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RESEARCH ARTICLE

QUANTITATIVE ASSESSMENT OF PAIN USING INTRALIGAMENTARY INJECTION TECHNIQUE VERSUS MENTAL INCISIVE NERVE BLOCK TECHNIQUE IN MANDIBULAR EXODONTIA. A COMPARATIVE BLINDED RANDOMIZED CLINICAL TRIAL

*Raghad Alharkan and Dr. Suzan Salem

Department of Oral Surgery, Maxillofacial and Diagnostic Science, College of Dentistry, Qassim University, KSA

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ABSTRACT

Background: Tooth extraction considered one of the most common dental procedures that require the applying of local anesthesia. The aim of this study was to compare the pain during injection and during extraction between two techniques of local anesthesia, intraligamentary injection technique and mental incisive nerve block technique. **Materials and Methods:** Thirty mandibular premolars \ incisors, which was indicated for extraction, were selected for this study & two different techniques of local anesthesia, intraligamentary and mental incisive nerve block, were compared during injection and during extraction with the use of universal pain assessment tool as parameters. **Results:** The pain at the time of injection was higher for patient having MINB than ILI. However, the pain at the time of extraction was lower for patient having MINB than ILI. **Conclusion:** ILI appears less painful during injection and provides sufficient pain relief during extraction. On the other hand, MINB can be used as it provides higher extraction pain relief.

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INTRODUCTION

Local anesthesia (LA) is the most common technique used to control the pain in dentistry (Second, 2014). It utilized to prevent pain; preoperatively, intraoperatively and postoperatively (Robinson, 2000). Bahl R reported that patients with fear for dentistry had preconceived anxiety to receive the injections of local anesthesia and that why they usually delayed their appointments or sometime they don't come at all. (2004), so it is very important to use a safe and effective technique with lesser pain during injection. Several techniques were employed to achieve pain free treatment; infiltration and nerve block are basic techniques used in dental treatment, particularly with teeth extraction (Salem). Tooth extraction considered one of the most common dental procedures that require the applying of LA, and the technique of LA is initially depends on the location of the tooth to be extracted. The Inferior alveolar nerve block is the technique that has been used for extracting mandibular teeth. However, it is associated with reported complications such as pain, nerve injury, trismus and rarely paralysis of facial nerve (Malamed, 2013). Another difficulty is the absence of consistent landmarks.

Indeed, reported failure rates for the IANB are found to be high, ranging from 31% and 41% in mandibular second and first molars, to 42%, 38%, and 46% in second and first premolars and canines, respectively, and 81% in lateral incisors (Kanaa, 2009). There are some alternative methods that can be used for administration of LA to prohibit the occurrence of these complications. The intraligamentary injection technique and mental incisive nerve block technique both can be used to anesthetize mandibular incisors and premolars (Salem). The intraligamentary technique (ILT), also referred as the periodontal or peridental technique has been supported as a primary and a supplemental anesthetic technique (Malamed, 1982). Overall success rates reported in clinical studies have ranged from 81% to 86% when used as a primary technique (Faulkner, 1983). The greatest advantage of the ILI is that it can give pulpal and soft tissue anesthesia in a localized area (one tooth) of the mandible without producing extensive soft tissue anesthesia as well, beside the minimum dose of LA that required to achieve anesthesia (0.2 mL per root) (Malamed, 1982; Faulkner, 1983). Several indications supported the necessary of employing of the ILI particularly when you need to anesthetize limited area for single-tooth extraction in a quadrant, treatment or extraction of single tooth in both mandibular quadrants (to avoid bilateral IANB), treatment of children (as the residual soft tissue anesthesia increases the risk of self-inflicted soft tissue injury), treatment where nerve block anesthesia is contraindicated as in case of in

*Corresponding author: Raghad Alharkan,
Department of Oral Surgery, Maxillofacial and Diagnostic Science,
College of Dentistry, Qassim University, KSA.

