

MANAGEMENT OF PAIN AFTER THIRD MOLAR SURGERY: A REVIEW OF LITERATURE AND RECENT ADVANCES

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SUMMARY

Background:

Pain has been identified as the most common cause of postoperative morbidity after the surgical removal of impacted lower third molars which could be severe enough to affect the patients' daily life. Several studies have been done on impacted mandibular third molars in developed countries, where several millions of dollars are spent annually on the management of impacted third molars, yet morbidity following lower third molar surgery still remains a great concern to many clinicians.

Objective:

The aim of this review is to evaluate and highlight the different methods available for the control of pain after lower third molar surgery. This will enable oral surgeons carrying out lower third molar surgical procedures to be properly guided and well informed on postoperative pain management.

Conclusion:

The studies reviewed did not confirm the effectiveness of the routine use of any systemic or local agent for the control of pain after third molar surgery without other undesirable effects. Consequently several non-therapeutic methods have been devised by oral surgeons to control the postoperative pain to a tolerable level.

Keywords: *third molar surgery-pain-management.*

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Accepted For Publication: 21st May 2006

INTRODUCTION

Several studies have been done on impacted mandibular third molars in developed countries, where several millions of dollars are spent annually on the management of impacted third molars¹ yet morbidity following lower third molar surgery still remains a great concern to many clinicians.² Pain is a very important surgical morbidity expected after third molar surgery.

Pain as defined by the International Association of the Study of Pain (IASP), is an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage.³ Pain has adverse physiological and emotional effect and research suggests that pain management is an important factor in better outcome of patients' managements.^{4,5}

Perception of pain is always subjective since pain is a subjective phenomenon and only the patient can therefore determine its severity.⁶

The post-surgical pain after third molar surgical procedure begins when the effect of the local anaesthesia subsides and reaches its maximum intensity during the first 12 hours postoperatively.⁷ Pain, which requires analgesics for control rarely, extends beyond 48 hours.⁵ A large variety of analgesics is available for management of post surgical pain including non-steroidal anti-inflammatory drugs such as ibuprofen.⁷

Women appear to be more sensitive to pain than men.^{5,7,8} Prolonged severe pain could be a sequel to alveolar osteitis or dry socket after third molar surgery, which varies between 3% and 25% in a study population.⁹ The incidence of dry socket seems to be higher in smokers¹⁰ and in female patients on oral contraceptives.¹¹ Its occurrence can be reduced by several techniques most of which are aimed at reducing the bacteria contamination of the surgical site. Deficient oral hygiene is associated with increased pain from dry-socket following lower third molar surgery, and thus with a greater use of

analgesics and preoperative mouth rinses with chlorhexidine the incidence of dry socket is reduced.⁹ Copious irrigation of the surgical site with large volume of physiologic saline is effective in reducing dry socket after third molar surgery.⁹

The use of a drain in association with the suture procedure may alleviate or minimize postoperative sequence in form of pain.¹² A drain allows the patient to experience a more comfortable postoperative period in relation to the pain, swelling and trismus, because it permits the drainage of the fluids located in the tissue spaces.¹³ The use of a tube drain when primary closure is to be done following third molar surgery has been advocated for reduction of postoperative pain following third molar surgery.¹² The use of a Penrose rubber drain after mandibular third molar removal appears to minimize postoperative pain and analgesic consumption, and thus contributes to enhanced patient comfort.¹⁴

The aim of this review is to evaluate and highlight the different methods and recent advances available in literature for the control of pain following lower third molar surgery. This will enable oral surgeons carrying out lower third molar surgery to be properly guided and well informed on pain management after third molar surgery.

THE PHARMACOLOGICAL APPROACH

The use of drugs to reduce the effect of inflammation after the surgical removal of impacted lower third molar is as old as the procedure itself because apart from other morbidities, pain is an integral part of every surgical procedure and the need to control pain after surgery is not in doubt.¹⁵ The drugs commonly used to minimize pain after third molar surgery can be considered under the following headings:

Analgesics and Corticosteroids.

