

MANAGEMENT OF INFLAMMATORY COMPLICATIONS IN THIRD MOLAR SURGERY

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Running Title - Management of Inflammatory Complications in Third Molar Surgery

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Abstract: Tooth extraction is linked to dentists who perform oral surgery and one of the most performed procedures in the specialty of oral and maxillofacial surgery is removal of impacted teeth, especially third molars. Pain, swelling and trismus are common complications associated with third molar surgery. The reasons for tooth impaction include several factors subdivided into a local and general factors such as position and size of adjacent teeth, dense overlying bone, excessive soft tissue or a genetic abnormality including abnormal eruption path, dental arch length and space in which to erupt. These complications have been reported to have an adverse effect on the quality of life of patients undergoing third molar surgery. This article reviews the different modalities in minimizing the pain and inflammatory complications in third molar surgeries. Oral surgeons should be aware of the different modalities of alleviation of these complications to make postoperative recovery more comfortable for patients.

Keywords: Extraction, Third molar, Surgery.

INTRODUCTION:

A wisdom tooth or third molar is one of the three molars per quadrant of the human dentition. The wisdom teeth have long been identified as a source of problems and continue to be the most commonly impacted teeth in the human mouth and are often extracted when this occurs. Impaction is defined as failure of teeth to erupt into the dental arch within the expected time. Clinically and radiographically, there are two types of impactions namely complete and partial. Complete impaction is referred to as where the tooth is covered by bone and mucosa and is prevented from erupting into a normal functional position; partial impaction is referred to as where tooth is partially visible or in communication with oral cavity, but it has failed to erupt fully into a normal position [1]. Third molar surgery is one of the most common procedures performed in oral and maxillofacial surgery offices and is often attended by complications which are distressing to patients [2]. Pain, swelling and trismus are common complications associated with third molar surgery. These complications have been reported to have an adverse effect on the quality of life of patients undergoing third molar surgery. Many clinicians have thus emphasized the necessity for better pain, swelling and trismus control in patients who undergo third molar surgery [3]. Methods range from surgical closure techniques, use of drains, physical therapy and pharmacological means in order to minimize the inflammatory effects during a third molar extraction. Studies reviewed have shown that no single modality effectively minimizes postoperative pain, swelling and trismus without undesirable effects [4]. Several professionals have concentrated on emphasizing the need for better controlling the postoperative inflammatory process of such surgical procedures, and different drugs have been proposed for such. Corticosteroids may inhibit the onset of inflammatory mediator's synthesis and are they help in controlling pain, oedema and trismus [5] [6]. Other studies reported modalities include physical therapeutic methods such as cryotherapy and laser treatment [7]. This article aims at reviewing the modalities in managing the inflammatory complication in a third molar surgery.

CLOSURE TECHNIQUE:

The closure technique is an operative factor that deals with the maintenance of pain and swelling as the intensity of these factors are diminished. There are two types of closure techniques namely, primary and secondary closure. Primary and secondary closure are used for the wound management after extraction of impacted lower third molars. There have been many studies to determine the effect of these wound closure techniques on postoperative pain, swelling and trismus. Primary closure is the complete repositioning of the third molar flaps using sutures such that healing is by primary intention, while in secondary closure healing is by secondary intention and the socket remains in communication with the oral cavity [8]. Danda et al. made a split-mouth study and concluded that the secondary closure of the wound produces less postoperative pain and swelling than the group with a primary closure [9]. Alternatively, Bello et al. reported lower swelling in the group with a partial closure of the wound but they did not find

differences regarding trismus or pain [10]. Creating a 'window' by excising the mucosa immediately distal to the second molar are one of the different methods that have been achieved on secondary closure and describe in published reports on closure techniques [11]. Hashemi et al. reported lower scores of pain and swelling in the group without suture. The benefits from a no suture technique are the lower cost, less operative time, less manipulation of soft tissue and hence, less postoperative morbidity [12].