hemophilia, leukemia and high bleeding tendency, and its use as a possible aid in the diagnosis of mandibular pain (Salem). It is contraindicated to use ILI at the site of infection or severe inflammation in the presence of primary teeth (Faulkner, 1983). ILI showed variable success rates according to the indication for treatment rapid onset of action, the duration of the anesthesia successfully obtained 30–45 minutes is quite variable and is not related to the drug administered (Malamed). Another technique had been implemented to anesthetize lower incisors and bicuspid is the mental incisive nerve block (MINB). The Incisive nerve is a terminal branch of the inferior alveolar nerve, originating as a direct continuation of the inferior alveolar nerve at the mental foramen, the incisive nerve travels anteriorly in the incisive canal, providing sensory innervation to those teeth located anterior to the mental foramen (Malamed, 2013).

The premolars, canine, and lateral and central incisors, including their buccal soft tissues and bone, are anesthetized when the MINB is administered. Where dental treatment involves bilateral procedures on mandibular premolars and anterior teeth, bilateral MINB can be administered where pulpal, buccal soft tissue, and bone anesthesia is readily obtained (Malamed, 2013). It is a useful alternative to the IANB in providing anesthesia for mandibular premolars (Whitworth et al., 2007; Meechan, 2011). In 2010, a study showed that 4% articaine 1:100,000 epinephrine can give a higher success rate, longer duration, and more profound anesthesia for teeth associated with the MINB than 2% lidocaine 1:100,000 epinephrine. The duration was obtained within a reasonable time and lasted 20 to 30 minutes (Batista da Silva, 2010). The purpose of this randomized clinical trial was to compare the pain during injection and extraction between two techniques, ILI technique and MINB technique.

MATERIALS AND METHODS

Subjects: This present study was a prospective randomized comparative clinical trial conducted in Qassim University female dental clinic, Saudi Arabia after approval of the local ethics committee of the Faculty of Qassim- University in a period of 4 months from November 2018 to February 2019. Thirty mandibular premolars \ incisors of female adult patients attending to Qassim university dental clinic, which was indicated for extraction, were selected for this study.

Study design: Two different techniques of dental local anesthesia intraligamentary injection (ILT) and mental incisive nerve block injection (MINBT) were compared with the use of universal pain assessment tool as parameters. The patients were assigned randomly into those who received ILT (Group1) and those who received MINBT (Group 2) as local anesthetic technique for the indicated dental extraction. The method of anesthesia used for a patient was blinded to the patient and chosen at random by the operator. Written consent was obtained from the patients.

Subjects Inclusion/Exclusion Criteria: Inclusion criteria were healthy female patients between the ages of 20 and 60 years, exhibiting full understanding of the given oral instructions, having caries or fracture in relation mandibular premolars and incisors that were no restorable. Exclusion criteria were patients with a malignant neoplasm, cardiac pacemaker, or epilepsy; and pregnancy, presence of acute dentoalveolar infection, periodontally compromised teeth, and patient who are unwilling to participate in the study.

Treatment procedures: Before administration of the local anesthetic, each patient was instructed by the operator on the universal pain assessment tools being used, which composed of 0-10 scale for patient self-assessment of pain with the help of verbal descriptor scale, Wong Baker facial grimace scale and the activity tolerance scale (Gupta, 2012). (Fig.1). During the first few minutes following completion of anesthetic injections, patients completed the scales to assess the amount of pain they experienced for each injection. For each technique, a standard 27-gauge short needle was used which was loaded with 2% lignocaine with adrenaline 1:200,000. A topical anesthetic was applied at the site of injection. For patients receiving the ILT, the needle was directed parallel to the long axis of the tooth and inserted till the depth of the gingival sulcus on the mesial and distal aspects of the root, buccal and lingual side. A dose of 0.2 mL of LA was given over 30 seconds.

