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Research Article

EVALUATION OF EFFICACY OF HYALURONIDASE ENZYME ON THE ONSET OF ANESTHESIA IN PATIENTS WITH IRREVERSIBLE PULPITIS - AN IN VIVO STUDY

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ABSTRACT

The Inferior Alveolar Nerve Block does not always result in successful pulpal anesthesia and therefore has a poor success rate in patients with irreversible pulpitis. An enzyme called "HYALURONIDASE"; a component of the extracellular matrix, temporarily cleaves the 1,4-beta glycosidic bond of hyaluronan and reduces the viscosity of the tissue, enhancing early onset of akinesia.In this prospective, randomized, double-blinded study, 32 healthy patients with irreversible pulpitis were divided into 2 groups. The control group was administered inferior alveolar nerve block using lidocaine with epinephrine. The experimental group was administered Hyaluronidase along with lidocaine with epinephrine. The duration of effect on the pulpal tissues was evaluated by response to electrical stimuli applied to the affected tooth. On interpretation of 'T' test, there was a statistically significant difference in the onset of ankinesia in the two groups with a 'p' value of <0.001 . The control group showed a mean of 3.5, whereas the study group showed a mean of 2.237.The results of the present study showed a statistically significant increase in the onset of the inferior alveolar nerve block when administrated with Hyaluronidase compared to plain Lidocaine with Epinephrine.

Keywords: Hyaluronidase, Lidocaine, Irreversible Pulpitis, Inferior alveolar Nerve Block.

INTRODUCTION

The key to a successful endodontic procedure is to relieve the patient of any sort of pain & discomfort. Among all the nerve blocks used in endodontics, the inferior alveolar nerve block is least effective.

Clinical studies in endodontics have found a 44%-81% failure rate associated with this nerve block. [3] .Various hypothesis have been reviewed by Hargreaves & Kieser as to why the inferior alveolar block has such a high failure rate.[7,19]

Another reason that may indicate failure of the inferior alveolar block is the viscosity of the surrounding tissues.[10] Lesser viscosity aids in better diffusion of the anesthetic agent.

An enzyme called "HYALURONIDASE"; first described by Meyer, Dubos & Smythe (1937) which is a component of the extracellular matrix, temporarily cleaves the 1,4-β glycosidic bond of hyaluronan and reduces the viscosity of the tissue, enhancing early onset of akinesia.[11] It catalyses depolymerization of hyaluronic acid and hence decreases viscosity resulting in increased diffusion ("SPREADING FACTOR").[11]

Hence the prime focus of this randomized blind study is to evaluate the efficacy of Hyaluronidase when added to Lidocaine in patients with irreversible pulpitis to augment the onset of anesthesia in Inferior Alveolar Nerve Blocks.

MATERIALS AND METHODS

Thirty two patients participated in this study. All were patients with irreversible pulpitis of the college of dentistry and were healthy. The research was approved by the institutional review board or ethical committee in accordance with national and international guidelines and regulations. (Cert.No: ABSM/EC/84/2012)

To qualify for the study, each patient had a vital mandibular posterior tooth (molar or premolar), was actively experiencing mild to moderate pain, and had a prolonged response to

electrical pulp testing. Each patient had a tooth that fulfilled the criteria for a clinical diagnosis of irreversible pulpitis.

Exclusion criteria was as follows: subjects who were hypersensitive to Hyaluronidase; local anesthetics and vasoconstrictors; history of significant medical problem; high risk cardiac patients & cardiac patients who have undergone surgeries in the past 6 months; pregnancy; lactation; Stokes Adam syndrome; subjects under medication that might interfere with local anesthetic activity or the perception of pain; subjects with a history of systemic infections or were unable to give informed consent.

Each patient rated his or her painful response on the electrical pulp tester. The pulp tester readings ranged from 0-10. The concerned and the adjacent tooth were isolated with cotton rolls. A medium to carry out the electrical impulses was used (toothpaste) .The patients were then randomly divided into two groups; control and experimental. Each group comprised of 16 patients. The patients in the control group were administered Local Anesthetic solution (2% Lidocaine with 1:80,000 Epinephrine) over a 2-minute interval (about 1mL/min), after blood aspiration test to avoid accidental intravascular injection. The volume of the solution was fixed at 1.8 mL to block the inferior alveolar and lingual nerves along with 1mL to be infiltrated into the buccal soft tissues. All blocks were administered by the same clinician.

The experimental group patients were administered the Local anesthetic solution along with 1mL of Hyaluronidase, in the same manner as the control group patients. 1mL of Hyaluronidase was added to 1.8 mL of the anesthetic solution in a 5mL disposable syringe. The Hyaluronidase enzyme was in a powdered form (1500 IU/2mL). The 2mL solution was produced by adding 2mL of distilled water .The entire procedure was carried out under aseptic conditions. The onset of the anesthetic effect in the pulpal tissue was assessed by the initial response to the electrical pulp tester at a time interval of 3 minutes after administration of the anesthetic solution. Readings were recorded every 3 minutes till no response was observed (up to reading number 10) .The readings obtained were tabulated and statistically analyzed using Student 'T' test.

RESULTS

All thirty-two patients completed the procedure and none required supplemental an injection of Local Anesthetic solution. There were no therapeutic effects or complications during or after the procedure. The onset of akinesia in both the groups was the same except for significant results seen in time intervals of 30seconds, 60seconds, 90seconds and 20seconds.