MUCOSA EXCISION:

Pasqualini et al did a study on 200 patients (122 women, 78 men; age range 19–27 years) with totally or partially bone-impacted mandibular third molar, Class C with mesial inclination included in the series. The study concluded that secondary closure of the socket causes less inconvenience to the patient as it appears to reduce pain and post extraction swelling [13]. In the first group, the mucosa was hermetically sutured to receive a primary healing. In the second group, a 5-6mm wedge of mucosa lying close to the second molar was removed to obtain secondary healing. Hence the mean pain score in both groups was obtained and showed 0.57cm, on a 0-5 cm visual analogue scale. This difference was statistically significant. In another study on 56 patients, Dubois et al extracted both mandibular third molars in a continuous pattern. The closure on the right was a window of approximately 6mm diameter which was created via the excision of the mucosa distal to the second molar and the socket was left open to heal by secondary intention while the primary closure was present on the left. The secondary closure was found to minimise swelling and pain after the procedure, thus reducing patients' discomfort [14] [15]. Few authors are in favour of closed healing, whereas other authors report that primary healing causes more pain and advances in swelling [16]. In another study conducted, Dander et al recorded the overall mean differences of 0.27cm and 0.54 cm (on a 0-5cm visual analogue scale) for swelling and pain respectively after the postoperative evaluation. These differences were significant for both parameters of pain and swelling ($p < 0.05$) [17]. The process of tissue excision may contribute to the surgical trauma and may result in prolonged operation time which leads to delayed healing [18]. Thus, other less traumatic techniques of minimizing the inflammatory complications associated with third molar surgery are needed to be taken into consideration.

USE OF DRAINS:

Cerqueira et al in a comparative study of the effect of a tube drain in impacted lower third molar surgery, recorded a difference of 0.26cm (on the visual analogue scale) in facial swelling between drain and no drain groups at 24 hours postoperative review. This difference was significant but had no significant change in the pain and swelling parameters [19]. In another study, S. Rakprasitkul et al 1997 indicated that group which had the third molar removed with primary closure and surgical tube drain had much less swelling compared to the group in which only primary closure was done [20]. Although the changes in the difference between the trismus in both weren't significant. Rakprasitkul and Pairuchvej [21] reported a 4-minute difference in the surgical time between patients who had primary closure alone and those who had primary closure plus insertion of a rubber tube drain. Henceforth the insertion of a surgical drain either in the form of a gauze or a rubber tube may add to the surgical time and may result in more trauma for the patient. In addition, the presence of a gauze or a rubber tube inside the mouth for a period of about 48-70 hours cannot be tolerated by patients due to its irritating sensation. Chukwunke et al [22] reported a higher pain score in patients due probably to the irritating effect of a rubber drain. A comparative study of the effect of a tube drain on postoperative discomfort following third molar surgery found that incorporation of a drain resulted in less swelling and trismus without any effect on pain. They recorded a mean difference of 5.4% ($t=5.8$, p) [22]. In addition, drains may act as a source of infection and could be aspirated or swallowed if not properly secured.

DRUGS AND PHYSICAL THERAPY:

The drugs commonly used to minimise the postoperative pain, swelling and trismus are analgesics and corticosteroids. Different therapeutic administration of drugs bring out a different change in the pain and trismus parameter.

ANALGESICS:

Analgesics are used to control postoperative pain after oral surgical procedure. Postoperative dental pains are usually moderate and of short duration and analgesics are often required for the first 24-48 hours [23]. Analgesics are classified as antipyretic analgesics, nonselective nonsteroidal anti-inflammatory drugs (NSAIDs), cyclooxygenase-2 (COX-2) selective NSAIDs, and opioids. Noxious stimuli that are strong enough to induce tissue damage can cause hypersensitivity, hyperalgesia, allodynia and abnormal paraesthesia leading to the onset of pain by non-invasive stimuli. This is attributed to the combination of peripheral sensitization associated with the lowered threshold of nociceptors and central sensitization linked to the increased excitability of central nervous system [24]. Acetylsalicylic acid (ASA) or aspirin in doses of more than 4 g/d can provide an anti-inflammatory effect. Nevertheless, it is usually administered for its antipyretic and analgesic actions. These actions are a consequence of ASA's irreversible inhibition of cyclooxygenases through covalent binding of the acetyl residue. Although all NSAIDs have a structure related to ASA, their inhibition of cyclooxygenase is reversible. Therefore, ASA will have a more profound effect on platelet function inhibiting aggregation and prolonging bleeding time. Moller et al [25] in a study compared the onset of acetaminophen analgesia using oral and intravenous methods after third molar surgery and found that the process was shorter for the intravenous route but no significant benefit in terms of analgesic efficacy. Ong and Tan [26] found lower pain intensity score, longer time for rescue medication (9 hours versus 7 hours, $P=0.007$) and less postoperative acetaminophen consumption ($P=0.02$) in the ketoralac group by comparing the efficacy of preoperative intravenous tramadol and ketorolac. They concluded that ketoralac was more effective in prevention of postoperative dental pain.

