

Comparative evaluation of efficacy and latency of twin mix vs 2% lignocaine HCL with 1:80000 epinephrine in surgical removal of impacted mandibular third molar

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ABSTRACT

Introduction: A prospective randomized double-blind controlled trial was conducted to evaluate the latency and duration of pterygomandibular nerve block with a mixture of 1.8 ml 2% lignocaine with 1:80,000 epinephrine and 1 ml of 4 mg dexamethasone and its impact on postoperative sequelae after surgical extraction of impacted mandibular third molars. **Materials and Methods:** This study was conducted in 40 subjects referred to the department of oral and maxillofacial surgery; they were divided into 20 subjects each in group A and B with the age range of 18–72 years planned for elective surgical removal of unilateral impacted mandibular third molar. Each patient was randomly selected to receive anesthesia using 1.8 ml 2% lignocaine with 1:80,000 epinephrine in group A or 2.8 ml twin mix (1.8 ml 2% lignocaine with 1:80,000 epinephrine + 1 ml 4 mg dexamethasone) in group B. After injection of the anesthetic solution, the time to anesthetic effect, duration of anesthesia from initial patient perception of the anesthetic effect to the time when the effect subsides, need to reanesthetize the surgical site were recorded, and 10-point visual analog scale (VAS) was used to subjectively assess the overall pain intensity while injecting the study drug, during surgery, and in the postoperative period. **Results:** Mean VAS value for pain on local anesthetic injection was less in twin-mix group. The time of onset of the local anesthetic was significantly less for the study group T, 51.35 ± 7.15 s when compared with patients in study group C (P less than 0.0001). The duration of soft tissue anesthesia was longer for all the patients in the study group T. On comparative evaluation between study group C and study group T, patients in the control group had more severe swelling and reduction in mouth opening in the postoperative period. **Conclusion:** The addition of dexamethasone to lignocaine and its administration as an intraspace injection significantly shortens the latency and prolongs the duration of the soft tissue anesthesia, with improved quality of life in the postoperative period after surgical extraction of mandibular third molars.

Keywords: Dexamethasone, impacted tooth, lignocaine, twin mix

Introduction

The removal of impacted third molar is the most common surgical procedure performed in oral surgery.^[1] The surgical

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procedure causes trauma to the soft and bony tissues resulting in pain, swelling, and trismus in the postoperative period, thereby causing considerable distress to the patient. Postoperative swelling and edema may be due in part to the conversion of phospholipids into arachidonic acid by phospholipase A₂, and the resultant synthesis of prostaglandins, leukotrienes, or thromboxane-related

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substances which act as mediators of the inflammatory response. These symptoms are not observed immediately after surgery but rather begin gradually, peaking 2 days after the procedure. Apart from nonsteroidal antiinflammatory drugs, corticosteroids have been widely used in a number of clinical trials as an aid to improve the post-surgical sequelae.^[2] Steroids prevent diapedesis, the initial leakage of fluids from the capillaries, and stabilize the membranes of the cellular lysosomes which hold large quantities of hydrolytic enzymes. There is also a decrease in the formation of bradykinin, a powerful vasodilating substance, thereby reducing the postoperative swelling.^[3] However even with ample clinical trials, clinicians remain uncertain about the preferred route of administration of steroids.^[4] This study compares the effectiveness of pterygomandibular nerve block using 2% lignocaine HCL with 1:80,000 adrenaline to twin mix (4 mg of dexamethasone mixed with 2% lignocaine Hcl with 1:80,000 adrenaline) on postoperative discomfort after mandibular third molar surgery.

Materials and Methods

Patient selection and anesthesia

This study was conducted with kind approval from the institutional ethical committee (20-12-2017) with proper signed informed consent being taken from the patients before the procedure.^[5] The study containing 40 subjects, referred to the department of oral and maxillofacial surgery, were divided into 20 subjects each in group A (control group) and group B (twin-mix group). Patients within the age range of 18–60 years planned for elective surgical removal of unilateral impacted mandibular third molar and fulfilling the inclusion criteria were selected for the study. All patients were of Indian origin. The inclusion criterion was ASA Class I subjects presenting with unilaterally impacted mandibular third molar with similar difficulty indices. The exclusion criteria were the presence of acute infection and/or swelling and pain at the time of surgery, medically compromised patients, any history of allergy to local anesthetic drugs, and refusal of informed consent. Each patient was randomly selected to receive anesthesia using 1.8 ml 2% lignocaine with 1:80,000 epinephrine in group A or 2.8 ml twin mix (1.8 ml 2% lignocaine with 1:80,000 epinephrine + 1 ml 4 mg dexamethasone) in group B. Preparation of twin mix was done by mixing 1.8 ml of 2% lignocaine with 1:80,000 epinephrine with 1 ml of 4 mg dexamethasone immediately before dispensing.^[6] The same operator performed all inferior alveolar nerve block injections in a standardized manner. Two plane aspiration was done and the solution was deposited at the rate of 1 ml/min. After injecting the anesthetic solution, the time to anesthetic effect was recorded (defined as the time elapsed from full needle withdrawal until the onset of subjective signs of anesthesia), also the duration of anesthesia was recorded from initial patient perception of the anesthetic effect to the time when the effect subsides. The need to reanesthetize the surgical site was also recorded. A 10-point visual analog scale (VAS) was used to subjectively assess the overall pain intensity while injecting the

study drug, during surgery, and in the postoperative period. All the findings were carefully recorded and statistically analyzed.

