

# The Incidence of Intravascular Needle Entrance during Inferior Alveolar Nerve Block Injection

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## Abstract

**Background and aims.** Dentists administer thousands of local anesthetic injections every day. Injection to a highly vascular area such as pterygomandibular space during an inferior alveolar nerve block has a high risk of intravascular needle entrance. Accidental intravascular injection of local anesthetic agent with vasoconstrictor may result in cardiovascular and central nervous system toxicity, as well as tachycardia and hypertension. There are reports that indicate aspiration is not performed in every injection. The aim of the present study was to assess the incidence of intravascular needle entrance in inferior alveolar nerve block injections.

**Materials and methods.** Three experienced oral and maxillofacial surgeons performed 359 inferior alveolar nerve block injections using direct or indirect techniques, and reported the results of aspiration. Aspirable syringes and 27 gauge long needles were used, and the method of aspiration was similar in all cases. Data were analyzed using *t*-test.

**Results.** 15.3% of inferior alveolar nerve block injections were aspiration positive. Intravascular needle entrance was seen in 14.2% of cases using direct and 23.3% of cases using indirect block injection techniques. Of all injections, 15.8% were intravascular on the right side and 14.8% were intravascular on the left. There were no statistically significant differences between direct or indirect block injection techniques ( $P = 0.127$ ) and between right and left injection sites ( $P = 0.778$ ).

**Conclusion.** According to our findings, the incidence of intravascular needle entrance during inferior alveolar nerve block injection was relatively high. It seems that technique and maneuver of injection have no considerable effect in incidence of intravascular needle entrance.

**Key words:** Inferior alveolar nerve, injection, local anesthesia.

## Introduction

The most-commonly used drugs in dentistry are anesthetics which are injected before painful procedures.<sup>1</sup> These drugs can be categorized as amides and

esters.<sup>2</sup> Amides are metabolized in liver by microsomal enzymes and mainly removed from kidney in unionized form. Esters which have high hydrolyzing potency are

metabolized by cholinesterase enzyme and removed from kidney in a more ionized form compared to amides.<sup>2</sup> Main drugs of amide group are lidocaine, mepivacaine, and prilocaine. Main esters include tetracaine, benzocaine and procaine.<sup>2</sup> Local anesthetic cartridge contains a vasoconstrictor in addition to the local anesthetic agent. High dose or accidental intravascular injection of local anesthetic agent with vasoconstrictor may result in cardiovascular and central nervous system toxicity, as well as tachycardia and hypertension.<sup>2</sup> Primary signs and symptoms of overdose are hypertension, tachycardia, tachypnea, headache, and vertigo. Other symptoms that may occur later are vision or auditory disorders, anesthesia of tongue and perioral areas or chill. If the blood level of the drug continues to increase, it can lead to unconsciousness, breathing depression and arrest. A number of factors increase the toxicity potential of anesthetic agents including age, weight, pregnancy, hereditary deficiency of cholinesterase enzyme, blood vessel constriction, technique and speed of injection, the blood supply in area of injection, and vasoconstrictors which are added to anesthetics to slow down absorption and reduce bleeding.<sup>1-7</sup>

An estimated 6,000,000 cartridges are used in the US weekly.<sup>1</sup> In one study, only 60% of dentists declared that they often perform aspiration before inferior alveolar nerve block (IANB) injection.<sup>1</sup> Accidental injection into the vessels may occur in all intra-oral injection techniques; however, when injecting into a highly vascular area, such as the pterygomandibular space during IANB, the dentist always faces the increased risk of an intravascular injection, vascular damage and hemorrhage with hematoma formation.<sup>8</sup> Using aspirable syringes, avoiding needles smaller than 25 gauge, slow injection and aspiration in two different places can minimize incidence of injection into the vessels.<sup>1</sup> Therefore, aspiration is necessary to avoid intravascular injection.

Considering the facts that intravascular injection may lead to overdose and toxicity and that there is a high risk of intravascular injection in IANB, the aim of this study was to assess the incidence of positive aspiration during IANB injections.

### **Materials and Methods**

Three oral and maxillofacial surgeons in Tabriz Faculty of Dentistry who had more than five years of experience in teaching anesthetic injections, performed IANB injections on 359 patients using direct or indirect techniques. Aspirable syringes and 27 gauge long needles (Sofijet, Mazamet, France) were used. The method of aspiration was similar in all cases. Two aspirations were performed before injection with the needle bevel in different directions. Injection technique, side of injection, and aspiration result were recorded. Data were analyzed using *t*-test.

### **Results**

This study included 359 IANB injections; 20.1% of them were performed by operator 1, 29.2% by operator 2 and 50.7% by operator 3.

51% of them were injected on the right side of mandible and 49% of them on the left.

88% of injections were performed using direct block injection technique and 12% using indirect block technique.

Positive aspiration was observed in 18.1%, 15.2%, and 14.3% of IANB injections performed by operators 1, 2, and 3, respectively (Table 1). There were no statistically significant differences between the operators in aspiration results ( $P = 0.754$ ). Overall incidence of needle entrance into the vessel was 15.3%.

Of all injections, 15.8% were intravascular on the right side and 14.8% were intravascular on the left (Table 2). The difference between intravascular injections on the right and left sides was not statistically significant ( $P = 0.778$ ).

Intravascular needle entrance was seen in 14.2% of cases using direct and 23.3% of cases using indirect block injection techniques (Table 3); the difference was not statistically significant ( $P = 0.124$ ).

**Table 1. Incidence of aspiration positive in inferior alveolar nerve block injections among three operators**

	Operator 1	Operator 2	Operator 3	Total
Number of injections	72	105	182	359
Aspiration positive (%)	13 (18.1)	16 (15.2)	26 (14.3)	55 (15.3)

**Table 2. Incidence of aspiration positive in inferior alveolar nerve block injections on the right and left sides**

	Right side	Left side	Total
Number of injections	183	176	359
Aspiration positive (%)	29 (15.8)	26 (14.8)	55 (15.3)

**Table 3. Incidence of aspiration positive in inferior alveolar nerve block injections using direct and indirect techniques**

	Direct technique	Indirect technique	Total
Number of injections	316	43	359
Aspiration positive (%)	45 (14.2)	10 (23.3)	55 (15.3)

### Discussion

According to the results of this study, the rate of intravascular needle entrance in inferior alveolar nerve block injections was 15.3%, which is a relatively high incidence. This notable finding emphasizes the necessity of aspiration before IANB injections.

The total rate of intravascular needle entrance during IANB injections was higher than the result of a previous study (11.7%).<sup>1</sup> In the latter study, however, the type and the gauge of the needles and the technique of injection was not mentioned and the number of cases was less than that of our study, which may explain the slight difference between the obtained results.

According to the current study, it seems that technique and maneuver of injection have no considerable effect in incidence of intravascular needle entrance. No study, to the best of our knowledge, has investigated this field. The operators in the present study were experienced oral and maxillofacial surgeons. It seems that the rate of intravascular needle entrance might be higher among general dental practitioners. Dentists

should be encouraged to consider the potential for anatomical complications when administering any dental local anesthetic. Failure to do so can result not only in less-than-optimal local anesthesia but, more significantly, in minor – perhaps major – consequences in the form of local and systemic complications.

### Conclusion

The incidence of intravascular needle entrance during inferior alveolar nerve block injection was relatively high. According to the current study, it seems that technique and maneuver of injection have no considerable effect in incidence of intravascular needle entrance.

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