

## A comparative evaluation on the effectiveness of infiltration and infraorbital nerve block techniques of local anesthesia in periapical surgery on maxillary anterior and premolar teeth

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### ABSTRACT

A comparative clinical evaluation was made between the effectiveness of infiltration and infraorbital nerve block techniques in periapical surgery on maxillary anterior and premolar teeth. The comparison was based on certain criteria adopted for this purpose. The study was conducted on (80) subjects of different ages and sexes. After a final diagnosis was made on the teeth chosen, they were indicated for periapical surgery (Curretage, apicectomy...etc.) as a last resort to extraction. Forty subjects received infiltration anesthesia at the site of surgery, while the other forty received the infraorbital nerve block technique as a single injection at site of surgery. The over all success was based on the grade of surgical anesthesia achieved during surgery. The results showed that the infraorbital nerve block technique provided 87.5% Grade A anesthesia during surgery when compared with only 27.5% Grade A anesthesia provided by infiltration techniques alone.

*Key Words:* Maxillary nerve block, local anesthesia.

### الخلاصة

تم إجراء تقييم سريري يقارن بين فعالية طريقة (infraorbital nerve block) للتخدير وطريقة الـ (infiltration) للتخدير على أسنان الفك الأعلى الأمامية والخلفية في العمليات الجراحية. تم إجراء المقارنة على أساس مقاييس معينة اختيرت لأجل هذا الغرض. تم إجراء التقييم على (80) مريضاً من مختلف الأعمار والجنس. بعد التشخيص النهائي على الاسنان المعنية تقرر إجراء العمليات الجراحية المناسبة عليهم كحل نهائي قبل القلع. تم إعطاء (40) شخصاً طريقة الـ (infiltration) والأربعون الآخرين تم إعطائهم طريقة الـ (infraorbital nerve block) كحقة واحدة لكل طريقة في مكان العملية. إن النجاح النهائي لهذه الطريقتين تم على أساس التخدير الكامل وقت إجراء العملية حيث أظهرت النتائج أن الطريقة (infraorbital nerve block) أكثر فعالية في توفير تخدير جيد درجة (A) (87,5%) مقارنة مع طريقة الـ (infiltration) التي وفرت تخدير جيد درجة (A) في (27,5%) فقط من الحالات.

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## INTRODUCTION

The advent of local anesthesia and subsequently the development of techniques for administration to relieve pain during dental treatment have been a major milestone in the progress of dental practice<sup>(1)</sup>. In regard to the techniques that can be adopted to achieve local anesthesia, the site of deposition of solution and the extent of dental treatment that is to be carried out will usually determine the type of injection as either simple infiltration injection or regional nerve block techniques<sup>(2)</sup>. The former is usually recommended to achieve anesthesia adjacent to maxillary teeth where the buccal cortical plate of bone overlying its roots is porous and where treatment is limited to simple procedures on one or two teeth (extraction, fillings) taking in mind that there is no acute infection at the site of injection nor anatomical variations (bony exostosis for example)<sup>(3)</sup>.

Nerve block techniques of anesthesia are most commonly employed in the mandible where infiltration anesthesia is ineffective due to the dense buccal cortical plate of bone enclosing its teeth<sup>(4)</sup>. However, there are certain situations in the maxilla where nerve block techniques become valuable to achieve wide extent anesthesia for extensive surgical procedures on teeth and soft tissue where infiltration injections alone will usually not suffice<sup>(5)</sup>. One of these well recognized maxillary nerve block techniques is the infraorbital nerve block technique to which this study adopted and compared with infiltration anesthesia. Briefly speaking, this technique provides pulpal and soft tissue and anesthesia labially and buccally from the upper central incisor to the upper second premolar in one side of the maxilla<sup>(2)</sup>. By a single injection, this technique will anesthetize the infraorbital nerve emerging from the infraorbital foramen and the anterior superior alveolar nerve inside the infraorbital canal at the same time<sup>(6)</sup>. The infraorbital nerve provides soft tissue anesthesia of the lower eyelid, side of nose and upper lip while the anterior superior alveolar nerve provides anesthesia from the upper central to the upper second premolar teeth including its labial and buccal peridontium<sup>(2)</sup>. In this clinical evaluation, the comparison was based on certain criteria, which included presence or absence of positive aspiration, pain on deposition of solution, onset of and achievement of surgical anesthesia throughout the period of surgery and any possible post-injection complications.

