

A Comparative Study of Effectiveness of Two Anesthetic Agent by Intrapulpal Injection

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Abstract

Background: The intrapulpal injection is commonly used when conventional anesthetic techniques fail during endodontic procedures. To compare the level of intrapulpal anesthesia achieved by lidocaine along with adrenaline and normal saline solution 0.9% w/v sodium chloride of intrapulpal injections.

Materials and methods: The study was conducted at the Department of Conservative Dentistry and Endodontics, Bangladesh Medical University, Dhaka between January 2007 to December 2007. The study populations were patients seeking treatment for the condition which required full anesthesia but could not be profoundly anaesthetized with conventional anesthesia. Based on sensitization test, a total of 99 patients were consecutively included in the study. The patients were randomly allocated into two groups— one group receiving injection lidocaine along with adrenaline (Group-A) and normal saline group (Group-B). Lack of profound pulpal anesthesia was determined if the patient experienced pain during chamber access or pulp extirpation. Anesthesia was determined to be effective when the patient could tolerate continuation of the treatment.

Results: The mean age of the subjects was 31.14 ± 7.74 years with a male to female ratio of roughly 2:1. Pain was invariably precipitated by cold and hot stimuli. Exaggerated responses were elicited as vitality test was evoked by heat (65.2%) and cold (98.5%). Test cavity preparation was also found positive. Based on these tests, majority (87.9%) of the cases was diagnosed as acute open pulpitis. Procedure using bars also elicited pain response in about 47% of the cases. The Group-A achieved profound anesthesia in 100% cases and the group-B in 62.5% cases.

Conclusion: This result suggesting that combined lidocaine and adrenaline is the best than normal saline. It concluded that achieving profound anesthesia for pulpal extirpation is of utmost importance which can be obtained using lidocaine with adrenaline.

Key words: Intrapulpal anesthesia; Injection lidocaine with adrenaline and normal saline.

Introduction

Profound analgesia is essential for vital pulp extirpation, as ineffective analgesia may make Endodontic treatment a traumatic experience for the patient and also create an embarrassing situation for the dentist. Analgesia, which may be fully adequate for extraction of a tooth, may not be completely effective during Endodontic treatment in the tooth having some inflammatory vital pulpal tissue, and hence pulp extirpation in these cases demands more profound analgesia. The intrapulpal anaesthesia, which is the direct injection of anesthetic solution into the body of the pulp, has been found to be more effective and widely advocated by different workers. It is wise to anticipate that in spite of apparently profound anaesthesia, an intrapulpal injection may be required to obtain total analgesia.¹

Different authors have advocated different anesthetic solutions and techniques of intrapulpal anesthesia but in many cases the effectiveness of the anesthesia is found to be lacking. Various authors and researchers have propounded various theories for this reason of lack of effectiveness of intrapulpal local anaesthesia. Harris has proposed that the reason for the pain, even after intrapulpal injection, is vascular distention of the tissues, i.e. engorgement of the blood vessels.²

In a double-blind study, Birchfield and Rosenberg found that it was immaterial whether a local anesthetic or sterile saline solution was used for intrapulpal anesthesia, provided the syringe needle fitted tightly into the access cavity leading to the pulp.³ They postulated that the anaesthesia is due to back-pressure of the solutions, irrespective of

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its composition. Pashley et al. advocated the idea that the direct tissue injury or compression of nerve endings might be responsible for the anaesthesia.⁴ The purpose of the present study was to compare the effectiveness of various factors that are related to the level of anaesthesia achieved by use of intrapulpal injection technique.

Materials and methods

The present study was carried out at the Department of Conservative Dentistry and Endodontics, Bangladesh Medical Medical University, Dhaka over a period of 1 year from January 2007 to December 2007. Adult patients of acute pulpitis who could not be profoundly anaesthetized with conventional anaesthesia technique were the study population. Lack of profound pulpal anesthesia was determined if the patient experienced pain during chamber access or pulp extirpation when they should have been comfortable with the dental treatment up to that point. A total of 66 such patients were consecutively included in the study. To supplement the block or infiltration anesthesia initially administered, the intrapulpal injection was given on chamber access followed or by pulp extirpation. Before proceeding with this injection, patient was explained that despite the primary anesthesia, the more sensitive nerve endings of the pulp may not be fully anaesthetized and that intrapulpal anesthetic injection is required to achieve complete anesthesia. Patients were made aware about the momentary painful sensation during the intrapulpal injection and taking their consent, drops of anesthetic solution were directly injected into the partially anesthetized pulp. The patients were randomly allocated into two groups— one group receiving injection lidocaine along with adrenaline (Group-A) and normal saline group (Group-B).

