Perception And Practice of Dental Practitioners Regarding use of Endodontic Irrigants in an Indian City : A Cross-Sectional Study

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Abstract

Background: During the last several years endodontics has progressed so that the treatment is less traumatic for the patient and less stressful for the dentist. There are many techniques available to accomplish the root canal preparation. We must ask ourselves the question, "Why do we irrigate and what irrigation protocol will provide the cleanest canal?" In this context, let us remember that the shaping is the result of endodontic instruments while the cleaning results from irrigation.

Aims: The purpose of this study was to determine current trends in irrigation selection among dentists.

Methods and Material: Two hundred dentists were randomly approached. Participants were asked about their irrigant selection, irrigant concentration and use of adjuncts to irrigation.

Statistical analysis used: SPSS 16

Results : Most frequently used irrigants are combination of sodium hypochlorite, saline and chlorhexidine. The use of irrigant varies in different clinical situations.

Conclusions: Sodium hypochlorite is the most commonly used and preferred solution.

Key-words: Chlorhexidine, EDTA, Sodium Hypochlorite.

Introduction

Dr. Herbert Schilder insisted on "**cleaning** and shaping". It may be more appropriate to say, "shaping for cleaning". The main goal of the root canal treatment is to completely eliminate the different components of the pulpal tissue, calcification and bacteria. The most commonly used irrigating solution is sodium hypochlorite. It performs bactericidal, cytotoxic, dissolution of organic material, and minor lubrication[1]. Alternatives to sodium hypoclorite irrigation are necessary because of its irritating properties and potential for severe inflammatory reactions.[1] Although many different irrigants and treatment protocols have been studied, little research has been done to determine its widespread acceptance. The purpose of this study was to ascertain the current trends in irrigation among dentists in the city of Mumbai.

Subjects and Methods

Two hundred registered dentists practicing in Mumbai were approached in a random manner. They were requested to participate in a clinical research. Clinical research participants were asked 16 questions consisting of multiple choice, multiple selections with options for write-in answers where appropriate. Data were collected and analyzed using SPSS 16.

Questionnaire

1. How many years you have been practicing?
   1year. ( ) 1-5 years. ( )
   5-10 years. ( ) >10 yrs. ( )
2. Do you do endodontics in your practice?
   Yes. ( ) No. ( )
3. Which irrigants do you use?
   Sodium hypochlorite. ( )
   Saline. ( )
   Chlorhexidine. ( )
   EDTA. ( )
   Sterile water. ( )
   Other ? ( )
   Specify _____
4. Which concentration of sodium hypochlorite do you use?
   <0.5%. ( ) 0.5-1.5%.
   1.6-2.5%. ( ) 2.6-4.0%.
   4.1-5%. ( ) >5%.
5. What temperature of sodium hypochlorite is used?
   Heated, Temperature.....
   Room temperature .
6. Do you use any other irrigant in conjugation with sodium hypochlorite?
   Yes, specify_____
   No. ( )
7. Does your choice of irrigant change based on pulpal involvement or periapical involvement?
   Yes. ( ) No. ( )
8. Which irrigant do you use for vital tooth?
   Sodium hypochlorite. ( ) Saline. ( )
   Chlorhexidine.( ) EDTA. ( )
   Sterile water. ( )
   Other ? specify_____
9. Which irrigant do you use for necrotic tooth?
   Sodium hypochlorite. ( )
   Saline. ( )
   Chlorhexidine. ( )
   EDTA. ( )
   Sterile water. ( )
   Other ? specify_____
10. Which irrigant do you use for immature tooth?
    Sodium hypochlorite. ( )
    Saline. ( )
    Chlorhexidine. ( )
    EDTA. ( )
    Sterile water. ( )
    Other ? specify_____
11. Which irrigant do you use for a tooth with radiographic evidence of periapical lesion?
    Sodium hypochlorite. ( )
    Saline. ( )
    Chlorhexidine. ( )
    EDTA. ( )
    Sterile water. ( )
    Other ? specify_____
12. Which irrigant do you use for retreatment cases?
    Sodium hypochlorite. ( )
    Saline. ( )
    Chlorhexidine. ( )
    EDTA. ( )
    Sterile water. ( )
    Other ? specify_____
13. Do you use any adjuncts to irrigants you use?
    Yes. ( ) No. ( )
14. Which adjuct do you use?
    Ultrasonic activation. ( )
    Sonic activation. ( )
    Subsonic activation (endoactivator). ( )
    Negative pressure (endovac). ( )
    Other? Specify_____
15. What is your recall time?
    1 week . ( ) 2 weeks. ( )
    6 months. ( ) Others? Specify___
16. Are you satisfied by the results obtained by the technique you use?
    Yes. ( ) No. ( )