## MATERIALS AND METHODS

The materials adopted for the study included the following:

- 1/ Conventional aspirating stainless steel dental cartridge syringe.
- 2/ QD disposable dental needle gauge (27), length (32) mm.
- 3/ (2%) lignocaine HCl with (1:80.000) adrenaline in a (2.2) ml carpule (Septodont with a standard expiry date).
- 4/ Complete surgical instrument set for periapical surgery.
- 5/ Stop watch.

The clinical study comprised (80) dental patients of different sexes and ages (19-35 years) with an average age of (24) years. The study was conducted at the department of oral surgery, Dental faculty, Mosul University. All of the patients chosen were medically fit had no previous history of any allergic reactions to local anesthetic solutions and were informed of the purpose of study before it was commenced. The teeth selected for operation on one side of maxilla were upper laterals, canines, and premolars. The upper central incisors were excluded as these teeth may receive contralateral innervation from the anterior superior alveolar nerve

of the opposite side thus misinterpreting the results. All of the teeth involved were accurately diagnosed necessitating periapical surgery as a last resort to extraction. Any acute infection at the site of surgery was rendered chronic before any operation could be performed. To avoid operator mediated errors, all the injections and surgery were made by the researcher.

For the purpose of comparison, (40) subjects received infiltration anesthesia only at the site of surgery and (40) subjects received the infraorbital nerve block technique.

In regard to the technique, it was performed as followed:

- 1/ For infiltration anesthesia, a total of (2) ml of local anesthetic solution was deposited labially and buccally at different sites adjacent to the apex or apices of teeth involved in surgery. The remaining (0.2) ml in the dental cartridge was injected into the palatal soft tissue adjacent to the area of surgery.
- 2/ For the infraorbital nerve block technique, the injection was made between the upper first and second premolar as this site is the most suitable to achieve anesthesia for the infraorbital and hence the anterior superior alveolar nerve. The infraorbital foramen, which is the target area was located by extraoral palpation using the index finger of the non-operating hand. With this index finger on the area of foramen and the thumb reflecting the upper lip, the needle is inserted slowly to about half its length keeping in mind that it should be placed parallel with the long axis of these teeth and its bevel facing bone to reach its target area at the upper border of the foramen just below the infraorbital ridge (figures 1 and 2). Another aid to the detection of this foramen was done by telling the patient to look straight forwards where an imaginary line was made passing from the center of the patients eye pupil and mental foramen (figure 3). After the needle has reached its target area, aspiration was performed and if negative, a total volume of (2) ml solution was slowly deposited at the area of foramen. The index finger of the non-operating hand was continuously placed over the area of foramen extraorally during the injection to avoid possible over insertion of needle hence diffusion of solution into the orbit as well as to direct the solution into the foramen itself to anesthetize the anterior superior alveolar nerve.

The remaining (0.2) ml of solution in the cartridge was deposited palatally adjacent to the area of surgery. For both techniques, no additional cartridges were given and if so happened the operation was excluded.

- 3/ Onset of anesthesia for both techniques was assessed by probing the gingival tissue at the site of periapical surgery until pain sensation had vanished. Surgical anesthesia (anesthesia necessary for instrumentation) was evaluated according to the absence or presence of pain during the surgical procedure itself.

The comparison between both techniques was based on the following criteria:

A- Presence or absence of a positive blood aspiration before the solution was deposited.

