

A Randomised controlled trial to evaluate the efficacy of 2% lignocaine buffered with sodium bicarbonate VS sodium bicarbonate infiltration followed by 2% lignocaine administration in patients with fascial space infection/odontogenic infection

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ABSTRACT

Background

It is found that higher pH solutions established anaesthesia of better quality [1]. Sodium bicarbonate is alkaline in nature and on infiltrating into an infected space can increase the pH of the surrounding. There are several causes for failure to achieve profound regional anaesthesia. These include inflammation and/or infection, anatomic variation, intravascular injection, accessory innervation, and deflection of the needle.

Inflammation and infection reduces the efficacy of a local anaesthetic by reducing its bioavailability. Infection represents an additional factor in anaesthetic performance. Lower tissue pH at the site of infections makes it extremely difficult for the typical la injection to provide adequate anaesthesia[2]. Infected tissue is more acidic which makes it more difficult for the RN conversion to occur.

Objective

The purpose of this randomised clinical trial was to evaluate the effect of sodium bicarbonate infiltration on the anaesthetic success of 2% lignocaine in achieving adequate anaesthesia in patient with odontogenic infection

Aim:

To evaluate the level of anaesthesia /numbness in odontogenic infection patient following sodium bicarbonate infiltration followed by 2% lignocaine administration.

Method:

20 patients diagnosed with odontogenic infection were randomly divided into 2 groups (Group A=10, Group B=10). Group A received 8.4 % sodium bicarbonate infiltration of 0.5ml on the affected site intra-orally followed by 2ml infiltration of 2% lignocaine 1:200,000 with epinephrine, on the same site Group B patient received 2ml infiltration of 2% lignocaine 1:200,000 epinephrine buffered with 0.5 ml of 8.4 % sodium bicarbonate .

Incision and drainage was initiate 15 minutes after Local Anaesthetic infiltration. Numbness of the infiltrated area was the a requisite for all patients . Success was determined using Heft-Parker Visual analog scale recording upon making an incision or initial instrumentation.

The offending tooth was either extracted or referred to Department of Endodontics for Root canal treatment.

Patient were prescribed Cap Amoxicillin 500mg ,Tab Flagyl 400mg and NSAIDs.

Patient were advised to maintain oral hygiene and to report to Department of Oral and Maxillofacial surgery after a Week.

Results

The success rate of sodium bicarbonate infiltration prior to local anaesthetic agent (2% lignocaine) administration was 100% (GROUP A Patients),Where as moderate to severe pain was experienced in the majority of patients where Sodium bicarbonate buffered Local Anaesthetic agent(2% lingoaine) was administered (GROUP B Patients). Sodium bicarbonate Buffered Local Anaesthetic agent failed to provide adequate anaesthesia in all the patients with odontogenic infection.

Conclusion

Infection represents an additional factor in anaesthetic performance. Lower tissue pH at the site of infections makes it extremely difficult for the typical la injection to provide adequate anaesthesia . Infected tissue is more acidic which makes it more difficult for the RN conversion to occur.

Sodium bicarbonate being alkaline in nature increases pH of the surrounding on infiltrating in the infected site . which in turn increases the success rate of Local Anaesthetic agent to achieved adequate anaesthesia .

But Sodium bicarbonate buffered local anaesthetic agent shows no result in significantly decreasing pain during incision and drainage .

Keywords: *sodium bicarbonate, acidosis, space infection,odontogenic infection,buffered local anaesthetic agent*

I. Introduction

It is found that higher pH solutions established anaesthesia of better quality [3]. Sodium bicarbonate is alkaline in nature and on infiltrating into an infected space can increase the pH of the surrounding. There are several causes for failure to achieve profound regional anaesthesia. These include inflammation and/or infection, anatomic variation, intravascular injection, accessory innervation, and deflection of the needle[4].

Inflammation and infection reduces the efficacy of a local anaesthetic by reducing its bioavailability. Infection represents an additional factor in anaesthetic performance. Lower tissue pH at the site of infections makes it extremely difficult for the typical la injection to provide adequate anaesthesia [2] . Infected tissue is more acidic which makes it more difficult for the RN conversion to occur.

II. Material and Method

20 patients diagnosed with odontogenic infection were randomly divided into 2 groups (Group A=10, Group B=10) . Group A received sodium bicarbonate infiltration of 0.5ml on the affected site introrally ,followed by 2ml infiltration of 2% lignocaine 1:200,000 epinephrine, on the same site

Group B patient received 2ml infiltration of 2% lignocaine 1:200,000 epinephrine buffered with 0.5 ml of 8.4 % sodium bicarbonate .

Incision and drainage was initiate 15 minutes after Local Anaesthetic infiltration. Numbness of the infiltrated area was the a requisite for all patients . Success was determined using Heft-Parker Visual analog scale recording upon making an incision or initial instrumentation. The patient was explained thoroughly on pain grading according to HP-VAS scale and to place a mark on the analogue scale to show the amount of pain that they feel [5]

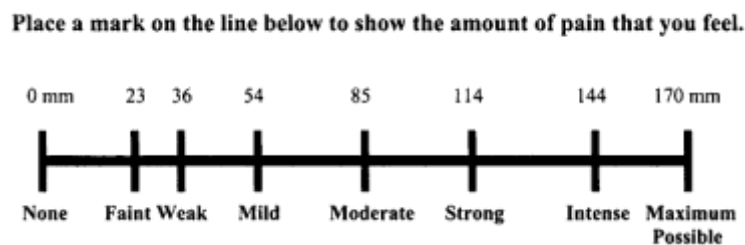


Fig 1 . HP-VAS scale

The offending tooth was either extracted or referred to Department of Endodontics for Root canal treatment.

