Comparative Study

PAIN-REDUCING EFFICACY OF ANESTHETIC SPRAY VERSUS COMPRESSION TO REDUCE THE PAIN DURING TOPICAL INJECTION IN THE PALATAL ZONE

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ABSTRACT

This study aims to evaluate the pain-reducing efficacy of xylocaine spray versus compression to reduce pain during topical anesthetic in the palatal zone. Thirty healthy individuals in the palatal area who needed local anesthesia participated in this comparative study. Male and female patients who consented to treatment between the age groups of 24–65 years with at least one posterior maxillary tooth extraction. All subjects provided signed informed consent. Exclusion criteria were as follows: smoking and malignant tumors. The subjects were randomly divided into two groups: Group A: 15 patients treated with xylocaine spray; Group B: 15 with local compression. Pain during injection and procedure satisfaction grades were recorded with a visual analog scale (VAS). The patients' perceptions were scored through the SEM score. No significant differences in patient perceptions and clinical pain were associated with the pre-anesthesia techniques ($p>0.05$). No differences regarding procedure satisfaction were detected between the xylocaine spray vs. pressure groups ($p>0.05$). Within the limits of the present investigation, the xylocaine spray and pressure procedure were effective for pain distress control during palatine local anesthesia.

KEYWORDS: *anesthetic spray, compression, anesthesia, xylocaine, pain, palate*

INTRODUCTION

Local anesthesia refers to a loss of sensation caused by a reversible nerve conduction blockade around the application site. In dentistry, local anesthetics are administered via a variety of anesthetic techniques that are classified according to their specific effects, such as (1) conduction anesthesia, (2) infiltration anesthesia, (3) topical anesthesia, or surface anesthesia (1). Although conduction anesthesia and infiltration anesthesia produce deep anesthesia, the use of needles may arouse fear and pain in patients.

The thought and performance of local anesthetic injection often provoke feelings of discomfort in the patient and have been described as one of the most anxiety-provoking procedures in dentistry (2). Acute pain depends on psychological factors, such as anxiety, fear, trust, and level of perception of the stimulus, which has put forward the use of dental topical anesthesia efficacy.

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On the other hand, although the intensity of the anesthesia is weak, topical anesthetics have little side effects with easy administration and reduce pain caused by needle injections and can thus generate positive responses towards dental treatment in patients (3).

Topical anesthetic gels are frequently used in dentistry to reduce or eliminate pain during the injection procedure (2). Topical anesthetics alter pain thresholds by controlling pain sensations through a blockade of signals that are transmitted from the peripheral sensory nerve fibers. However, they are only effective in blocking the pain stimuli in the superficial layer of the mucosa. Local anesthetics used for topical anesthesia must have superior mucosal permeability to easily reach free nerve terminals (4).

Vasoconstrictors are not added to topical local anesthetics because they undermine mucosal permeability. Furthermore, topical local anesthetics are typically more concentrated than injectable anesthetics in order to promote diffusion after passing through the mucosa (5).

In addition to topical anesthesia, there are some other simple methods to diminish pain during injection, for example, local pressure on the area before injection. According to the theory of gate control, which was first presented by Melzack and Wall, local pressure could reduce pain during injection. Stimulation of A beta fibers through pressure and vibration could regulate the medullary dorsal horn, resulting in a decrease in painful nerve inputs from peripheral tissues (6, 7).

The aim of this present study was to compare the effect of local pressure and topical anesthesia with xylocaine spray on pain during infiltration injection for topical anesthetic in dental nerve blocks.

MATERIALS AND METHODS

In this clinical randomized study, thirty patients were evaluated. Patients who agreed to participate in this study were randomly assigned to the study groups without considering their gender. A total of thirty healthy individuals needs local anesthesia in the posterior palatal area, participated in this comparative study. Male and female patients who consented for treatment between the age groups of 24–65 years with at least one posterior maxillary tooth extraction. All subjects provided signed the signed informed consent. The subjects were randomly divided into two groups: Group A: 15 patients treated with Xylocaine spray; Group B: 15 with local compression. During injection, pain was recorded with a visual analog scale (VAS) (8, 9). Randomization was performed using the computer-generated random equal numbers of blinded packages containing either group code. Blinded packages were prepared by the nonclinical staff according to the generated random chart and were available to the investigator only after the child was recruited for the study.

Before the administration of anesthesia in each group, one side was randomly selected as experimental and the opposite as control. In group B, the pressure was applied with the mirror handle until the area was ischemic on the alveolar mucosa at the injection site (Fig. 1). In group A, the site was treated with xylocaine spray applied with xylocaine-soaked cotton for 5 minutes (Fig. 2).