Results

Most frequently used irrigants are combination of sodium hypochlorite, saline and chlorhexidine. (Fig 1). The concentration of sodium hypoclorite most preferred is 2.6-4.0% (Fig. 2). Sodium hypochlorite is ordinarily used at room temperature. (Fig. 3). Usually sodium hypochlorite was used in combination with other irrigants (Fig. 4). The choice of irrigants depended on pulpal involvement. (Fig. 5). The use of irrigant varies in different clinical situations.

1. Vital tooth sodium hypochlorite
2. Necrotic tooth combination of sodium hypochlorite, saline chlorhexidine and EDTA.
3. Immature tooth saline
4. A tooth with periapical lesion combination of sodium hypochlorite and saline
5. Retreatment cases combination of sodium hypochlorite, saline, EDTA

Discussion

Sodium hypochlorite is widely used as an irrigant since its introduction in endodontics by Walker in 1936.[2] It was used as wound irrigants up to 1915[3] and has become the most popular irrigation solution in endodontics since Crane described the use of Dakin's solution (0.5 % Sodium hypoclorite) in 1920. In addition to bleaching, deodorizing and tissue-dissolving properties, Sodium hypoclorite has been demonstrated to be an

effective disinfectant agent. Sodium hypochlorite has been demonstrated to be an effective agent against a broad spectrum of bacteria and to dissolve vital as well as necrotic tissue.[4] Different irrigation regimens have been proposed to enhance the effectiveness of Sodium hypoclorite in disinfecting the root canal system. Grossman (1943) suggested the alternate use of Sodium hypoclorite and hydrogen peroxide (H_2O_2) for the irrigation of the root canal. This association caused effervescence, which may improve the debridement and disinfection of the root canal. Martin (1976) has proposed irrigation with Sodium hypoclorite solution during ultrasonic instrumentation of the root canal system. He claimed that ultrasonic waves accelerate chemical reactions and potentiate the bactericidal efficiency of Sodium hypoclorite. Studies have demonstrated that ultrasonication of Sodium hypoclorite solution increases its cleaning and antibacterial effects.[5] The effective concentration range of Sodium hypoclorite is from 2.6 to 5.25%. Heating sodium hypochlorite enhances its tissue solubility and debridement properties.[6] However in the present study the most commonly used concentration is in the desired range of 2.6 to 4 percent (Fig. 2) but is used most commonly at room temperature giving practitioners desired results (Fig. 3). Optimizing the concentration, temperature, flow, and surface tension can improve the tissue dissolving effectiveness of hypochlorite even 50-fold.[7] Density, pH, viscosity, wetting capacity and conductivity of the solution are directly proportional to concentration of Sodium hypoclorite.

Objectives And Properties of Irrigants [8]

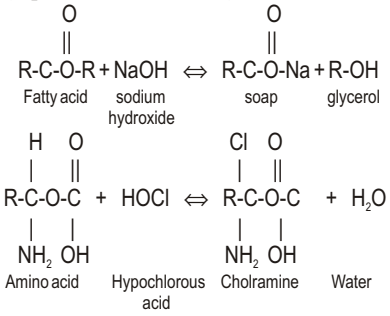
- Be highly efficacious against endodontic flora.
- Neutralize the components of endodontic infection.
- Intense and direct action against endodontic flora.
- Facilitate the action of instrumentation.
- Alter the pH of enviornment.
- Remove blood in pulp cavity.
- Prevent smear layer formation, favor action of intracanal medicaments.
- Remove organic and inorganic matter.
- Have good tissue tolerance.
- Penetrate the entire root canal.

Mechanism of Action

Pecora et al. reported that sodium hypochlorite exhibits a dynamic balance.

$$NaOCl+H_2O \leftrightarrow NaOH+HOCl \leftrightarrow Na^+ + OH^- + H^+ + OCl^-$$

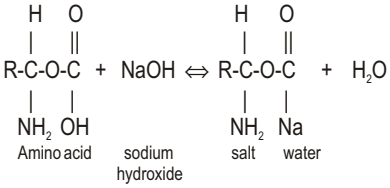
Sodium hypochlorite acts as an organic and fat solvent degrading fatty acids, transforming them into fatty acid salts (soap) and glycerol (alcohol), that reduces the surface tension of the remaining solution (saponification reaction).