A minute opening into the pulpal chamber was made by using a high and low speed instrumentation with light and intermittent pressure to minimize patient's discomfort. The tooth was isolated and any debris in the area of the pulp exposure was removed. The results of the injection were checked with an endodontic explorer, and then by extirpation of the pulp.

The intrapulpal injection was given with back-pressure. A standard anesthetic syringe was used with a 27 gauge needle. Adequate back-pressure was defined as definite resistance on the syringe

handle when at least a moderate force was used to inject the solution. Definitive back-pressure was required for a treatment case to be included in this study. The study was double-blinded in that neither clinician nor patient was aware of which solution was being injected. All anesthetic cartridges used for the intrapulpal injections were labeled in a similar manner; the only difference was a code number on the label that was later used to identify the solution. Anesthesia was determined to be effective when the patient could tolerate continuation of the treatment. Data were collected using a structured questionnaire (Research instrument) containing all the variables of interest and were processed and analysed using SPSS (Statistical Package for Social Sciences) version 11.5. The test statistics used to analyse the data were descriptive statistics and Chi-square (χ^2) Probability Test. The level of significance was set at 0.05 and $p < 0.05$ was considered significant. Necessary approval was taken from the proper authorities.

Results

Table I Distribution of patients by age (n = 66)

Demographic characteristics	Frequency	Percentage (%)
Age*		
< 25	13	19.7
25 – 30	21	31.8
31 – 35	12	18.2
36 – 40	12	18.2
≥ 40	8	12.1
Mean±SD	31.15±7.74	
	19-52	
Range (Years)		
Gender		
Male	44	66.7
Female	22	33.3

Table II Distribution of patients by presenting complaints (n = 66)

Presenting complaints	Frequency	Percentage (%)
Pain	66	100
Nature of pain		
Referred	52	78.8
Sharp	65	98.5
Lancinating	61	92.4
Intermittent	51	77.3
Continuous	17	25.8
Others	1	1.5
Precipitating factor		
Hot	65	98.5
Cold	43	65.2

Table III Clinical and radiographic findings of the patients (n = 66)

Findings□	Frequency□	Percentage
Periodontal condition □	□	
Good□	12□	18.2
Average□	48□	72.7
Poor□	6□	9.1
Crown □	□	
Dental caries□	59□	89.4
Restoration□	7□	10.6
Root □	□	
Straight□	15□	22.7
Curved□	1□	1.5
Both□	51□	77.3

Table IV Distribution of patients by vitality test (n =66)

Vitality test□	Frequency□	Percentage (%)
Heat test		
Normal response□	36□	36.4
Exaggerated response□	63□	63.6
Cold test		
Exaggerated response□	99□	100.0
Test cavity preparation		
Positive□	99□	100.0
Clinical diagnosis		
Acute close pulpitis□	12□	12.1
Acute open pulpitis□	87□	87.9

Table V Selection of patients with failed anaesthesia of the teeth (n = 66)

Sensitization tests □	Frequency□	Percentage (%)
Air-blow sensitivity □	□	
Lower□	11□	16.7
No response□	55□	83.3
Cold application □	□	
Same as before□	1□	1.5
Lower□	29□	43.9
No response□	35□	53.0
Heat application □	□	
Same as before□	1□	1.5
Lower□	20□	30.3
No response □	45□	68.2
Procedure using burs □	□	
Same as before□	35□	53.0
Lower□	31□	47.0

Table VI Comparison of profound anesthesia achieved among group (n = 66)

□	Group-A□ (n = 34)□	Group-C□ (n = 32)□	
Yes□	34(100.0)□	20(62.5)□	0.001
No□	00□	12(37.5)□	

