

The Wand Versus Traditional Injection for Mandibular Nerve Block in Children and Adolescents: Perceived Pain and Time of Onset

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Abstract

Purpose: The purpose of this study was to compare the perception of pain and time of onset in relation to mandibular alveolar nerve block administered by a computerized anesthesia delivery system (ie, The Wand) and a traditional anesthesia system (ie, the syringe).

Methods: This study was conducted according to a split-mouth design, with both types of injections being given to all patients. Subjects consisted of 33 patients between 7 and 18 years of age requiring local anesthesia for dental restorations in both sides of the mandible. All patients were blindfolded, and the sound from the Wand machine was activated during both types of administration. Topical analgesic was placed in the area of the injection site in all cases. Pain ratings were obtained using a 10-point visual analog scale (VAS). Time of onset was measured, from withdrawal of the needle to numbness of the lower lip was reported.

Results: The computerized anesthesia delivery system resulted in significantly lower pain ratings than the traditional syringe. No difference could be found in time of onset between the 2 methods.

Conclusions: Mandibular alveolar block analgesia seems to be less painful when using The Wand than when using a traditional syringe. (*Pediatr Dent.* 2004;26:481-484)

KEYWORDS: LOCAL ANESTHESIA, INJECTION, MANDIBULAR NERVE BLOCK, PERCEIVED PAIN

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Dental procedures are connected with pain and discomfort, which is considered one of the main reasons for dental fear and anxiety, with possible severe consequences for the individual's future dental health. Injection of local anesthetic may be one such potentially painful procedure, amongst which the mandibular nerve block is commonly known by many clinicians to be the most stressful to perform. Good pain control during restorative care can best be obtained using local anesthesia. Hence, painless injection technique is one of the keys to avoid dentally fearful and uncooperative patients, and a skill every pediatric dentist should strive to master.

A newly marketed technology, The Wand (Milestone Scientific, Livingston, NJ), uses a microprocessor and an electronically controlled motor to deliver the anesthetic solution at a constant slow rate and under controlled pressure, regardless of the resistance within the tissue.¹⁻⁴ Delivery of

the anesthetic solution is activated with a foot pedal, and the thin, weightless handpiece with a needle held in a pen-like grasp helps to avoid variation in finger pressure during injection. Further, the technique of rotating the needle during insertion avoids deflection, resulting in precise injections.

Several studies have compared injections with The Wand to traditional syringe technique in terms of reaction to pain, reporting pain, and patient behavior.⁵⁻¹¹ The only study performed so far on mandibular block anesthesia in children and adolescents, however, could not find any difference in patients' rating of pain between injections using The Wand or a traditional syringe.¹¹

The purpose of this study was to compare the perception of pain and the time of onset for mandibular alveolar nerve block administered by The Wand and a traditional syringe.

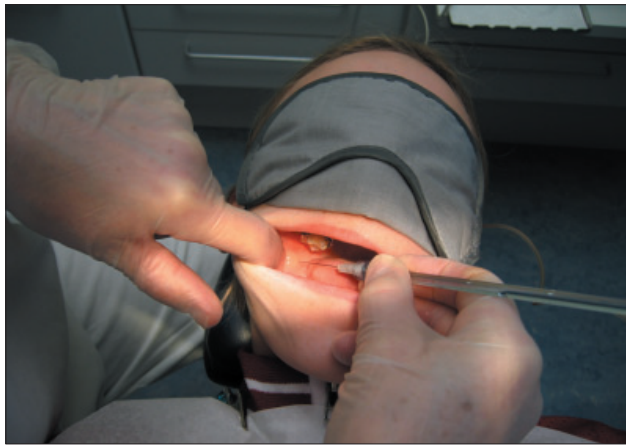


Figure 1. Clinical picture showing the blindfolding of the subjects during injection. The sound of the machine was also activated during both types of injection.

Methods

Subjects

Thirty-three children and adolescents were recruited among children from Frederikssund Municipal Dental Service, Denmark, who required local anesthesia for restorative dental treatment in both sides of the mandible. The study was performed according to a split-mouth design, with both types of injections given to all patients. Type and sequence of administration to each individual were randomly assigned, using a table of random numbers.

Procedure

Topical anesthetic (EMLA, Astra Zeneca Inc., Roskilde, Denmark) was placed in the area of the injection site for 1 minute. All injections were made with 1.5-ml Scandonest-Adrenaline (mepivacaine hydrochloride: 20 mg/ml; adrenaline: 10 mg/ml), delivered in cartridges. A 27-gauge needle was used for both methods of delivery. The traditional syringe was Aspiject (Rønvig Dental, Inc, Vejle, Denmark).