Analgesics

The main use of analgesics in dentistry is for controlling postoperative pain after a dental surgical procedure. Post operative dental pain is usually of short duration and analgesics are often required for the first 24-48 hours.⁵ Analgesics for use in dentistry are classified into three groups; peripherally acting, centrally acting and compound analgesic.

Peripherally acting analgesics include aspirin, paracetamol, ibuprofen, mefenamic acid diflunisal, and other non-steroidal anti-inflammatory drugs. They act by inhibiting the synthesis of some of the biochemical mediators of pain produced in damaged or injured tissues. These analgesics also possess anti-inflammatory properties and some exhibit an anti-pyretic effect. They are particularly effective in management of postoperative dental pain with a major inflammatory component following surgical procedures.

The opioids morphine, pethidine, codeine and pentazocine are mainly centrally acting analgesics but their efficacy in dental pain is poorly established and they are mainly used in hospital practice to treat moderate to severe pain¹⁶.

Analgesics are consumed in vast quantities throughout the world because many are readily available to the public especially in this environment. It is not surprising that such wide-spread use of these drugs has resulted in a large number of unwanted effects. The most commonly used analgesics after lower third molar surgery are paracetamol (acetaminophen), ibuprofen and diclofenac.^{17, 18}

Paracetamol is an aniline derivative which possesses analgesic, antipyretics and weak anti-inflammatory properties. At normal therapeutic doses, paracetamol is a remarkably safe analgesic. There are very few medical contra-indications to its use and the drug can safely be prescribed to the very young, the pregnant and breast-feeding mothers and to the very old.

Panadol is a brand of paracetamol which contains ionic sodium and long-term use should be avoided in patients where salt intake should be restricted. This includes patients with hypertension, cardiac or renal insufficiency and pregnant women with oedema. Paracetamol has occasionally been implicated in skin rashes, white blood cell disorder and thrombocytopenia. However, the most serious side effect is hepatotoxicity in overdose.

Clinical manifestation of liver damage occurs 2-4 days after overdose and includes hepatic tenderness followed by jaundice and coagulation disorder due to impaired production of the clotting factors. Survival after paracetamol overdose is unlikely if more than 60 percent of liver cells are necrotic.¹⁹ It is readily available to the public and is often used in attempted suicide.²²

Ibuprofen is a propionic acid derivative and has a similar pharmacodynamic profile to aspirin. Propionic acid derivatives are probably the most widely used non-steroidal anti-inflammatory drugs (NSAIDs) and very effective in controlling pain and reducing swelling after the surgical removal of impacted lower third molars. The incidence of unwanted side effects from ibuprofen and other propionic derivatives are uncertain, with some reviews suggesting that these drugs are well tolerated²⁰, while other studies report an incidence of unwanted effects in the range of 10 – 30 percent.²¹ Unwanted effect include dyspepsia, gastrointestinal disturbances, bone marrow aplasia, haemorrhage, skin rashes and transient optic nerve dysfunction which is totally reversible on cessation of the drugs.²²

Ibuprofen may produce bronchoconstriction in aspirin-sensitive asthmatics, and those with nasal polyp, thus this drug should be avoided in asthmatic patients. However, several studies have shown that ibuprofen remains one of the best drugs of choice after lower third molar surgery^{16, 17, 18, 20} because apart from

controlling pain, ibuprofen has a reduction effect on swelling.

Diclofenac (cataflam) is a non-steroidal anti-inflammatory drug derived from phenylacetic acid. It possesses analgesic, anti-pyretic and anti-inflammatory properties. Diclofenac is available as tablets, suppository and as a preparation for intramuscular administration. It was recently introduced for use after the lower third molar surgery¹⁶. The main unwanted effect of this drug are gastrointestinal disturbances ranging from bleeding, ulceration or even perforation of the intestinal walls. Thus in line with other NSAIDs, diclofenac should not be given to a patient with history of gastrointestinal disturbances. Diclofenac has also been implicated as a cause of chronic hepatitis²³. Diclofenac should not be prescribed to breast-feeding mothers or pregnant women.

