

Comparison of Periodontal Ligament Injection and Inferior Alveolar Nerve Block in Mandibular Primary Molars Pulpotomy: A Randomized Control Trial

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Abstract:

Background: Inferior alveolar nerve block is a common technique for anesthesia of the primary mandibular molars. A number of disadvantages have been shown to be associated with this technique. Periodontal ligament (PDL) injection could be considered as an alternative to inferior alveolar nerve block. The aim of this study was to evaluate the effectiveness of PDL injection in the anesthesia of primary molar pulpotomy with mandibular block.

Methods: This study was performed using a sequential double-blind randomized trial design. 80 children aged 3-7 years old who required pulpotomy in symmetrical mandibular primary molars were selected. The teeth of these children were anesthetized with periodontal injection on one side of the mandible and block on the other. Pulpotomy was performed on each patient during the same appointment. Signs of discomfort, including hand and body tension and eye movement, the verbal complaint and crying (SEM scale), were evaluated by a dental assistant who was blinded to the treatment allocation of the patients. Finally, the data were analyzed using the exact Fisher test and Pearson Chi-squared exact test.

Results: Success rate was 88/75 and 91/25 in the PDL injection and nerve block groups, respectively. There was no statistically significant difference between the two techniques ($P = 0.250$).

Conclusion: Results showed that PDL injection can be used as an alternative to nerve block in pulpotomy of the mandibular primary molars.

Key Words: Evaluation, inferior alveolar nerve block, periodontal injection, primary molar

Introduction

Local anesthetic injection is the most anxiety-provoking procedure for children.¹ Injection also produces the greatest negative response in children.² Pain and anxiety can reduce the efficacy of anesthesia in pediatric patients.³ Inferior mandibular nerve block is the technique of choice for treatment of mandibular primary molars.² However, the mandibular nerve block technique has some disadvantages for children

such as a higher percentage of post-operative trauma (lip and tongue biting)^{4,6} and increased risk of trismus⁷ and positive aspiration that occurs in 10-15% cases.⁸ Facial nerve palsy is a complication of inferior alveolar nerve block anesthesia.⁹

Considering the side effects of the mandibular nerve block technique, periodontal ligament (PDL) injection can be considered as an alternative.^{10,11} This technique is simple and seems to provide adequate pain control without an extended period of post-operative anesthesia. This technique also requires very small quantities of anesthetic solution.²

Results of study showed 91/5% effectiveness for restorative procedures when PDL injection was used. The success rate of this technique was 66/6% for crown preparation and 50% for endodontic procedures.⁹ Another study also reported a 92% success rate for pulpal anesthesia with this technique.¹² Results of a study showed that the success rate of PDL injection for restorative treatment, pulpotomy and extraction is 91/46%.¹³

Because mandibular block has some side effects, and PDL injection has some advantages, it makes sense to evaluate the effectiveness of PDL injection in anesthetizing of mandibular primary molars.

The purpose of this study was to compare the effectiveness of PDL injection in the anesthesia of primary molar pulpotomy with mandibular block.

Methods

This study was conducted at the dental clinic of Shahed University from September to December 2011. The study was performed using sequential double-blind randomized trial. Based on a pilot study and a previous study 80 children aged between 3 and 7 years who required pulpotomy (based on pre-operative radiograph and clinical signs) on symmetrical mandibular primary molars were selected and entered in the study sequentially. These children were healthy and did not have any contra indications for local anesthesia and were cooperative (3,4 Frankle classification). Informed consent was obtained from the parents of the children. All children participating in the study were treated by the same operator. In each child who did not have any disease and contra indication for local anesthesia and was not uncooperative (1,2 frankle classification). A primary molar on one side randomly received a nerve block injection and its symmetrical tooth received PDL injection

randomly. Random allocation (using a coin) was done by the dental assistant who was instructed for this duty and was not informed about the study design. Topical anesthetic was applied before injection in both techniques. In the mandibular nerve block technique approximately 1/3 and 0/5 ml of an esthetic solution² (Persocain E, Lidocain Hcl Darupakhsh Pharmaceutical Mfa Co., Iran) was placed near the inferior alveolar nerve and in the muco buccal fold (Aesculap Syringe, Made in USA, Niddle: Nik Rahnama KarCo, Made in Iran, 27G- short (0.4-25 mm), respectively. In the PDL technique, 0.2 ml of anesthetic solution was placed in the bottom of the middle part of the buccal gingival sulcus until blanching of the buccal tissue was observed. At the time of injection, needle was slightly bent that needle was not seen by the child. Pulpotomy for symmetrical teeth were performed on each patient during the same appointment. Turn of treatment in each side was also selected randomly. Signs of discomfort included eye movement, hand and body tension, the verbal complaint and crying (SEM scale).¹³ These were evaluated after 3 min in the PDL injection group (because onset of anesthesia after PDL injection is faster than mandibular block) and after 5 min in the block group by a single rater who was not the surgeon and was blinded to group allocation. This rater was instructed about this evaluation. Finally, the data were analyzed using the exact Fisher test and Pearson Chi-square exact test.

Results

The results of this investigation were derived from a sample population comprising 41 female (the samples were selected randomly) and 39 males. Pulpotomy was completed in 42 first primary molars and 38 s primary molars. Mean age of the samples has been presented in Table 1.

In the inferior alveolar nerve block group, two patients (one 4-year-old and one 6-year-old; both of the teeth were E) exhibited hand and body tension. Verbal complaint was seen in four cases (one 7-year-old, two 4-year-olds, and one 5-year-old; 1 of the teeth was D and three were E) and crying was seen in one patient (4-year-old; the tooth was an E).

