



IMMEDIATE COMPLICATIONS OF LOCAL ANESTHETIC ADMINISTERED TO 1,007 CONSECUTIVE PATIENTS

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ABSTRACT

Background. Probably the most common procedure in dentistry is the administration of local anesthetic, or LA. Immediate complications of LA administration include positive blood aspiration, blanching of the tissue and burning sensation on impingement of the nerve. Because studies about the immediate complications of LA administration were conducted before 1980, more recent data regarding this procedure are needed.

Materials and Methods. In this prospective study, an experienced dentist administered 2,528 LA injections to 1,007 consecutive patients with 1-inch 27-gauge needles, using a solution of 2 percent lidocaine and 1:100,000 nordefrine hydrochloride.

Results. The authors observed positive blood aspiration in 73 injections (2.9 percent) without

any further complications. The most severe immediate complication—syncope—occurred only in one case. In 63 injections (2.5 percent), the dentist touched the nerve, and the patient reported feeling an electric current sensation (40 times with inferior alveolar nerve blocks, 18 times with lingual nerve blocks, four times with mental nerve blocks and one time with a second injection to the same site) without any further complications.

Conclusions. The results confirm that LA injections that are properly carried out appear to be safer today than they were in the past.

Clinical Implications. LA is a safe procedure when the appropriate technique is used. It is even safer when an inferior alveolar nerve block is administered.

Probably the most common procedure in dentistry is the administration of local anesthetic, or LA. It is estimated that in the United States, LA is administered 300 million times annually in dental-related situations.¹ This procedure, which accompanies almost all dental procedures, has many potential risks for patients. Although questionable, studies conducted in the 1950s through the 1970s estimated death caused by administration of LAs as one in 25 million to one in 50 million in general dentistry² and one in 1.49 million to one in 1.85 million in oral and maxillofacial surgery.²⁻⁵

LA complications can be classified as local or systemic.¹ Our study focused on both local and systemic immediate postinjection, in-the-chair complications such as needle breakage, pain or burning sensation on injection, penetration of a

blood vessel (venous or arterial), hematoma, edema, nerve damage, facial nerve paresis and adverse drug interactions (overdose, allergy or idiosyncrasy).

We conducted a literature search and found studies regarding immediate complications of the administration of LAs only from the 1950s through the 1970s.⁶⁻⁸ Most of these studies focused on blood aspiration in mandibular blocks, which brought about the harpoon and aspiration techniques. Since the 1960s, the use of a syringe with a harpoon has enabled dentists to aspirate before administering LA, thus avoiding intravascular injection.⁹ The use of this device has been mandated in Israel by order of the director general of the Ministry of Health since 1986.¹⁰

In previous studies,⁶⁻⁸ different needles, injection techniques, dentists (one study was per-

TABLE 1

AGE AND SEX OF PATIENTS.				
SEX	NO. OF PATIENTS	AGE (MEAN YEARS)	SD*	AGE RANGE (YEARS)
Male	474	35.17	13.91	8 to 99
Female	533	32.13	11.89	12 to 82
TOTAL	1,007	33.56	12.97	8 to 99

* SD: Standard deviation.

TABLE 2

NUMBER OF INFERIOR ALVEOLAR NERVE BLOCKS AND NUMBER AND PERCENTAGE OF POSITIVE ASPIRATIONS.								
TYPE OF INJECTION	TOTAL		FIRST INJECTION		SECOND INJECTION		SECOND INJECTION AFTER POSITIVE FIRST INJECTION	
	No. of Injections	No. of Positive Aspirations (%)	No. of Injections	No. of Positive Aspirations (%)	No. of Injections	No. of Positive Aspirations (%)	No. of Injections	No. of Positive Aspirations (%)
Inferior alveolar nerve block	731	59 (8.1)	495	35 (7.0)	236	24 (10.0)	16	5 (31.3)

formed by dental students) and LAs were used, making a comparison of the findings difficult. Therefore, we conducted a study to determine the prevalence of the immediate side effects of LA injections, while eliminating the variability in armamentarium and technique and recording all injection sites.

MATERIALS AND METHODS

An experienced oral and maxillofacial surgeon (J.P.L.) administered all LA injections using the same type of syringe with arrowhead-shaped aspiration mechanisms. We used 1-inch 27-gauge needles for all injections for standardization, although longer and larger-gauge needles are preferred for mandibular blocks. We used an anesthetic solution of 2 percent

lidocaine and 1:100,000 nordefrine hydrochloride.

The oral and maxillofacial surgeon administered the injections, using a standard injection technique described by Malamed.¹ A total of 1,007 consecutive patients received a total of 2,528 injections, based on their anesthesia needs. The 474 male patients and 533 female patients ranged in age from 8 to 99 years, with a mean age of 33.56 years (Table 1). We recorded each patients' age, sex, injection site, number of injections and immediate side effects.

We defined local infiltration as penetration above the buccal apexes of the maxillary first molars. All other injections were regional blocks: nasopalatine nerve, greater palatine nerve, posterior superior alveo-

lar nerve, infraorbital nerve, mental nerve, long buccal nerve, inferior alveolar nerve and lingual nerve.

RESULTS

The oral and maxillofacial surgeon administered 731 mandibular blocks (inferior alveolar nerve) (Table 2). In 59 of these cases (8.1 percent), positive aspiration occurred, which is in agreement with previous studies. Jastak and colleagues¹¹ summarized eight studies, consisting of 10,286 cases, and found a positive aspiration rate of 7.9 percent. Malamed,¹ however, reported an incidental positive aspiration rate of 10 to 15 percent.