Fig. 1. *During the handle of the mirror the area was ischemic on the alveolar mucosa at the injection site.*

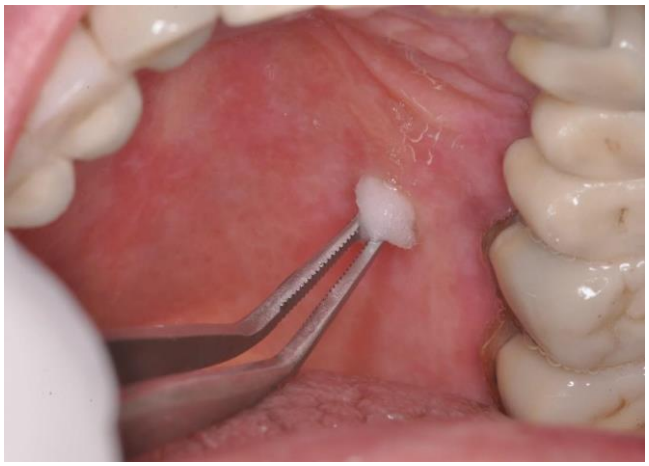

Fig. 2. *During the application of xylocaine-soaked cotton.*

We followed the same protocol of asking the patient to keep the mouth open and using a suction apparatus to clear the pooling saliva, which helped to maintain the adhesiveness of cotton on the mucosa. In all the groups, palatal infiltration of 2% articaine with 1:200.000 adrenaline was carried out. All the injections were performed by the same surgery with a 25 mm and 27 gauge needle. During the insertion of the needle and during anaesthetic infiltration, the patient's behavior was evaluated for pain perception using sound, eye, motor (SEM) scale and visual analog scale (VAS) by the operator (Fig. 3).

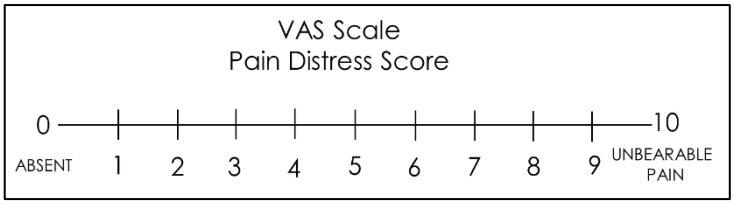

Fig. 3. *Pain VAS: Are you having during palatine injection?*

Immediately after the injection, the volunteers were asked to rate their pain during needle penetration and injection on the 10 mm VAS forms. On this scale, 0 was considered as no pain, 1 to 3 as mild pain, 4 to 6 as moderate pain, and 7 to 9 as severe pain. Patient satisfaction was validated using the VAS satisfaction score, which had two descriptors representing extremes of satisfaction; the patients rated their satisfaction by making a vertical mark on a scale of 0 to 10, where 0 stands for not satisfied all and 10 scores for completely satisfied (Fig. 4).

Fig. 4 *Satisfaction VAS: Are you satisfied with the palatine block given during treatment?*

The VAS was chosen because of its simplicity and as it is accepted as a standard scale for pain score. In the study, the patient's behavior was evaluated for pain perception using a SEM (sound, eye, motor) scale by the operator (Table I).

Table I. *SEM scoring (sound, eye motor) during palatine injection*.

Parameter	Comfort (1)	Mild discomfort (2)	Moderate discomfort (3)	Severe discomfort (4)
Sound	No sound	Non-specific sound	Verbal complaint, louder sound	Verbal complaint, shouting, crying
Eye	No sign	Dilateded eyes without tears (anxiety sign)	Tears, sudden eye movements	Crying, tears covering the face
Motor	Relaxed body and hand status	Muscular contraction, hands contraction	Sudden body and hand movements	Hand movement for defence turning the head to opposite side

Statistical analysis

The assessment was conducted using the statistical package GraphPad 8.0 (Prism, San Diego, CA, USA). The descriptive statistics were conducted by calculating the means, standard deviation, and 95% Confidence Intervals of the means. The Mann-Whitney test was applied to compare the study variables. The level of significance was considered for $p<0.05$.

RESULTS

Pain score by VAS is a numerical rating scale where 0 stands for no pain and 10 represents the possible worst pain. Patient satisfaction score was assessed by VAS. At the beginning and the end of the scale are two descriptors

representing extremes of satisfaction, where 0 stands for not satisfied at all and 10 stands for completely satisfied. The exact questions that have been asked for Pain VAS and Satisfaction VAS has been mentioned.

Out of 30 patients included in the study, 14 were male and 16 were female in the age group of 24–65 years with a mean age of 6.27 years. Tables II and III show a comparison between both the test groups under VAS and SEM scales. The mean scores obtained for the group B were lower than the group A under both pain scales. However, the mean scores under both the pain scales were statistically not significant ($p > 0.05$).