Corticosteroids

Corticosteroids are hormones produced by the adrenal cortex, and they have a diverse range of properties and functions. Therapeutically, corticosteroids are mainly used for their anti-inflammatory and immunosuppressive properties, and in replacement therapy. In dentistry, they are principally used for their anti-inflammatory properties in reducing swelling and trismus especially after third molar surgery. Recent studies have shown that pre-operative corticosteroids are effective in controlling post-operative dental pain after third molar surgery.²⁴

Peterson²⁵ advocated the use of corticosteroid to help minimize pain, swelling and trismus. He noted that the most effective method of usage is yet to be defined. It was observed that an initial intravenous dose of steroid at the time of surgery had a major clinical impact on pain in the early postoperative period. Also he concluded that if the initial intravenous dose is not followed up with additional doses of steroid, this early advantage disappears by the second or third postoperative day. He stated

that maximum control of pain and swelling requires that additional steroids be given for 1 or 2 days following surgery.

The two most widely used steroids are dexamethasone and methylprednisolone. Both of these are almost pure glucocorticoid with little mineralocorticoid effect. Common dosages of dexamethasone range between 4 to 12 mg given intravenously at the time of surgery. Additional oral dosages of 4 to 8mg twice a day commenced on the day of surgery and two days afterwards leads to a maximum relief of pain, swelling and trismus.

Methylprednisolone is most commonly given intravenously 12mg at the time of surgery followed by significantly lower doses, usually 4mg three or four times daily taken orally for the day of surgery and for two days after surgery. Peterson maintained that high dose, short-term usage has minimal side effect.

For several decades surgeons have administered corticosteroids before, or just after third molar surgery to reduce inflammation and improve recovery from sequel of inflammation, pain, swelling and trismus^{24,27,28}. However, the use of steroid is contraindicated in the patient with gastric ulcer, active infection and a certain types of psychosis such as psycho-neurosis and euphoria. The potential complications of peri-operative corticosteroids use are adrenal suppression and delayed wound healing.²⁸ Some authors²⁹ however, reported a high incidence of alveolar osteitis (dry socket), thus making another alternative agent for the reduction of pain imperative.

NON-PHARMACOLOGICAL APPROACH

Different surgical and closure techniques were employed by several authors to reduce the postoperative morbidity in form of pain after the removal of impacted lower third molar. Tetsch and Wegner³⁰ observed that when a lingual split bone technique was employed during surgical procedure, the postoperative

morbidity in form of pain was reduced. On the other hand, Rood et al.³¹ investigated the effect of removal of impacted lower third molar on pain, swelling and trismus using the lingual split bone technique. The result of the study indicates that the lingual split bone techniques have no advantage over the use of bur technique through the buccal approach. A subjective assessment of pain and swelling following the surgical removal of impacted third molar teeth using different surgical techniques was carried out by Shevel et al.³² The result of this study shows that when a small incision was used, with minimal reflection of the mucoperiosteum, the subjective evaluation of patients is that there is significantly less postoperative pain than when the larger standard incision is used. Garcia et al.³³ investigated the effect of raising a mucoperiosteal flap on trismus and pain after extraction of impacted third molars. The result showed no significant difference in those in whom mucoperiosteal flap was not raised. Holland and Hindle³⁴ in their study observed that pain after third molar surgery may be associated with the type of suture technique and the length of surgical intervention. They used a suturing technique that led to primary healing while Berge³⁵ and Akota et al.³⁶ employed secondary closure technique. While there was reduction of postoperative pain in those with secondary closure, the healing of the wound was faster in those with primary intention. Hellner et al.³⁷ while comparing the primary closure and gauze drain technique after third molar surgery, observed that the subjective disturbance of patients treated with dressed gauze was less and that the dressing technique leads to reduction in pain. This in line with similar studies by Brabander and Cattaneo.³⁸ Pasqualini et al.³⁹ in their recent report on primary and secondary closure of the surgical wound after removal of impacted mandibular third molars, concluded that in cases of equal intra-operative difficulty, open healing of

surgical wound after third molar removal produces less postoperative pain than occurs with closed healing by hermetically suturing the socket.