B- Pain on deposition of solution as stated by the patient taking in mind the variable pain response between different subjects. The level of pain experienced was rated according to a numerical value and as recommended <sup>(7)</sup> :

- 0 = No pain
- 1 = mild pain
- 2 = Moderate pain
- 3 = severe pain



Figure (1): Extraoral palpation of infraorbital block



Figure (2): Insertion of needle in infraorbital foramen

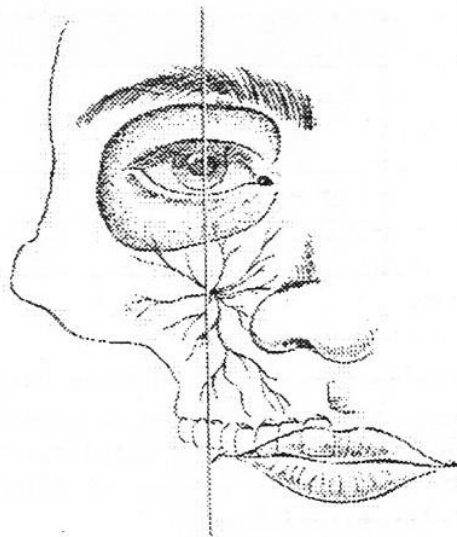


Figure (3): Extraoral identification of infraorbital foramen

Topical anesthesia was not used to avoid masking of pain sensation abolished by topical anesthesia.

- C- Onset of anesthesia was assessed in seconds or minutes using a stopwatch.
- D- Surgical anesthesia was evaluated according to the Dobb and Devier system<sup>(8)</sup> advised which is as followed:  
 Grade A anesthesia = Total absence of pain during surgery.  
 Grade B anesthesia = Presence of pain but no re-injection of solution was necessary.
- E- Possible post-injection complications such as blurred vision and hematoma formation over the area of injection.
- For the statistical analysis, the F-value test was used. Comparisons were considered significant at  $p < 0.05$ .

## RESULTS

The number of males and females who participated in this study is shown in table (1):

Table (1): Number of males and females

Male	Female
55	35

The type and number of teeth involved in the surgery are shown in table (2):

Table (2): Type and number of teeth

Type of Tooth	Number
Lateral Incisor	16
Canine	10
1 <sup>st</sup> Premolar	37
2 <sup>nd</sup> Premolar	25

The operations performed were either on single teeth alone or involved the adjacent tooth or teeth. As mentioned before, on surgery if the upper central was seen to be involved in the lesion, the case was excluded from the research.

For the (40) subjects who received the infiltration technique as a single injection, the results showed the following:

- 1/ Aspiration: A positive blood aspirate was seen in (2%) of injections performed before the solution was deposited.
- 2/ Pain on deposition of solution: with the steps for a painless injection followed (reflection of tissue, sharp needle, warm solution and a slow injection), pain sensation was inevitable. (32.5%) of subjects (13 patients) who received the



injection stated that pain was mild on deposition of solution while (52.5%) (21 patients) stated that pain was moderate. Severe pain was experienced by (15%) (6 patients).

3/ Onset of anesthesia: For onset of anesthesia for the total injections given, the onset ranged from (30 second to 1.5 min) with a mean of (45) seconds. This was recorded when the sharp dental probe was placed on the gingival tissue labially and/buccally and palatally overlying the tooth or teeth involved in surgery until pain sensation had been completely abolished.

4/ Surgical anesthesia: The overall success of injection was assessed according to the grade of anesthesia that it provided throughout the dental procedure. The Dobb and Devier system<sup>(8)</sup> was used to evaluate this criterion and the results were as followed:

Grade A = Total absence of pain sensation throughout the period of surgery was recorded in (27.5%) (11 patients).

Grade B = was recorded in (72.5%) (29 subjects) and in spite of pain experienced, no additional anesthesia was given.

For all operations performed, the duration of surgery ranged from (15-25) minutes.

5/ Post-injection complications: The possible post-injection complications that were to be considered were hematoma at site of injection (which if so happened would be masked by the surgery performed) and ocular disturbances. Fortunately no hematoma or ocular disturbances were reported following the injection on the same and second day following the surgery.

The above results are shown in table (3).