Surgical procedure

All the patients received antibiotics (amoxicillin + clavulanic acid 625 mg) 1 h prior to surgery. Surgical access to the mandibular third molars was achieved using wards or modified ward's incision depending upon the difficulty level of impaction, mucoperiosteal flap was raised, and bone removal was done with a 702 surgical carbide tapered fissure bur (SS White) using straight surgical micro-motor/hand piece under copious normal saline irrigation. The impacted tooth was removed in toto or after odontectomy as desired, based on the type of impaction and root pattern. Surgical site was thoroughly irrigated and sutured with 3–0 silk sutures. The time required for each surgical procedure was recorded from incision to the placement of the last suture. Postoperative instructions were given to the patients. All the patients were prescribed tablets amoxicillin + clavulanic acid 625 mg and diclofenac potassium 50 mg tablet twice for 5 days. Each patient was evaluated for postoperative pain, facial swelling, and maximal mouth opening on the first, third, and seventh postoperative day. Pain was recorded using 10-point VAS scale; facial swelling using measurements between tragus to angle of mouth, menton, and angle of mandible, and postoperative maximal mouth opening interincisally using vernier caliper.^[7]

Results

All the 20 nerve blocks in group B (twin-mix group) were successful, not requiring reanesthesia, whereas, in group A (control group), 05 out of 20 subjects required the need for reanesthesia. The mean time recorded for the surgical procedure was 26.9 ± 4.12 min for study group A and 29.8 ± 4.18 min for study group B, showing no statistical difference ($t = 0-2.206$, $P = 0-0.73$). Mean VAS value for the pain/sting on local anesthetic injection/block was 1.05 ± 0.68 for study group B which was comparatively less than study group A, i.e. 1.70 ± 1.08 [Table 1]. Time of onset of local anesthesia was 51.35 ± 7.15 s for study group B which was significantly less as compared to 80.85 ± 10.00 s for study group A, showing the much faster onset of anesthesia in case of twin-mix group. The mean duration of soft tissue anesthesia was clinically and statistically much longer for study group B (250.85 ± 37.86 min) than study group A (142.10 ± 36.84 min) Table 2. Intraoperative VAS scores did not show any statistical difference between the study group B (0.75 ± 0.85) and the control group A (1.75 ± 0.91). Postoperative mean visual analog scale scores for group B were

Table 1: Mean VAS value for the pain/sting on local anesthetic injection/block

Solution	Mean (\pm SD) VAS value for the pain/sting on local anesthetic injection/block
2% Lignocaine with 1:200,000 Epinephrine	1.7000 ± 1.08
Twin mix	1.0500 ± 0.68

lower in the first, third, and seventh postoperative day [Table 3]. On the first postoperative day, in the control group A, there was a gradual increase in the facial swelling from the first to third postoperative day followed by the reduction in the swelling till seventh postoperative day. In the study group B, facial swelling was maximum on the first postoperative day followed by a reduction in the swelling till seventh postoperative day. Mean reduction in mouth opening in group B was significantly lower on the first, third, and seventh postoperative day. On comparative evaluation between study group A and study group B, patients in the control group had more severe swelling and reduction in mouth opening in the postoperative period. Recovery from the local anesthetic was complete, without any residual deficit in all the patients in both the study groups.

Discussion

Every oral surgeon encounters problems of pain, swelling, and trismus associated with third molar surgery.^[3] Steroids are added to local anesthetic agents in order to prolong the duration of anesthesia and improve the quality of pain relief. This combination provides both neuroaxial route and peripheral nerve blocks.^[8-10] Dexamethasone exerts potent antiinflammatory action by inducing the synthesis of endogenous proteins, which acts by blocking the enzymatic activation of phospholipase A2.^[11] Dionne *et al.* stated that glucocorticoids act as potential suppressor agents of multiple signaling pathways involved in the inflammatory response causing decreased levels of inflammatory mediators at the site of injury, and therefore, corticosteroids are used as the drug of choice used after surgical procedures to suppress acute inflammatory manifestations.^[12]

Bhargava *et al.* in their prospective study used dexamethasone as an intraspace injection in surgical removal of mandibular third molars and found that addition of dexamethasone to lignocaine and its administration as an intraspace injection significantly shortens the latency and prolongs the duration of the soft tissue anesthesia, thereby improving the quality of life in the postoperative period.^[11]

In our study, 1 ml (4 mg) dexamethasone with 2% lignocaine is used as an intraspace injection prior to third molar surgery.