In the PDL injection group, two patients (one 3-year-old and one 4-year-old; one tooth was D, and one was E) exhibited hand and body tension. Verbal complaint was seen in six patients (three 5-year-olds, one 3-year-old and two 4-year-olds; the teeth were two D and four E) and crying was observed in one case (a 3-year-old; the tooth was E).

Based on the results of this study success rate was 88/75 and 91/25 in the PDL injection and nerve block groups,

respectively. There was no statistically significant difference between the two techniques ($P = 0.250$).

The Fisher exact test showed no statistical difference between two groups. The Pearson Chi-square exact test showed that there was not a significant difference in pain based on the patient’s age and gender between the two groups ($P = 0.250$).

The Fisher exact test showed that there was not a significant difference in pain between the first and second primary molar ($P=0.250$).

Discussion

When anesthesia is not successful, pain during dental treatment is tormenting.^{14,15} Unfortunately approximately 11.6% of children aged 26-155 months experience insufficient levels of anesthesia during dental procedures.¹⁶ This may be due to the child’s age and gender¹⁷⁻¹⁹ anxiety about injection^{15,20} the kind of anesthetic agent administered^{21,22} the operative procedure performed^{16,17} the use of nitrous oxide/oxygen analgesia and oral sedation²³ whether they are arch treated¹⁶⁻¹⁸ and method of local anesthetic administration.⁵

When the tooth is clinically normal, the success rate of inferior nerve block has been reported to be approximately 75-90% or more.²⁴ Furthermore, deeper penetration of the needle causes more discomfort and access to the injection area can be difficult.⁵ PDL injection is an easy technique that probably produces adequate anesthesia for primary molar pulpotomy.²⁵

In this study, we evaluated the effectiveness of PDL injection as primary injection not as adjunctive compared with mandibular block in the pulpotomy of primary molars.

In PDL technique, we injected an anesthetic agent into the middle of the sulcus on the buccal surface and observed gingival blanching and high success rate of this technique in the present study can be related to this point.

These results indicate that the PDL injection is an effective technique for performing pulpotomy on a primary molar. According to results of this study, PDL injection was effective in 88/75% of all cases.

The results of Malamed’s study showed that PDL injection is 50% effective for endodontic treatment, and these results do not agree with our results. He used this technique on eight teeth and pointed out that the sample size he used was small for endodontic procedures and that additional research must be done.⁹ In this study injection of an anesthetic agent was done into the middle of the sulcus on the buccal surface, and gingival blanching was observed. It is probable that the differences between the results of our study and Malamed’s stem from this key difference. Furthermore, anatomical position of primary molars and bone density in the primary dentition can affect on the success rate of PDL injection in the present study.

Table 1: Mean age and standard deviation of the samples.

Gender	Mean	N	Standard deviation
Girl	5.24	41	1.356
Boy	4.74	39	1.272
Total	5.00	80	1.331

Walton and Abbott reported a 92% success rate for this technique.¹² The results of his study are in accordance with those of our study. However, Walton evaluated the effectiveness of PDL injection in all teeth (anterior and posterior) in both the maxilla and mandible and found that the technique is least effective in mandibular molars.¹² We compared the effectiveness of anesthetizing mandibular primary molars with mandibular block and PDL injection in pulpotomy procedures and believe that our study is more accurate than Walton's study.

A study by Haghgoo found that the success rate of periodontal injection for the pulpotomy of mandibular primary molars (30 cases) was 83/4%.¹³ The results of our study are similar to hers. However, the sample size in our study was more than in Haghgoo's and the age range in our study was smaller.

Another study by Naidu *et al.* compared the effectiveness of the mandibular block/long buccal with infiltration/intra papillary for pulpotomy and stainless steel crown placement in lower primary molars.²⁶ Results of this study showed that there was no difference in the effectiveness of pain control between infiltration/intra papillary injection and inferior alveolar nerve block/long buccal infiltration. This finding is in accordance with the present study. However, Naidu *et al.* compared infiltration/intra papillary injection and inferior alveolar nerve block/long buccal infiltration for pulpotomy and stainless steel crown placement in lower primary molars and in present study effectiveness of PDL injection and block injection have been compared.

Oztas *et al.* compared children's reactions to inferior alveolar nerve injection with a traditional syringe and PDL injection with a computerized device (Wand) and found that immediately after injection the traditional syringe was more painful than injections and pain scores with the Wand were significantly higher than those with traditional inferior alveolar nerve injections at the end of the recovery.²⁷ The results of Oztas *et al.* study are different to the results of the present study. In Oztas, *et al.* study contra lateral primary mandibular second molars were treated in two separate visits, and the differences in the results of these two studies may be a result of differences in methods and materials.

The results of the present study indicate that there was no significant difference in pain between first and second primary molars. Studies generally compared effectiveness of PDL injection in mandibular first and second primary molars. In PDL injection, an anesthetic agent is injected into the bottom of the gingival sulcus and this area is similar to the mandibular first and second primary molars.

Time is an important factor in pediatric treatment. This technique provides reliable pain control rapidly and only requires very small quantities of anesthetic solution.²

In the present studied we investigated the effectiveness of PDL injection in the anesthesia of primary molar pulpotomy with mandibular block. It is recommend that the effectiveness of PDL injection will be studied in dental treatment including pulp treatment and restoration and extraction of maxillary molars and incisors.

Conclusion

Based on the results of this study, PDL injection can be used for pulpotomy of mandibular primary molars.

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