Table (3): Results of comparison between both injection techniques

Criteria	Infiltration	Infraorbital Block	Statistical Significance
Aspiration (%)	Positive = 2 %	Positive = 1.5%	N.S
Pain on Deposition (% and Number)	Mild = 32.5% Mod = 52.5 % Severe = 15%	No pain = 20% Mild = 65% Mod = 15%	S < 0.05
Onset of Anesthesia	Range 30 sec – 1.5 min Mean = 45 sec	Range 60 sec – 2.5 min Mean = 2.1 min	S < 0.05
Surgical Anesthesia	Grade A anesthesia = 27.5 % Grade B = 72.5%	Grade A anesthesia = 87.5 % Grade B = 12.5%	S < 0.05

For the subjects who received the infraorbital technique as a single injection, the results were as followed:

- 1/ Aspiration: A positive blood aspirate was seen in (1.5%) of injections performed before the solution was deposited.
- 2/ Pain on deposition of solution: (20%) (8 subjects) who received the injection stated that pain sensation was absent during deposition of solution provided that the steps recommended for a painless injection were followed. (65%) (26 patients) experienced mild pain while the remaining (15%) (6 patients) stated that pain was moderate during the deposition of solution.
- 3/ Onset of anesthesia: Onset of anesthesia ranged from (60) seconds to (2.50) minutes with a mean of (2.1) minutes.
- 4/ Surgical anesthesia: Grade A anesthesia was recorded in (87.5%) of operations performed (in 35 patients) while grade B anesthesia was experienced in (12.5%) (5 patients) only.
- 5/ Post-injection complications: Hematoma formation was noticed in (2) subjects on the second day following the injection below the lower eyelid and the patient was reinsured in that this situation may happen and will take three to four days to disappear. Fortunately no ocular disturbances were reported following this injection.

The above results are shown in table (3).

In regard to the statistical analysis, the results were as followed:

1. No significant differences between both techniques in regard to a positive blood aspirate was seen ( $p > 0.05$ ).
2. A significant difference ( $p < 0.05$ ) was noticed between both techniques concerning pain on deposition of solution favouring the infraorbital injection as a more comfortable technique.
3. For onset of anesthesia, a significant difference was seen ( $p < 0.05$ ) between both techniques favouring the infiltration technique in that it is faster in onset.
4. Surgical anesthesia: A significant difference ( $p < 0.05$ ) was recorded between both techniques favoring the infraorbital technique which provided Grade A anesthesia in (87%) of operations performed when compared with only (27%) Grade A anesthesia when the infiltration technique was adopted.

These results are shown in table (3).

## DISCUSSION

A number of nerve block techniques are available in the maxilla to provide wide extent anesthesia in situations where infiltration anesthesia will not suffice one of which is the infraorbital nerve block technique<sup>(5)</sup>. These techniques if properly learned and administered will provide a good success rate during dental treatment as shown in this study where grade A anesthesia was achieved in (87.5%) of cases when compared with infiltration anesthesia (27.5%). These results were also reported by other study<sup>(6)</sup>. Despite of this well documented success rate many dentists fear to use this technique owing to the possibility of injuring the eye<sup>(5)</sup>. Careful identification and palpation of the infraorbital foramen, insertion of needle to about half its length with its shaft parallel to long axis of tooth as well as continuously applying pressure by the index finger of the non-operating hand extraorally over the area of foramen

during the injection will no doubt prevent this mischief<sup>(3)</sup>. As an advantage over the infiltration technique, pain during deposition of solution is less when using the block technique owing to the fact that the space available to accommodate the solution is wide enough in the area of foramen<sup>(2)</sup>. In addition, by a single injection in one site when using this approach will avoid multiple needle insertions and hence more volume of solution when the infiltration technique is to be used in surgery<sup>(6)</sup>. The only reported disadvantage by this approach is the bothering wide anesthesia that it provides and the possibility of hematoma formation<sup>(2,3)</sup>. Careful aspiration before injection will avoid this problem. Finally, one can conclude that it is best to learn and administer several techniques available rather than to know one only where the dentist in certain cases and owing to fear or other reasons may face the difficulty of achieving successful anesthesia to continue the treatment provided by him to the patient.

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