Table II. *Comparison of pain determined by the anaesthesia procedures by VAS.*

Group	N of patients	Mean ±SD	95% CI	P Value
A – Xylocaine spray	15	1± 0.4	(0.79-1.2)	p=0.827
B – Pressure	15	0.9±0.5	(0.68-1.2)	

Table III. *Comparison between both test groups using SEM*

Group	N of patients	Mean ±SD	95% CI	P Value
A – Xylocaine spray	15	3.7± 0.13	(3.4-3.9)	p=0.105
B – Pressure	15	4.1±0.19	(3.7-4.5)	

The pain distress associated to xylocaine spray vs. pressure group were respectively 1± 0.4 (95% CI: 0.79-1.2) and 0.9±0.5 (95% CI: 0.68-1.2) (p=0.827). The SEM scale for xylocaine spray vs. pressure group were respectively 3.7± 0.13 (95% CI: 4.4-6.5) and 4.1±0.19 (95% CI: 3.8-6.0) (p=0.105). The procedure satisfaction associated with xylocaine spray vs pressure were 5.5± 1.9 and 4.9±2.0 (p=0.447) (Table IV) (Fig. 5).

Table IV. *Comparison of satisfaction determined by the anaesthesia procedures by VAS.*

Group	N of patients	Mean ±SD	95% CI	P Value
A – Xylocaine spray	15	5.5± 1.9	(4.4-6.5)	p=0.447
B – Pressure	15	4.9±2.0	(3.8-6.0)	

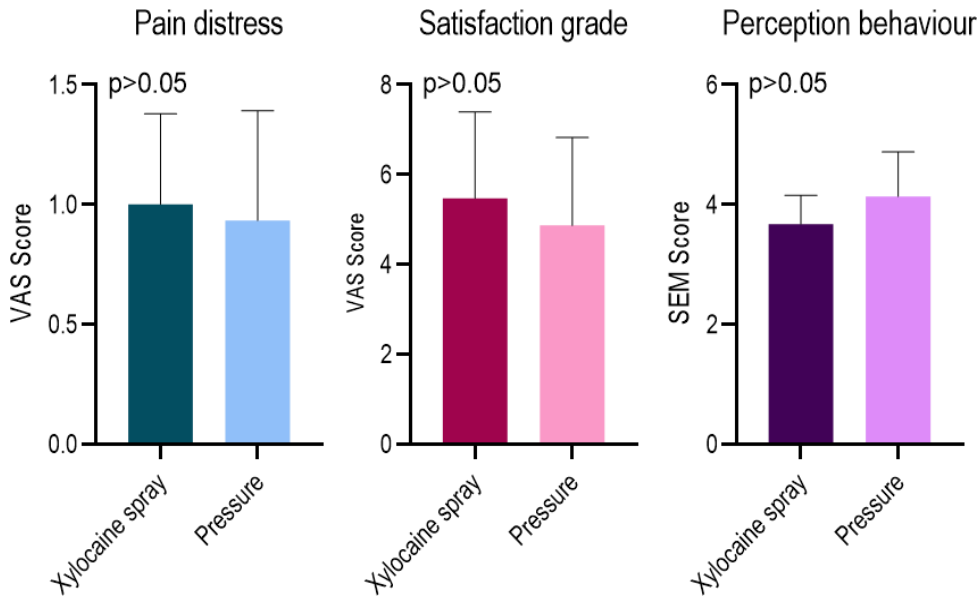

Fig. 5. *Chart summary of the VAS and SEM scoring of the xylocaine spray vs pressure group (p>0.05).*

DISCUSSION

Topical anesthetics are highly useful for reducing discomfort, pain, and anxiety during dental procedures. Traditional topical anesthetic agents with benzocaine and lidocaine as active ingredients are available in various forms, and products should be selected based on their intended use (10). In this randomized clinical trial, we compared the effect of local pressure and xylocaine spray as a topical anesthetic agent on pain during infiltration injection for maxillary canine teeth. Topical anesthetics typically act for 10–15 min (11). When topical anesthetics are applied to the dried mucous membrane, they reversibly inhibit peripheral sensory nerve fibers, altering pain thresholds. Thus, the surface anesthetic action largely depends on the drug permeability (1). One method to improve the surface permeability is to alter the mode of drug delivery (12). In addition, dental anxiety and fear of needles is some of the most common problems encountered during dental extraction. Needle phobia is treated as one of the medical conditions affecting 10% of the population, which can result in physiological changes like blood pressure, heart rate, and stress hormone variations in the body (13).

According to the gate control theory, the rationale behind investigating the effect of local pressure on pain during infiltration injection in this study was that it could effectively reduce pain during injection (14). One of the most primitively used techniques, gaining popularity, is acupressure, which involves applying pressure at certain key points that stimulate the nervous system to initiate natural healing (15). It is a procedure that either involves the application of pressure directly by finger in a circular motion or the application of consistent and constant pressure through bead/pellet at the stipulated points. The myelinated nerve fibers in muscles are stimulated with the application of pressure at acupoints, which will activate the midbrain and pituitary-hypothalamus via the spinal cord. Various neurotransmitters, like Enkephalin, b-endorphin, Dynorphin, Serotonin, and Noradrenalin, play an important role by stimulating A^{δ} fibers in the skin and muscles. The A^{δ} fibers, which terminate in the second layer of the black horn, release the enkephalins, which inhibit the incoming painful sensations (16). In conclusion, the xylocaine spray and pressure are equally effective in controlling pain during the administration of local anesthesia.

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