Table 2: Mean latency and duration of the soft tissue anesthesia in the study groups

Study group	Mean latency in sec (\pm SD)	Mean duration in min (\pm SD)
Group C	80.8500 \pm 10.00	142.1000 \pm 36.84
Group T	51.3500 \pm 7.15	250.8500 \pm 37.86
t ²	-10.728	9.206

All the patients in group T showed a mean latency of 51.3500 ± 7.15 s and longer duration of soft tissue anesthesia (mean 250.8500 ± 37.86 s).

Grossi *et al.*^[13] concluded that corticosteroids are primarily used after surgical procedures for suppressing tissue mediators of inflammation, thereby reducing transudation of fluids and lessening edema. Although some reduction of postoperative pain generally accompanies a reduction of edema, steroids alone do not have a clinically significant analgesic effect.

In our study, patients in study group T showed a significant reduction in VAS score on the first, third, and seventh postoperative day.

In a well-conducted trial with patients serving as their own control, Graziani *et al.*^[14] investigated the effect of submucosal injection of dexamethasone 4 mg in 43 subjects undergoing bilateral surgical extraction of lower third molars. With regard to the edema analysis, each treatment subgroup showed a reduced postoperative degree of edema compared with the control group, as highly significant on the second postoperative day as after 1 week.

In agreement with Graziani *et al.*,^[14] our data shows that the intraspace administration of dexamethasone 4 mg resulted in a highly significant decrease in edema on the third postoperative day.

Bhargava *et al.*^[15] in their study concluded that twin-mix administration did reduce the severity of trismus in the study patients when seen in comparison to the control group. The reduction of trismus may be attributed to the suppression of fluid transudation and relatively lesser edema in the twin-mix group.

In our study, patients in study group T showed a significant reduction in postoperative trismus in the first, third, and seventh day.

Berrada *et al.* reported in their study that alkalization of local anesthetic agents may shorten the onset time and lengthen the duration of action and, hence, increases its clinical effectiveness, and makes its injection more comfortable.^[16] Local anesthetics exist in equilibrium between the basic uncharged (nonionized) form, which is lipid-soluble, and the charged (ionized) cationic form, which is water-soluble. Lipid soluble, nonionized form of the local anesthetic penetrates the neural sheath and nerve membrane. The ionized form of the local anesthetic binds with the sodium channel and prevents the propagating of nerve

Table 3: Mean operative and postoperative visual analog scale scores

Study group	Mean visual analog scale scores (\pm SD)			
	Surgical Procedure	First postoperative day	Third postoperative day	Seventh postoperative day
Group C	1.7500 \pm 0.91047	2.7500 \pm 1.16416	2.1000 \pm 1.02084	0.9000 \pm 0.91191
Group T	0.7500 \pm 0.85070	1.2000 \pm 0.76777	0.6000 \pm 0.68056	0.2000 \pm 0.41039

impulses. Altering the pH to a more basic solution tends to increase the amount of nonionized form compared to ionized form which will speed the onset of action. Increasing the pH of lidocaine decreases the pain associated with its infiltration.^[17]

This study utilized 2.8 ml study solutions for pterygomandibular nerve blocks to maintain volume parameter consistent in twin-mix groups, 1 ml more than the standard inferior alveolar block. Steroid induces shorter onset and prolonged duration, apart from change in pH, which may also be due to the property of vasoconstriction of dexamethasone, or by an increase in the activity of the inhibitory potassium channels on nociceptive C-fibers (via glucocorticoid receptors), thus decreasing their activity.^[18,19] Addition of dexamethasone increases the pH, thereby increases the amount of free base of the local anesthetic, decreases the time required for onset of the anesthetic, decreases pain during injection, and improves overall patients postoperative comfort and quality of life as demonstrated by the postoperative VAS scores and measurements for the facial swelling and reduction in mouth opening.

In this study, patients in group T showed a significantly faster onset of anesthesia (mean: 51.35 ± 7.15 s). Pain during injection for both groups C and T does not show much statistical difference, whereas VAS score for group T shows a significant decrease in pain on postoperative first, third, and seventh day.

Facial swelling for patients of group T shows a significant decrease in the postoperative first, third, and seventh day with the peak level on the third postoperative day. Patients of group T does not show much decrease in mouth opening as compared to group C.

Conclusion

Clinical anesthetic efficacy of twin mix offers the advantage of single prick co-administration of dexamethasone with local anesthetic, lesser sting of local anesthetic injection, shorter aesthetic latency, and prolonged duration of the soft tissue anesthesia and a decrease in postoperative discomfort after the oral surgical procedure. A long-term stability study is mandated to assess the compatibility of the mixture components for its production, storage, and shelf-life assessment.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patients have given their consent for their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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