CORTICOSTEROIDS:

Corticosteroids are a class of steroid hormones that are produced in the adrenal cortex of vertebrates, as well as the synthetic

analogues of these hormones. Corticosteroids are involved in a wide range of physiological processes, including stress response, immune response, and regulation of inflammation, carbohydrate metabolism, protein catabolism, blood electrolyte levels, and behaviour [27]. The two most widely used are dexamethasone and methylprednisolone. In 1969, a study by Hooley and Francis, 26 patients who received prophylactic oral betamethasone immediately before surgery experienced much less edema, 50% less pain and used 50% less analgesics after surgery than the control group [28]. Markiewicz et al [29] showed in a study where all corticosteroids have been compared to methylprednisolone. The effect of treatments administered either immediately or later after surgery has been analysed. Data obtained report a reduction of 0.6 mm and of 0.5 mm of swelling at 1–3 and 7 days, respectively. Baxendale et al had evaluated the effect of a single prophylactic dose of 8 mg oral dexamethasone on postoperative sequelae after mandibular third molar surgery in study of 50 adult patients. Dexamethasone resulted in significant pain reduction. The incidence of severe swelling was also reduced significantly, but there was no effect on trismus [30]. Oral dexamethasone administration shows a post period effect, which is inherent to its pharmacokinetics. However, it is a convenient, safe and low-cost route. Graziani et al [31] studied the effect of submucosal and endoalveolar administration of dexamethasone sodium phosphate to prevent inflammatory effects after surgical removal of lower third molars. It was found that both submucosal and endoalveolar administration of dexamethasone shows a reduction in postoperative sequelae after surgical removal of lower wisdom teeth. The steroid group showed greater reductions in all clinical parameters recorded compared to the control group. Peterson et al [32] advocated the use of corticosteroids to help minimize pain, swelling and trismus. Administration of steroid following third molar surgery is effective in reducing the postoperative inflammatory response associated with this procedure. Corticosteroids are not indicated for continuous. Rather, they should be used for more complex oral surgical procedure in which trauma is categorized as moderate to severe.

LASER:

The use of laser is a relatively new method of reducing postoperative discomfort, especially oedema, after third molar surgery. Low level laser treatment has been used for the prevention of swelling and trismus after the removal of impacted third molars, following periodontal surgery procedures, for reducing orthodontic post adjustment pain, as well as for the treatment of chronic facial pain, chronic sinusitis and gingivitis. Laser increases protein absorption by activating macrophages, modifying hydrostatic and capillary pressure, and inducing the absorption of interstitial fluids with consequent reduction in oedema. Roynesdal et al. [33] investigated the effect of soft-laser application on postoperative swelling and trismus, they carried out extraction of both lower third molars similarly impacted in two separate operations, irradiating unilaterally with a 6-J semiconductor laser at 830 nm, 40 mW, and found pain reduction—and decreases in swelling and trismus—at 9 h, without statistically significant differences. Neckel and Kukizl [34] studied two groups which had undergone extraction of a lower third molar, applying 11 J/cm² of energy with a laser diode at 810 nm intraorally at the surgical site. Statistical evaluation had showed significant reduction in the pain levels from the recorded number of days and levels of postoperative pain. Carillo et al. [35], In their 100 patients study, they had randomly allocated to receive helium-neon laser, ibuprofen or placebo in a prospective parallel clinical trial, they observed that pain was significantly less in the ibuprofen group compared with helium-neon laser and placebo groups and found that trismus was significantly reduced in the helium-neon laser and ibuprofen groups. The swelling seen in all the three groups were the same. The use of laser in third molar surgery is non-invasive, painless and has no adverse effect that have been reported in patients. However, its use in developing countries is still limited due to its high cost [36] [37] [38].

CONCLUSION:

Postoperative swelling is a common event after surgery of impacted third molar and may affect, only for a few days, the social and working life of the patient. This article has presented the different modalities in pain management, trismus management and effective inflammatory management in third molar surgeries. In the postoperative period, the use of ice pack is largely recognized to provide good results and it helps the patient to cooperate with pharmacological treatments and/or intraoperative strategies in the prevention of oedema. In addition, there may be no need for additional medications such as the use of steroids. All the data developed by this article can be useful for clinicians to analyse all the parameters which provide discomfort in third molar surgeries.

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