

## PERCEPTION OF DISCOMFORT DURING INJECTION AND THE NEED FOR SUPPLEMENTAL ANESTHESIA IN THE INTRAOSSEOUS TECHNIQUE USING 4% ARTICAININE

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### ABSTRACT

The authors conducted an experimental study to determine patient perception of discomfort during injection and the need for supplemental anesthesia using the intraosseous technique with 4% articaine with 1:100,000 epinephrine in patients with symptomatic pulpitis in mandibular molars. At different clinical sessions, researchers used 4% articaine with 1:100,000 epinephrine to apply intraosseous injection (Group 1) or inferior alveolar nerve block (Group 2). Each technique was applied in 35 patients. In each group, the need for additional anesthesia was determined and patient discomfort during

injection was assessed with a Visual Analogue Scale (VAS) test. In the intraosseous group, no supplemental technique was needed in 22 patients (62.85%), and results were similar for the inferior alveolar technique (n: 23 - 65.71%). The intraosseous technique proved to be more comfortable than the mandibular technique (18 patients - 25.7%). This study found that the use of intraosseous technique with 4% articaine shows promising results regarding patient comfort and reducing the need for additional anesthesia.

**Key words:** Articaine; lidocaine; local anesthesia dental anesthesia.

## PERCEPCIÓN DE INCOMODIDAD DURANTE LA INYECCIÓN Y NECESIDAD DE ANESTESIA SUPLEMENTARIA EN ANESTESIA INTRAÓSEA USANDO ARTICAINA AL 4%

### RESUMEN

Los autores condujeron un estudio experimental para determinar la eficacia de la técnica anestésica intraósea usando articaina al 4% con epinefrina 1:100.000, en pacientes con pulpitis aguda en molares mandibulares. En diferentes sesiones clínicas, los miembros del equipo de investigadores usaron articaina al 4% con epinefrina 1:100.000 para inducir anestesia mandibular con la técnica intraósea (Grupo 1) o con el bloqueo del nervio alveolar inferior (Grupo 2), se aplicó cada técnica en 35 pacientes con diagnóstico de pulpitis aguda en molares inferiores. En cada grupo, se determinó la necesidad de hacer anestesia complementaria y la comodidad del paciente

con un test Escala Visual Analoga. Un total de 70 pacientes fueron enrolados en este estudio (35 sujetos por grupo). En el grupo de intraósea no fue necesaria la aplicación de técnicas complementarias en 22 pacientes (31.4%), resultados similares en la técnica alveolar inferior (n: 23 - 32.8%). La técnica intraósea demostró ser más cómoda al compararla con técnica mandibular (18 pacientes - 25.7%). Este estudio demostró que el uso de la técnica intraósea con articaina al 4%, arrojó resultados prometedores en lo que a comodidad y reducción en la anestesia complementaria hace referencia.

**Palabras clave:** Articaina; anestesia local; anestesia dental.

### INTRODUCTION

Pain control in dentistry is based on the use of different anesthetics. When conventional techniques do not provide adequate anesthesia, alternatives are needed. The success rate of anesthesia is variable, with 10% to 20% failure reported when inferior alveolar nerve block is used<sup>1</sup>. It is therefore necessary to include new techniques<sup>1,2</sup> as well as active principles such as 4% articaine, which supplements good anesthesia technique

using an active principle which was introduced in the USA in the year 2000<sup>3</sup>. Articaine appears to have greater residual diffusion capacity, providing an intermediate period of anesthesia. Although it is an amide-type anesthesia, it has an additional ester group and is thus less toxic, since 90% is metabolized by plasma esterase. Its higher liposolubility enables greater diffusion than other amides in soft tissues and bone, so it has been proposed for use in infiltrations in the mandibular

molar region<sup>3,4</sup>. The onset of the anesthetic effect occurs within 1-6 minutes, and it lasts for about an hour, with maximum effect at 25 minutes.<sup>5</sup>