DISSCUSSION

As stated by Hargreaves & Keiser, the major cause of failure of Inferior Alveolar Nerve Block in inflamed pulp is the activation of nociceptors[7].One of the many reasons put forward for the failure of the inferior alveolar block is the viscosity of the surrounding tissues. Although the present study revealed faster onset of anesthesia which was a result of reduced viscosity of the surrounding tissues. This was a result of the enzyme Hyaluronidase added to lidocaine.

However clinically this may not be relevant as Bupivacaine helps achieve long term anesthesia clinically. Cardiac patients are restricted to this drug. Hence the use of Hyaluronidase enzyme in cardiac patients is advantageous as it increases anesthesia and decreases the volume of anesthetic applied.

However some studies have shown that the use of Hyaluronidase along with local anesthetics increase the pH of the surrounding tissues & therefore nullify the effect of local anesthetics[3] .This may be the reason for insignificant results in some cases.

Negating the above studies, *malamed et al* discussed the use of Hyaluronidase with local anesthetics and obtained significant results[17].With reference to articles on studies being done using hyaluronidase and local anesthetic agents [3], this study has been conducted to infer the onset of akinesia in patients with irreversible pulpitis.

The sole disadvantage of the use of hyaluronidase enzyme is its allergenic nature however rare[13]. Although enzymes similar to hyaluronidase have been detected and isolated from a large number of tissues, for example liver, kidney , spleen, uterus and placenta[16].

We conclude that under the conditions of our study, Hyaluronidase injected along with Lidocaine and Epinephrine augments the onset of Inferior alveolar Nerve Block.

Fig. 1: Comparison of the pulp testing values at each interval: 'T' test

	Groups	N	Mean	Std. Deviation	T	df	Sig. (2-tailed)
Before LA	CONTROL	20	3.45	1.234	0.471	37	0.64
	LIDOCAINE WITH HYALURONIDASE	19	3.26	1.24			
30s	CONTROL	20	3.65	1.137	-4.985	37	**<0.001**
	LIDOCAINE WITH HYALURONIDASE	19	5.63	1.342			
60s	CONTROL	20	4.8	1.508	-6.578	37	**<0.001**
	LIDOCAINE WITH HYALURONIDASE	19	7.68	1.204			
90s	CONTROL	20	5.75	1.682	-6.053	32	**<0.001**
	LIDOCAINE WITH HYALURONIDASE	14	8.93	1.207			
120s	CONTROL	19	7.05	1.393	-4.89	24	**<0.001**
	LIDOCAINE WITH HYALURONIDASE	7	9.71	0.488			
150s	CONTROL	18	8.33	1.283	-1.305	19	0.207
	LIDOCAINE WITH HYALURONIDASE	3	9.33	0.577			
180s	CONTROL	12	8.83	0.937	-0.948	12	0.362
	LIDOCAINE WITH HYALURONIDASE	2	9.5	0.707			
210s	CONTROL	8	9.5	1.069	-0.441	7	0.673
	LIDOCAINE WITH HYALURONIDASE	1	10	.			
240s	CONTROL	3	9	1	-0.866	2	0.478
	LIDOCAINE WITH HYALURONIDASE	1	10	.			
270s	CONTROL	2	5	5.657			
	LIDOCAINE WITH HYALURONIDASE	0a	.	.			
A 'T' cannot be computed because at least one of the groups is empty.							

Fig 1 depicts a significant p value of < o.oo1.This states that a significant increase in onset of anesthesia was seen in the experimental group

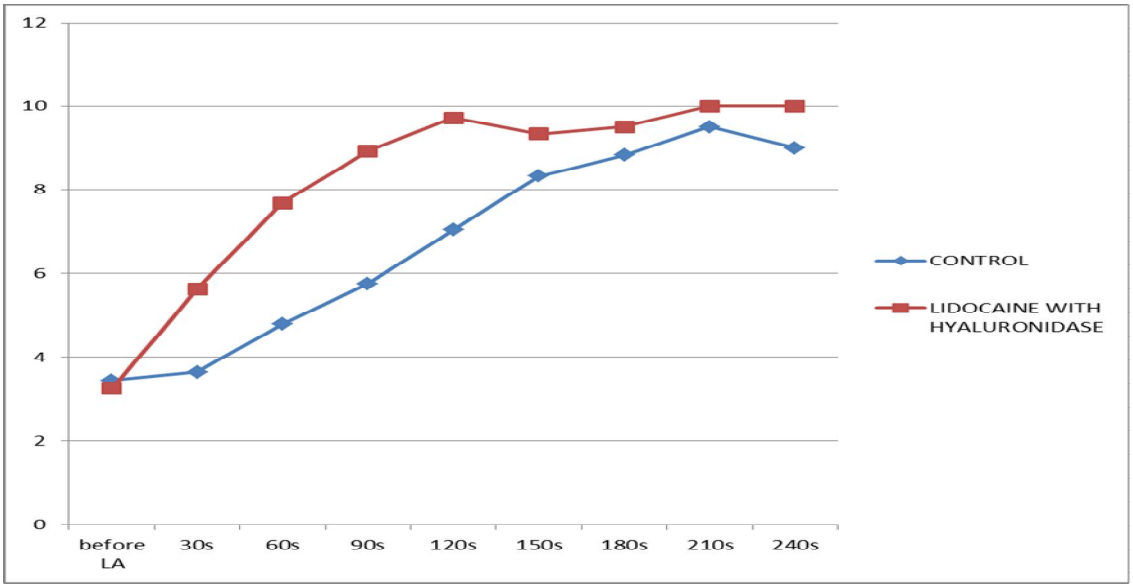

Fig. 2: Graph 1 depicts an increase in onset of anesthesia at 30s, 60s 90s and 120s in the experimental group when compared to the control group

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