With the exit of hydroxyl ions, there is a reduction of pH. Hypochlorous acid, a substance present in sodium hypochlorite solution, when in contact with organic tissue acts as a solvent, releases chlorine that, combined with the protein amino group, forms chloramines (chloramination reaction). Hypochlorous acid ($HOCl^-$) and hypochlorite ions (OCl^-) lead to amino acid degradation and hydrolysis.

The chloramination reaction between chlorine and the amino group (NH) forms chloramines that interfere in cell metabolism. Chlorine (strong oxidant) presents antimicrobial action inhibiting bacterial enzymes leading to an irreversible oxidation of SH groups (sulphydryl group) of essential bacterial enzymes (cystein).

Sodium hypochlorite neutralizes amino acids forming water and salt (neutralization reaction).



Sodium hypochlorite is a strong base (pH>11). At 1% concentration, sodium hypochlorite presents a surface tension equal to 75 dynes/cm, stickiness equal to 0.986 cP, 65.5 mS of conductivity, 1.04 g/cm^3 of density and moistening capacity equal to 1 h and 27 min. Its antimicrobial mechanism of action can be observed verifying its physico-chemical characteristics and its reaction with organic tissue. The antimicrobial effectiveness of sodium hypochlorite, based in its high pH (hydroxyl ions action), is similar to the mechanism of action of calcium hydroxide. The high pH of sodium hypochlorite interferes in the cytoplasmic membrane integrity with an irreversible enzymatic inhibition, biosynthetic alterations in cellular metabolism and phospholipid degradation observed in lipidic peroxidation. Grossman and Meiman observed pulp tissue dissolution capacity, of 5% sodium hypochlorite dissolves is 20 min to 2 h[9].

In this study, it was found that the overwhelming majority used sodium hypochlorite as primary irrigant. The reason for same being its antibacterial and tissue dissolving properties. This results are in accordance with previous surveys conducted elsewhere. In United Kingdom a survey conducted reported around 71% of rubberdam users used sodium hypochlorite.[10] Another survey in Australia reported 94% of endodontists use sodium hypochlorite as primary irrigant.[11] in this study it is evident that the choice of irrigant is based on the pulpal diagnosis where 70% of clinical conditions require the use of sodium hypochlorite only or in combination with other irrigants. (Fig. 4 & Fig. 5)

Conclusion

Sodium hypochlorite is the most commonly used and preferred solution. The choice of irrigant also varies according to nature of lesion. Sodium hypoclorite is also used in various concentration and in conjugation with other irrigants. Sodium hypoclorite has been used with different adjuncts at different temperature in different clinical situations.

References

References are available on request at **editor@healtalkht.com**

Legends for Graphs

Fig. 1 Pattern of use of various irrigants.
Fig. 2 Concentration of sodium hypochlorite
Fig. 3 Temperature of sodium hypochlorite
Fig. 4 Any other irrigant in conjugation with sodium hypochlorite
Fig. 5 Choice of irrigant change based on pulpal involvement

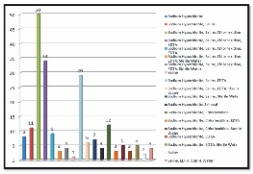


Fig. 1

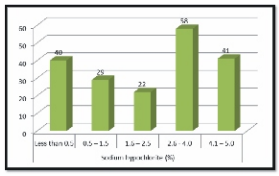


Fig. 2

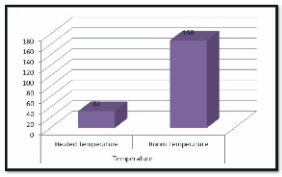


Fig. 3

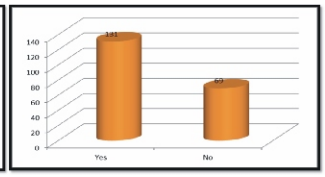


Fig. 4

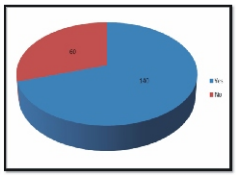


Fig. 5

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