Patient were prescribed Cap Amoxicillin 500mg ,Tab Flagyl 400mg and NSAIDs.

Patient were advised to maintain oral hygiene and to report to Department of Oral and Maxillofacial surgery after a Week.



Fig.2 unilateral swelling on left side of face.



Fig 3. 0.5 ml of 8.4 %Sodium bicarbonate infiltrated intraorally in relation to 36, 15 mins post infiltration 2ml of 2% local Anaesthetic agent was administered intra-orally at the same site where Sodium bicarbonate was administered .



Fig4. Horizontal incision of 10-15mm approx was made at the vestibular region in relation to 35 to 37 region using size 15 BP blade .
Pus was drained with out patient complaining of pain or discomfort



Fig 5. Sodium bicarbonate

Table 1: Comparison of clinical parameters in Group A and Group B.

Clinical Parameters	Group A=10(Sodium bicarbonate infiltration followed by LA administration)	Group B=10 (Buffered LA)
Duration of operation	30 mins	2 hours
Age	22-70	25-68
Sex	3 females 7males	4 females 6 males
ANTIBIOTICS (n)%		
Yes (patient who are under Antibiotics)	(0/10) 0%	(0/10)0%
No (Patients who are not under antibiotics)	(10/10)100%	(10/10)100%
CLINICAL DIAGNOSIS (n)%		
Cellulitis	(4/10)40%	(0/10)0%
Purulence	(6/10)60%	(10/10)100%
INCISION AND DRAINAGE (n)%		
Cellulitis	(4/10) 40%	0
Purulence	(6/10)60%	(1/10) 10%
Treatment discontinued due to pain	(0/10) 0%	(9/10)90%

Table 2: Percentage and Discomfort rating according to HP-VAS Scale

Solution	No pain	Weak pain	Mild pain	Moderate Pain	Strong pain	Intense Pain	Maximum possible pain
Sodium bicarbonate infiltration prior to local anesthetic administration	(9/10) 90%	(1/10) 10%	0	0	0	0	0
Sodium bicarbonate Buffered local Anaesthesia	0	(1/10) 10%	0	0	0	(9/10)90%	0

Chart showing percentage and discomfort rating

III. Results

TABLE 1 shows the clinical parameters of patients in group A and B

There was a significant difference between the two formulations in clinical and surgical parameters in which incision and drainage was done in 40% of patient with cellulitis and 60 % in patient with purulence using *sodium bicarbonate infiltration followed by La administration*. This technique was successful and gave a 100 % success rate . Where as on using the Buffered technique ,incision and drainage was being able to perform in only 10 % of patient with purulence , remaining 90% complaint of severe pain and treatment was discontinued

Table 2 represent the pain associated with incision and drainage in both group (HP VAS Analogue)

- Intense pain was observed in (9/10) 90% of patients belonging to group B
- Weak pain was observed in 10% (1/10) of patient belonging to group B
- Weak pain was observed in 10%(1/10)of patient belonging to group A
- No pain was observed in 90 % of patient belonging to group A

IV. Conclusion

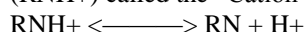
Infection represents an additional factor in anaesthetic performance. Lower tissue pH at the site of infections makes it extremely difficult for the typical la injection to provide adequate anaesthesia. Infected tissue is more acidic which makes it more difficult for the RN conversion to occur [6].

Sodium bicarbonate being alkaline in nature increases pH of the surrounding on infiltrating in the infected site. which in turn increases the success rate of Local Anaesthetic agent to achieved adequate anaesthesia.

But the addition of sodium bicarbonate buffer to 2% lignocaine with 200,000 epinephrine did not result in significant decrease in pain of the incision and drainage.

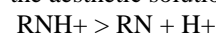
V. Discussion

Local Anesthetics exist as salts [7]. They are both water soluble and stable. In a solution Local Anesthesia exist as uncharged molecules, also called the "Base" (RN) and a charged molecule (RNH⁺) called the "Cation"



1) The relative proportion of each ionic form in the solution varies with pH of the solution or surrounding tissue

In the presence of high concentration of Hydrogen ions (Low pH) the equilibrium shift to the left and most of the aesthetic solution exist in cationic form



As hydrogen ion concentration decreases (Higher pH) the equilibrium shift towards the free base form:



2) The relative proportion of ionic forms also depends on the pKa or dissociation constant of the specific local Anesthesia (**pKa of lignocaine is 7.7**)

When pH of the solution is as the same value as that of the local Anaesthetic agent, Exactly 50% of the drugs exist in RN and 50% in RNH⁺ form. The uncharged molecule or the free base form is responsible for diffusion through the nerve sheath and RNH⁺ is responsible for binding to the receptor site.

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