The traditional injection was given according to the standard technique.¹² The child was requested to open his mouth as wide as possible. The operator positioned the ball of the index finger on the coronoid notch of the ramus' anterior border. The needle was gently inserted between the internal oblique ridge and the pterygomandibular raphe about 1 cm over the occlusal surface in a direction coming from the opposite side. The patient was

instructed to close his mouth a little to relax the pterygoid medial muscle. The needle was advanced 1.5 to 2 cm in a dorsal direction along the ramus' medial side.

A small amount of anesthetic was injected during tissue penetration. When the needle reached the bone, at the middle of ramus mandibularis, it was pulled back 1 to 2 mm. After negative aspiration, the cartridge was slowly emptied. From everyday practice, it is known that the present operator takes approximately 60 to 90 seconds to give a mandibular block.

The Wand injection was given according to the manufacturer's instruction (the model used was a first-generation model produced by Milestone Scientific, Livingston, NJ). The handpiece was rotated when inserting the needle in order to avoid deflection. The foot pedal was set on slow delivery, and the rotating needle was slowly advanced through the tissue. After negative aspiration, the cartridge was emptied at what is labeled "fast flow rate" on the instrument. The time taken to give a mandibular block with The Wand was 90 seconds, as indicated in the manufacturer's instructions. The same experienced pediatric dentist performed all injections.

Measurement of pain and time of onset

All patients were blindfolded with a sleeping mask (Figure 1), and the sound from The Wand machine was activated during both types of administration so that patients were not aware of the method being used. During the injection, physical reactions such as crying, moving the head, or other disruptive behaviors were noted. Immediately after each injection, the children were asked to remove their masks and rate the amount of pain perceived during the injection, using a 10 points visual analog scale (VAS).

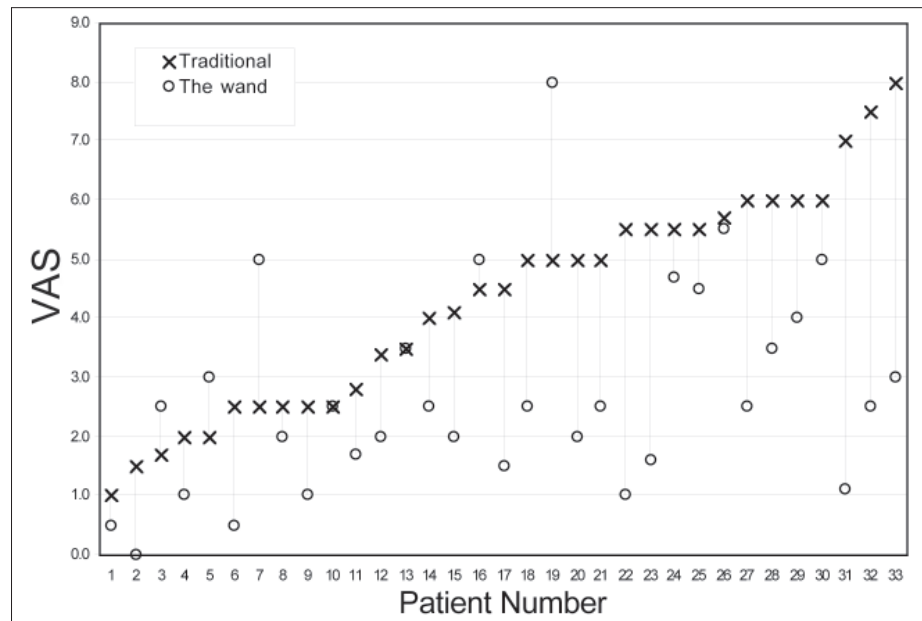


Figure 2. Graph showing the perceived pain, as measured on a VAS-scale, after the traditional injection and The Wand injection for each of the 33 patients.

Table 1. Descriptive Statistics of Reported Pain After Mandibular Block With The Wand and a Traditional Syringe

	The Wand	Traditional
Median	2.5	4.5
25% percentile	1.6	2.5
75% percentile	3.8	5.6
Mean±SD	2.7±1.73	4.3±1.84

The time of onset was measured from withdrawal of the needle, until the children reported lip numbness. A trained dental surgery assistant registered the time. Before the treatment, the children were well informed about how to use the VAS scale and when to report the numbness.

Statistical analysis

Pain perception differences between groups were tested using nonparametric tests (Wilcoxon's Signed Rank test for dependent data and Mann-Whitney U-test for independent data). Paired students *t* test was used to test differences in time of onset. The 5% level of significance was adopted.