For patients receiving MINBT, the needle was directed on the mucobuccal fold just anterior to the mental foramen. The depth of penetration is 5 to 6 mm. A dose of 0.6 mL of LA (approximately one third of a cartridge) solution was given over 30 seconds, and 0.3 mL LA solution was given as lingual infiltration. The patients were asked to assess the degree of pain during needle insertion using the pain assessment form while waiting for the anesthesia to take effect. The extraction was performed after the symptoms were evaluated. After the extraction, the patients were asked to assess the pain of the extraction using the same form.

Statistical Analysis: Statistical analysis was performed using Statistical Package for Social Sciences (SPSS) software (version 22). Visual analog scale values were compared between both of the groups during injection and following extraction. Chi-square test was done to check the statistical significance. Results were considered significant if $P < 0.05$.

RESULTS

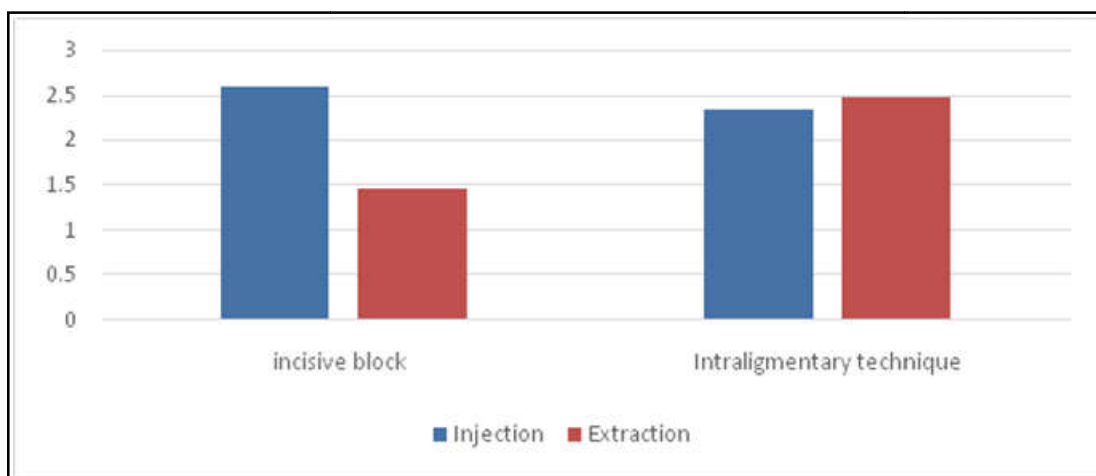
A total of 30 lower anterior teeth and premolars of female patients were included in this study. The age of study participants was between 20-60 years with mean 40.6 years. Evaluation of pain at the time of injection, show a mean VAS score of 2.60 in group 2 and 2.33 in group 1 with p value 0.004 which was statistically significant as shown by the results of Chi-square test (p value= 0.004). (Table1) The mean score during extraction was found to be higher group 1 (2.47) than for group 2 (1.47) with p value 0.039 which was statistically significant as shown by the results of Chi-square test (p value= 0.039). (Table1). Graph 1 shows the mean VAS scores between two groups during injection and extraction.

DISCUSSION

Fear and anxiety is a common feeling experienced by patients who come for dental treatment. Klingberg and Broberg described dental anxiety as a state of apprehension that something dreadful is going to happen in relation to dental treatment or certain aspects of dental treatment⁽¹⁵⁾. This feeling is severe in some cases, which makes patients not to report for treatment. Teeth extraction is the most commonly performed procedure and thus adequate anesthesia is required. To avoid the complications of inferior alveolar nerve block technique, an alternative technique were introduced; such as intraligamentary technique "ILT" and mental incisive nerve

0 Pain Free	1 Very Mild	2 Discomforting	3 Tolerable	4 Distressing	5 Very Distressing	6 Intense	7 Very Intense	8 Utterly Horrible	9 Excruciating Unbearable	10 Unimaginable Unspeakable
No Pain	Minor Pain			Moderate Pain			Severe Pain			
Feeling perfectly normal	Nagging, annoying, but doesn't interfere with most daily living activities. Patient able to adapt to pain psychologically and with medication or devices such as cushions.			Interferes significantly with daily living activities. Requires lifestyle changes but patient remains independent. Patient unable to adapt pain.			Disabling; unable to perform daily living activities. Unable to engage in normal activities. Patient is disabled and unable to function independently.			