The use of intraosseous anesthesia dates back to 1910, when *Masselink BH* published a technique for placing the solution inside the medullar bone through a perforation in the cortical bone made with a round carbide drill.<sup>6</sup> Intraosseous anesthesia is indicated for removing deep caries, pulpotomy, carving abutments in living teeth, endodontic treatment of teeth with pulpitis and exodontic treatment of permanent teeth. Its advantages include providing deep pulp anesthesia which is highly effective for endodontic treatment of teeth with pulpitis. Its use is somewhat limited by the fact that it requires a special kit for application, and should therefore be planned before beginning a procedure so that it may be used immediately as a supplement during the operation.<sup>7-10</sup> Potential complications reported are perforation of the roots of the tooth under treatment or neighboring teeth, laceration of the inferior alveolar nerve and perforation of the maxillary sinus.<sup>11</sup> Different authors have recommended infiltration of the mandible with 4% articaine 4%, demonstrating that anesthesia efficacy improves when using this anesthetic solution.<sup>12-14</sup>

This paper reports the results of a clinical study to determine the efficacy of intraosseous anesthetic technique using 4% articaine with 1:100,000 epinephrine compared to conventional mandibular block technique in patients diagnosed with acute pulpitis in mandibular molars.

## MATERIALS AND METHODS

A double-blind randomized uncontrolled study was performed to determine patients' perception of discomfort during use of the intraosseous technique, and the need for supplemental injection

with 4% articaine with 1:100,000 epinephrine in cases of symptomatic pulpitis in mandibular molars. Sample size (N = 70) was obtained using *Epi Info*. As there was no quantifiable target population, non-probabilistic sampling by criterion was used and a technique assigned randomly.

Patients underwent clinical and radiographic examination and sensitivity tests to confirm the diagnosis of acute symptomatic pulpitis. Exclusion criteria were periapical lesions, temporary dentition, allergy to anesthetic solution and radiologic evaluation determining existence of anatomical structures preventing the application of the intraosseous technique. Seventy patients were divided randomly into two groups (n = 35): Group 1, intraosseous technique and Group 2, inferior alveolar nerve block. Anesthetics were applied by a standardized researcher. The need for supplemental anesthesia during root canal treatment was determined and patient perception of discomfort after the use of either the intraosseous technique or inferior alveolar nerve block was assessed using a Visual Analogue Scale (VAS).

Data were recorded in standardized collection instruments and tabulated on an Excel spreadsheet. Statistical analyses included descriptive statistics, frequency tables and comparison of variables. The Chi<sup>2</sup> test with Yates correction was applied assuming p < 0.05, using STATA 9<sup>®</sup> statistic software. Ethical considerations were followed as set forth in Colombia's Ministry of Health Resolution 008430 of 1993. All participants signed informed consent.

## RESULTS

Demographics: 70 patients were treated: 35 in the intraosseous injection group and 35 in the inferior alveolar nerve block group. There was no statistical difference between groups for age and sex (Table 1).

**Table 1: Demographic Data.**

	INTRAOSSEOUS GROUP		IANB GROUP		P Value
	n (%)	n (%)	n (%)	n (%)	
GENDER					
MALE	19 (45.71)		16 (54.29)	35 (100)	0.47
FEMALE	16 (45.71)		19 (54.29)	35 (100)	
<b>AGE (YEARS)</b>					
MEAN ± STD DEV	42.14±13.95		41.82±18.83	70 (100)	0.93

\*STD DEV: Standard Deviation,

\*IANB: Inferior Alveolar Nerve Block

**Table 2: Supplementary Anesthesia.**

	INTRAOSEOUS GROUP n (%)	IANB GROUP n (%)	Total n (%)	P Value
No	22 (62,85)	23 (65,71)	64,28%	0.80
YES	13 (37,15)	12 (34,28)	35,71%	

\*IANB: Inferior Alveolar Nerve Block

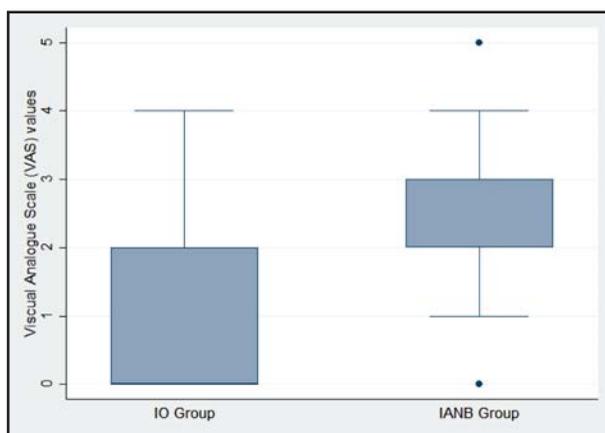


Fig. 1: Perception of injection and perforation discomfort during intraosseous injection and inferior alveolar nerve block.