Discussion

In the present study, 100% success rate of the intrapulpal injection with Lignocaine with Adrenalin 62.5% with normal saline, indicate the significant statistical difference between the two test solutions. The result of the present study are in agreement with Malamed and Tarik, who suggested that the effectiveness of the intrapulpal injection is dependent on the type of anesthetic solution used with proper back-pressure technique.^{5,6} The analysis of the figures indicate the actual, active effect of the anesthetic solutions in achieving the complete anesthetic effectiveness with intrapulpal injection, contraindicating the findings of Gheluwe et al. and of Birchfield et al. who indicated that the back-pressure is the only significant factor responsible for effectiveness of intrapulpal injection, irrespective of the content of the anesthetic solutions.^{7,3}

However, it should be noted at this stage that the back-pressure is the essential requirement for the success of the intrapulpal injection. The result of the present study are in agreement with Malamed and Tarik, who suggested that the effectiveness of the intrapulpal injection is dependent on the type of anesthetic solution used with proper backpressure technique.^{8,9}

In the present study about two-third of our study subjects was in between 25 – 40 years of age with mean age 31 years. A male preponderance was observed in the sampled population with male female ratio of 2:1. All the selected cases complained of pain. The nature of pain (Sharp, lancinating continuous/intermittent, referred) was suggestive of acute condition demanding supplemental anesthesia after conventional anesthetic techniques. A higher proportion of patients exhibited cold (98.5%) than heat (65.2%) as a precipitating factor thus suggesting the condition was much acute. More than 72.7% of the patients' periodontal condition was average indicating that the patients selected were not aware of gingival health. The result of the present study are in agreement with Malamed and Tarik.^{5,6}

Majority (77.3%) of the teeth were multi-rooted with curved and straight roots showing their natural limitation to be anesthetized. Exaggerated response obtained to cold test (100%) and positive

test cavity preparation (100%) indicates that the vitality of the pulp was intact and the inflammation was in advanced stage. Procedures like air blow sensitivity, using burs, heat and cold were applied to evaluate the status of anesthesia. These steps provoked different responses indicating various states of anesthesia. In case of procedure using burs, responses (Same as before or lowered) necessitates the use of intrapulpal anesthesia.

As with any dental procedure, proper case selection is important to achieve a success. The intrapulpal injection is not an appropriate supplement if, for any reason, back-pressure cannot be achieved or if the pulp tissue is inaccessible to the effects of the back-pressure. When remaining pulp tissue to be anesthetized is located deep within a relatively narrow or curved canal, the situation may not lend itself to successful anesthesia with an intrapulpal injection even. An effective injection then becomes more likely by changing to a smaller size syringe needle, although some canals may be smaller than even a 30 gauge needle.⁹

There are various aids for achieving back-pressure with the intrapulpal injection if the opening into the chamber is too large to wedge the needle. Sometimes a larger size needle could be used. Oftentimes, however, it is necessary to place pieces of rubber, wax, or cotton pellets over or around the needle to form a stopper. Placing a cotton pellet over the needle was a primary stoppering technique and was successful.¹⁰

The precise mechanism by which pressure can produce anesthesia is not fully understood. Monheim has suggested that prolonged pressure may lead to degeneration of nerve fibers in many instances.¹¹ The pressure that is transmitted to the dental pulp during an intrapulpal injection is instantaneous and it gives profound anesthesia even for unusually long endodontic treatment.

The findings of present study thus indicate that the anesthesia produced by the intrapulpal technique was not the result of anesthetic solution only. It appears that the pressure that is transmitted to the pulp by the solution in the syringe might have played some role in producing the anesthesia.

Limitation

Single centre study with small samples size.

Conclusion

These clinically significant observations should be considered during the administration of intrapulpal anesthesia with lidocaine along with adrenaline, particularly, in cases of endodontic management of young permanent molars for rendering safe, painless and successful pulpectomy procedures.

Recommendation

Multicentre study with large samples size has suggested to see the proper picture.

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Contribution of authors

ARMM-Conception, acquisition of data, data analysis, drafting & final approval.

MRH-Design, interpretation of data, critical revision & final approval.

FHC-Conception, acquisition of data, data analysis, drafting & final approval.

KA-Data analysis, interpretation of data, drafting & final approval.

KK-Data analysis, interpretation of data, drafting & final approval.

Disclosure

All the authors declared that there is no conflict of interest.

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