RECENT ADVANCES

The use of drugs for the control of pain has been undergoing several modifications. The latest studies focus on the topical application of opioids and NSAIDs, to avoid the side effects associated with systemic dosing and on the combination of analgesics in order to reduce the individual doses and thus limit adverse effects

Modification of the Pharmacological Approach

Paracetamol in a dose of 1 g as single therapy or in combination with 60 mg of codeine has been shown to be effective for the treatment of pain after oral surgery.⁴⁰ Codeine at a dose of more than 60 mg produces a significant increase in adverse effects, without concomitant improvement in analgesia.⁴¹ Mehlish⁴⁰ advocated the combination of 1 g of paracetamol with 10 mg of oxycodone in cases of intense pain.

The use of NSAIDs and steroidal anti-inflammatory drugs in the pre- and intra-operative phases is beneficial in terms of pain reduction and swelling after the third molar operation⁴². Certain cytokines have been related to tissue damage, including IL-1b, whose pharmacological reduction with ibuprofen affords a reduction in pain.⁴² Joshi et al.⁴³ in their study, observed that a dose of 400 mg of this drug every 8 hours orally leads to a reduction in postoperative pain in 65% of the patients subjected to dentoalveolar surgery.

NSAIDs require higher doses in order to achieve adequate anti-inflammatory effects compared with the dosage needed to afford good analgesia. In the case of ibuprofen, 2400-3200 mg/day orally in divided doses are needed to achieve anti-inflammatory action,

while analgesia is provided by 200-600 mg 4 four times a day, or 800 mg three times a day.⁴⁰

Ketorolac with codeine also achieves adequate pain control after the extraction of impacted lower molars. The best results are obtained by oral mix combining 10 mg of ketorolac and 15 mg of codeine phosphate. In this way the amount of codeine required for pain relief is reduced along with its adverse effects.⁴⁴ A study by Zackova et al.⁴⁵ shows that ketorolac and tramadol show similar postoperative analgesic performance, significant differences between the two drugs being limited to their respective side effects. No differences are observed between doses of 10 and 20 mg of ketorolac in the treatment of postoperative pain – efficacy being superior to that of 50 mg of ketoprofen.⁴⁶

Two specific cyclooxygenase-2 inhibitors (COXIBS), celecoxib and rofecoxib, have been introduced, with an efficacy similar to that of naproxen, ibuprofen, diclofenac and acetylsalicylic acid (aspirin) for the treatment of dental pain. Rofecoxib induces analgesia comparable to that produced by other NSAIDs such as ibuprofen 400mg,⁴⁷ though the duration of the effect exceeds 24 hours after a single dose, and is not associated with gastrointestinal adverse effects. The duration of action in the case of celecoxib is similar to that of rofecoxib, though its analgesic potential is slightly less.⁴⁸ Both drugs allow convenient dosing (1-2 daily doses).⁴⁷ Chang et al.⁴⁹ maintained that a single dose of 50 mg of rofecoxib affords greater analgesia, a faster onset of analgesic action, and a longer-lasting effect than a single dose of 50 mg of diclofenac in patients with pain associated with lower molar surgery. However, since little is yet known of the long-term effects of the COXIBS, it is advisable to limit their use to patients with a risk of developing severe gastrointestinal complications due to NSAIDs, and when chronic pain is involved.⁵⁰

Although rofecoxib is more expensive than other NSAIDs, it is less expensive than the sum of the cost of these latter drugs plus the addition of a gastroprotective agent such as omeprazole.⁵⁰ The administration of an opioid or a local anaesthetic prior to surgical intervention postpones the onset of pain. The efficacy of the local anaesthetic administered before or after surgery is the same – provided it is applied before pain develops.⁵¹ Fentanyl (an opioid) injected in combination with local anaesthetics such as mepivacaine, increases and prolongs the anaesthetic effect in inflammatory zones. This in turn implies a lesser need for postsurgical analgesic measures.⁵²

Transdermal administration of Fentanyl or the suppositories in the management of pain after third molar surgery have not been documented to the best of our knowledge. Intranasal tartrate butorphanol (Stadol NS®), a synthetic analgesic-opioid agonist-antagonist, offers great efficacy and safety in controlling pain after third molar extraction. It is moreover easy to administer, the analgesic effect is rapid, and administration is possible when the patient has difficulties swallowing. This medication affords 50% pain reduction within 15 minutes after the first dose, and the effect lasts about four hours. Ladov et al.⁵³ suggested the use of intranasal Stadol NS® as first choice pharmacological treatment of pain after third molar extractions and oral surgery in general. Desjardins et al.⁵⁴ recommended a dose of 1.0 mg with the purpose of reducing the adverse effects.