Fig.1 Universal Pain Assessment Tool



Graph 1. Shows the mean VAS scores between two groups during injection and extraction

Table 1. Differences in VAS scores of pain on injection (PI) and Pain on procedure (PP) between the two groups

	Incisiveblock PP	Intraligamentary PP	Incisiveblock PI	Intraligamentary PI
N Valid	15	15	15	15
Missing	0	0	0	0
Mean	1.47	2.47	2.60	2.33
Std. Deviation	1.922	2.167	1.844	.816

Table 2. Demographic data for all participants

Characteristic	N
Age	
20-30	7
31-40	7
41-50	6
51-60	10
Marital status	
Single	5
Married	18
Divorced	3
Widow	4
Occupation	
Student	2
Teacher	6
No specific occupation	22

block technique (MINBT). In this present study, the pain scores were compared between the two techniques during injection and extraction of mandibular anterior teeth and premolars. The VAS pain score was used due to its ease of use and higher sensitivity and validity than the VRS (Briggs, 1999). The statistical analysis showed that the mean VAS during IL injection was lower than that for MINB. On the other hand, the mean VAS for pain during tooth extraction in the IL injection side was higher than that of MINB, although techniques were used effectively for extraction of mandibular anterior teeth and premolars as a replacement of the inferior alveolar nerve block. Similar study was conducted in 2011 by Moore *et al.* Intraligamentary and intraosseous injection technique was utilized as an alternate to anesthetize mandibular teeth instead of inferior alveolar nerve block and they found that both techniques provided adequate anaesthesia, and thus, can be used to manage failed mandibular nerve blocks (Salem *et al.*). Several years earlier, Malamed SF in 1982 conducted a study to compare the ILT as an alternative to IANBT and he reported that the periodontal injection provided a positive result in obtaining adequate anaesthesia and could be used as an alternative to IANBT (Malamed, 2013). The use of ILT has several advantages mainly that only single mandibular tooth can be anesthetized instead of all the teeth in the quadrant. ILT also limits the amount of soft tissue anesthesia, so the lip and the tongue are not anesthetized, thus increasing patient comfort (Prasanna, 2013) In addition to the low dose of anesthetic solution and also can be used in situations where IANB considered as a contraindication (Salem, ?). Regarding MINB, a study was conducted in 1992 by Robert A. Nist *et al.*, to evaluate the degree of anesthesia obtained with the incisive nerve block, the inferior alveolar nerve block and a combination of both injections in mandibular teeth. They found that the MINB alone did not provide any success in pulpal anesthesia in the central, lateral, first, and second molars. It only succeeded in the first and second premolars. Recently several studies were introduced to evaluate MINBT, In 2016, Vivek *et al* compared the effectiveness of MINB and IANB in providing anesthesia to symptomatic mandibular premolars. They concluded that a combination of MINB and IANB can perform better local anesthesia for symptomatic mandibular premolars (Vivek Aggarwal, 2016). Also, In 2019 a study to compare the onset, success rate, injection pain, and post-injection pain of MINB with that of IANB & concluded that MINB and IANB with 4% articaine showed similar efficacy in anesthetizing mandibular premolars with irreversible pulpitis. Pain after injection with MINB was higher than with IANB (Faulkner, 1983).

Conclusion

Intraligamentary anesthesia and mental incisive nerve block techniques may be used to induce a profound local anesthesia during extraction of mandibular anterior teeth and premolars, which may help improve the treatment services provided to the community. However, although both techniques provide alternative approaches to establishing effective anesthesia, ILT appears less painful during injection and provides sufficient pain relief during extraction. On the other hand, MINB can be used as it provides higher extraction pain relief.

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