Supplemental Injection: 35.71% (95% CI: 25.18 – 47.83) (n= 25) of the sample required supplemental injection (Table 2). 37.15% of the patients in the mandibular intraosseous injection group required supplemental injection compared to 34.28% in the inferior alveolar nerve block group (Table 2) (p=0.80).

Patient perception of injection and discomfort: the mean values on the visual analogue scale (VAS) were 0.94 (SD: 1.21) for Group 1 (mandibular intraosseous injection) and 2.6 (SD: 1.24) for Group 2 (alveolar nerve block group), differing statistically (p=0.00) (Fig. 1).

## DISCUSSION

Pain control in mandibular molars with pulpitis is one of the main challenges during pulp removal for canal preparation, so alternatives to conventional nerve blockage are needed in order to achieve deep anesthesia in the mandibular molar zone. One of the best options is to combine an active principle with high bone diffusion, e.g. 4% articaine, using the intraosseous anesthetic technique. In this study, intraosseous technique was proposed as the primary

anesthesia with 4% articaine including 1:100,000 epinephrine for mandibular molars with asymptomatic pulpitis. The intraosseous technique was found to be similar to the conventional technique with regard to the need for supplemental anesthesia: 13 (18.57%) and 12 patients (17.14 %), respectively. With regard to patient discomfort during the injection of anesthesia, as reported on the Visual Analog Scale (VAS), 18 patients (25.79%) reported no pain during the intraosseous technique, in contrast to the mandibular technique group, in which only 2 (2.85%) reported no pain. This shows that the intraosseous technique with the X Tip Kit is more comfortable than puncture using the conventional technique at the level of the inferior dental orifice. The results of this research differ from those reported by Pereira LA et al. Faltancitas 10 a la 14 inclusive<sup>15</sup> in a double blind study in 60 patients comparing anesthetic effectiveness and cardiovascular changes after the application of 0.9 ml of 4% articaine with 1:100,000 and 1:200,000 epinephrine using the intraosseous technique, in mandibular molars with acute pulpitis, which showed that both solutions had a highly anesthetic effect (96.8% and 93.1% respectively) with minimal cardiovascular effects. Their results are comparable with our study if we consider that for the intraosseous technique, 18.57% required supplemental anesthesia, reflecting 81.43% effectiveness. Mohammad *et al.*<sup>16</sup> conducted a double blind clinical trial in 100 patients diagnosed with irreversible pulpitis in maxillary teeth, who received infiltrative anesthesia with 2 ml of 4% articaine with 1:100,000 epinephrine or with 2% lidocaine with 1:80,000 epinephrine. The response was evaluated with an electronic pulp measuring device and found no significant statistical difference compared to 4% articaine with 1:100,000 epinephrine and lidocaine with 1:80,000 epinephrine, in anesthesia of maxillary teeth infiltrated in the buccal zone. They additionally

determined that only 67% of the patients expressed numbness with the mandibular technique and 33.3% required a supplemental technique. Our study found that only 13 patients required supplemental anesthesia (18.57%). Inferior alveolar nerve blockage is the technique most often used to numb the mandibular posterior teeth in root canal treatments. Jung IY *et al.*<sup>17</sup> report that the local anesthesia used to block the inferior alveolar nerve can provide a success rate of 70% in non-inflamed pulps, but the success rate decreases dramatically to 30% in patients with irreversible pulpitis, who are 8 times more likely than normal patients to undergo failure. These are the cases for which we highly recommend the use of intraosseous injection with 4% articaine as a primary technique,

improving the success ratio during the preparation of root canals.

Nusstein *et al.*<sup>18</sup> recommend the intraosseous technique due to a 98% success rate with lidocaine and 1:100,000 epinephrine with rapid-onset pulpal anesthesia. Our study suggests that intraosseous anesthesia can be used as a primary technique in root canal treatments in patients with symptomatic pulpitis because it provides an adequate level of anesthesia and a high degree of comfort.

The use of intraosseous technique with 4% articaine shows promising results regarding comfort and reduction of the need for additional anesthesia. The intraosseous technique is probably the best alternative when deep pulpar anesthesia is required in mandibular molars

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