pre-emptive administration of NSAID is considered to induce pre-emptive analgesia by inhibiting peripheral sensitization.

In conclusion, for the removal of mandibular third molars by open surgical method, the process of central sensitization due to surgical tissue damage can be inhibited by the pre-emptive administration of an analgesic. Following this, in order to inhibit postsurgical peripheral sensitization, analgesia may be administered again. This is considered to be a more successful method for suppressing postoperative pain.

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