Ethical aspect

After written and verbal information was obtained, written consent was garnered from both parents and children. The project was approved by the Ethical Scientific Committee for the municipalities of Copenhagen and Frederiksberg.

Results

This study included 33 children, 18 girls and 15 boys, between the ages of 7 and 18 years (mean=13.7 years±3.1 SD). The study design applied resulted in:

1. 8 patients having the first injection with the traditional syringe technique in the right side of the mandible;
2. 13 patients having the first injection with The Wand in the right side of the mandible;
3. 8 patients having the first injection with The Wand in the left side;
4. 4 patients having the first injection with the traditional technique in the left side.

None of the children reacted by crying, moving the head, or any other disruptive behavior. Twenty-six of the 33 patients found the injection with the traditional syringe to be more painful than the injection with The Wand, while 5 found the injection with The Wand to be more painful than the injection with the traditional syringe (Figure 2). Two of the 33 patients found The Wand and the syringe technique to be equally painful. Pain ratings using the visual analogue scale (VAS) were significantly higher after the traditional injection than after The Wand injection (Table 1; $P<.001$).

When the patients were ordered according to increasing pain response during the traditional injection, a trend towards a higher reduction of perceived pain due to The Wand was seen, with increasing pain response during the traditional injection (Figure 2). This was supported by the finding that, when the patients were placed into 2 groups according to whether their pain rating after the traditional injection was less than or equal to the median (4.5; Table 1; $N=17$) or larger than the median ($N=16$), a statistically significant greater reduction in perceived pain was found in those patients with a high pain perception during the traditional injection ($P=.006$).

Time of onset varied from 82 seconds to 832 seconds for The Wand, and from 86 to 680 seconds for the traditional side, with a mean of 287 seconds (± 171 SD) for The Wand and 329 seconds (± 154) for the traditional method. Mean difference in time of onset was negligible (mean=42±240 seconds), and not statistically significantly different.

Discussion

This study showed a statistically significant reduction of pain perception in relation to mandibular nerve block, when comparing a computerized anesthesia delivery system to a traditional system in children.

This study was conducted using a design and methodology that must be considered efficient in reducing bias (eg, blind-folding the children). The effect of the blinding was confirmed by questioning the children about the type of injection they had received. Furthermore, every effort was made to minimize differences between the 2 procedures, such as assuring that a cartridge with an easy moving piston was used to reduce the pressure during injection with the traditional syringe. Finally, the same experienced operator performed all the injections.

Not all children had experience with local anesthetics in the orofacial region, but they were carefully instructed and questioned by the operator to secure valid information at the time of onset.

The only previous study that compared pain perception after mandibular block injections with The Wand and a traditional syringe found no difference.¹¹ In contrast to the present study, this previous study included younger children. Furthermore, the blinding procedure seems to be less sufficient. The fact that several studies^{2,3,5,6,9} have found low pain perception after injection methods, which would otherwise be considered rather painful, support the authors' findings of low pain perception after injections with The Wand.

The lower pain perception after injections with The Wand could be explained by the inverse relation between time spent on the injection and perceived pain,¹³ which has also been demonstrated when using The Wand.⁵ Using The Wand automatically draws the operator's attention to the time used for administration of the anesthetic and might, in the present study, have resulted in a longer time of administration of the anesthesia also using the traditional injection method.

In spite of this, pain perception in relation to the 2 methods significantly differed statistically. To what extent the results are operator dependent demands further study.

One previous study found that time of onset was shorter after injections with The Wand.¹⁴ This study could not confirm this, which might be due to the fact that complete alveolar nerve block may not be obtained until approximately 1.5 ml of anesthetic is disposed.

Conclusions

The present study indicates that mandibular block injections performed using The Wand are less painful than injections performed using traditional methods. No difference in time of onset could be found.

Acknowledgements

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ABSTRACT OF THE SCIENTIFIC LITERATURE



PREDICTING MAXILLARY CANINE IMPACTIONS

The purpose of this retrospective study was to identify measurements from posteroanterior cephalograms taken in the mixed dentition that could accurately predict maxillary canine impaction. A formula derived from the data provided over 95% accuracy in predicting maxillary canine impaction.

Comments: Most of us obtain a panoramic film in the mixed dentition, and certainly the information gleaned from these films is very useful in assessing maxillary canine position. But the accuracy in predicting impaction is not nearly as good as this study's results (see Warford, *Am J Orthod Dentofac Orthop* 2003;124:651) While landmarks on PA cephalograms are sometimes difficult to make out, those used in this study are readily identifiable. ALS

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