Introduction of Laser Therapy

In recent time, a modern method of reducing postoperative pain with laser therapy has been developed. Maskova and Smekal⁵⁵ while highlighting the effect of laser therapy in dentistry are of the opinion that laser irradiation of the alveolus along with the lingual and buccal bony wall after molar extraction will lead to faster coagulation, less postoperative pain and quicker healing

In their study, Rucero et al.⁵⁶ evaluated the effect of different frequencies of lower-level laser radiation (diode-670nm and helium-neon 632,8nm) on healing process after human molar extraction. They concluded that laser therapy objectively improves extraction wound healing, less postoperative pain which is contributory not only due to subjective feelings of the patients who accept laser therapy but also due to its non-invasiveness and painlessness.

A randomized double-blind clinical trial on the effectiveness of helium-neon laser in the prevention of pain, swelling and trismus after removal of third molars was carried out by Carrillo et al.⁵⁷ in 100 patients randomly allocated to receive helium-neon laser, ibuprofen or placebo in a prospective parallel clinical trial. They found trismus to be significantly reduced in helium-neon laser and Ibuprofen groups while pain was significantly less in the Ibuprofen group with regard to helium-neon laser and placebo groups but swelling was the same in the three treatment groups.

Roynesdal⁵⁸ investigated the effect of soft laser application on postoperative pain following molar extraction and found the use of laser therapy helpful in minimizing this postoperative variable.

The Use of Drain

The search for less complicated and cost effective ways of reducing post-operative pain has lead to several researches by dental clinicians and oral surgeons across the world. The use of various types of drains after third molar surgery from the literature has been shown to reduce postoperative variables. Poeschl et al.⁵⁹ in a study on postoperative complication employed the use of postoperative antibiotic treatment on one group of their patients and a local iodoform gauze drain on the other group after third molar surgery. The result of the study showed that postoperative prophylactic antibiotics

treatment after third molar surgery does not contribute to better wound healing, less pain, swelling and better mouth opening and could not prevent inflammatory problems after surgery. Instead there was a remarkable reduction of pain in patients with the iodoform gauze drain.

Ayad et al.¹⁴ in their study on comparative prospective randomized study of surgical removal of mandibular wisdom teeth with and without rubber drain found a significant difference between the two methods. This investigation compared the effect of 2 methods of wound closure ; primary closure technique with and without Penrose drains (Natural latex). In both the test group (n = 27) and control group (n = 25), the molar were removed using a buccal mucoperiosteal flap. The test group received a drain partially submerged into the socket to secure more drainage of wound secrete. Examinations were performed 1 day, 3 days and 7 days after surgery, and pain, swelling, trismus and analgesic consumption were recorded. Analysis of variance indicated that there was a significant difference between the two methods ($P < 0.05$). The drain method appears to minimize postoperative pain and analgesic consumption, and thus contributes to enhanced patient comfort.

CONCLUSION

The surgical removal of impacted mandibular teeth has been associated with postoperative pain which is serious enough to affect the patient's daily activities. Proper management of pain after the surgical removal of impacted lower third molar still remains an important factor in patients' postoperative recovery and comfort. Therefore, every effort must be ensured by oral surgeons carrying out third molar surgery in controlling this postoperative variable to a minimum level for patients' perceived comfort. The studies reviewed did not confirm the effectiveness of the routine use of any systemic or local agent in

preventing or reducing this postoperative variable without other undesirable effects hence the recent advances in development of non-invasive and non-therapeutic methods. In view of the available data on the effectiveness of these methods, oral surgeon carrying out third molar surgical procedure should be well informed and properly guide to consider the use of any of these methods with less unwanted side effects for effective control of pain after third molar surgery.

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