In this study, we found a higher positive aspiration rate when we administered a second injection to the same site (Table

TABLE 3

NUMBER OF INJECTIONS AND NUMBER AND PERCENTAGE OF POSITIVE ASPIRATIONS, BY INJECTION TYPE.

TYPE OF INJECTION	TOTAL		FIRST INJECTION		SECOND INJECTION	
	No. of Injections	No. of Positive Aspirations (%)	No. of Injections	No. of Positive Aspirations (%)	No. of Injections	No. of Positive Aspirations (%)
Long buccal nerve block	559	1 (0.2)	468	1 (0.2)	91	0 (0.0)
Mental nerve block	17	1 (5.8)	16	1 (6.3)	1	0 (0.0)
Local infiltration	239	2 (0.8)	209	1 (0.5)	30	1 (3.3)
Posterior superior alveolar nerve block	342	8 (2.4)	292	4 (1.4)	50	4 (8.0)
Infraorbital nerve block	107	1 (0.9)	79	0 (0.0)	28	1 (3.6)
Nasopalatine nerve block	48	0 (0.0)	44	0 (0.0)	4	0 (0.0)
Greater palatine nerve block	484	1 (0.2)	468	1 (0.2)	16	0 (0.0)

2). If positive aspiration occurred with the first injection, there was a greater chance that positive aspiration occurred with the second injection (31.3 percent).

Positive aspiration in long buccal nerve blocks is very rare, as is evidenced by the single case reported in this study (Table 3). Schiano and Strambi⁷ reported no occurrence of positive aspiration with long buccal nerve blocks, but Bartlett⁸ found 0.5 percent.

We found that positive aspirations occurred in 5.8 percent of the mental nerve block cases in our study (Table 3), compared with the 7 percent reported by Jastak and colleagues,¹¹ the 5.7 percent reported by Bartlett⁸ and by Malamed,¹ and the 15 percent reported by Schiano and Strambi.⁷ We ex-

pected a higher rate because of the injection technique; mental nerve blocks are administered close to the blood vessels.

Local infiltration in the buccal side of the maxilla resulted in positive aspiration in 0.8 percent of the cases (Table 3). Among posterior superior alveolar nerve block cases, we found positive aspiration in 2.4 percent of the cases compared with the 3.9 percent reported by Jastak and colleagues¹¹ and the 2.6 percent reported by Schiano and Strambi.⁷ Malamed¹ reported 3.1 percent. Our results suggest that when the right technique is used, there is little risk of a positive aspiration's occurring.

The injection technique the oral and maxillofacial surgeon used for the posterior superior alveolar nerve is similar to that

of the mental nerve block—a highly vascular area. We expected to find the same percentage rate as we did in the mental nerve block. But, among the mental nerve block cases, we found only one occurrence of a positive aspiration.

We found that anesthesia of the infraorbital, nasopalatine and greater palatine nerves is safe and the chances of a positive aspiration's occurring are small (Table 3). Similar results were reported by Bartlett,⁸ Schiano and Strambi⁷ and Malamed.¹

We found that blanching of the tissues occurred in five cases of local infiltration, five cases of posterior superior alveolar nerve blocks (only two in positive aspiration cases) and two cases of infraorbital nerve blocks.



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Blanching of the tissues is caused by intra-arterial injection. In our study, we

had 10 cases of blanching without positive aspiration. Therefore, in at least 10 cases, LA was injected intra-arterially. These results show that dental practitioners can inject LA into a blood vessel without inducing positive aspiration. Therefore, it is important for practitioners to watch out for side effects and to inject LAs slowly.

Patients reported feeling an electric current sensation 40 times with inferior alveolar nerve blocks, 18 times with lingual nerve blocks, four times with mental nerve blocks and one time with a second injection to the same site.

In our study, syncope occurred only once when we injected local anesthetic a second time into an inferior alveolar block. Despite 63 cases of physical contact with the nerve, we received no complaints of paresthesia or hypoalgesia.

In this study, patients did not report any immediate side effects such as needle breakage, pain or burning sensation on injection, hematoma, edema, nerve damage, facial nerve paresis and adverse drug reac-

tions (overdose, allergy or idiosyncrasy).

DISCUSSION

To our knowledge, this is the first prospective study to determine the prevalence of all immediate side effects of LA administration. No similar studies have been reported in the literature in the last two decades. The studies conducted in the 1950s through the 1970s used different techniques and recorded different injection sites. We designed our study to eliminate the variability in armamentarium and technique, while recording all injection sites.

Over the years, the armamentarium and technique for LA administration have improved. For instance, needles now are made of one piece of metal tube with a soft plastic hub on it. Occurrences of needle breakage are anecdotally reported as a result of better manufacturing and single use.

Because this study was prospective, we were able to standardize it. We standardized all injections as much as possible; the oral and maxillofacial surgeon consistently used the same type of cartridge, syringe and needle. We defined the injection sites and administered all injections to the same anatomical locations, using standardized injection techniques. We used regional blocks as often as possible.

CONCLUSIONS

Our results confirm that LA injections that are properly carried out appear to be safer today than in the past. In 2,528 injections to 1,007 patients in

an oral and maxillofacial practice, the most severe immediate complication—syncope—occurred in only one case. In 63 cases (2.5 percent), the dentist touched the nerve, and the patient reported feeling an electric current sensation (40 instances with inferior alveolar nerve blocks, 18 with lingual nerve blocks, four with mental nerve blocks and one time with a second injection to the same site) without any further complications. We observed positive aspiration in 73 cases (2.9 percent), also without any further complications. ■

Some of the data in this article were presented at the 1996 Annual Meeting of the Israeli Branch of the International Association for Dental Research, Kiryat Anavim, Israel, June 27-28, 1996.

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