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Formulation Of Fresh 2% Glutaraldehyde For Pulpotmy In Primary Teeth

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Abstract
Glutaraldehyde is recommended for pulpotmy in primary teeth but main disadvantage of glutaraldehyde is shelf life , which is less than one year and it has to be freshly prepared before using as pulpotmy agent so in this study formulation of fresh 2% Glutaraldehyde for pulpomy of primary teeth is discussed .

Key Words
Formulation, Glutaraldehyde, Pulpotmy

Introduction

Glutaraldehyde may be an alternative to formocresol in vital pulp therapy. It is an excellent bactericidal agent. Glutaradehyde received attention as an alternative to formocresol for pulpotomy in primary teeth in view of superior fixative properties, self limiting penetration, low antigenicity and low toxicity. Glutaraldehyde is bifunctional and polymeric and has the ability to quickly and irreversibly form long molecule with effective cross linking. The stability of glutaraldehyde –fixed tissue therefore appears much greater than tissue fixed with formaldehyde [1]. Glutaraldehyde. appears to be the recommended alternative [2].Glutaraldehyde did not exhibit the ability to diffuse or leach out of tooth (may be due to larger bifunctional molecule of glutaraldehyde).[3] Glutaraldehyde appears to be superior to formaldehyde preparation for pulp therapy in Formaldehyde reactions are reversible, (as the protein molecule does not change in its basic overall structure) but glutaraldehyde reactions are not.Formaldehyde is a small molecule that penetrates the apical foramen, where glutaraldehyde is a larger molecule that does not. Formaldehyde requires a long reaction time and an excess of solution to fix tissue, where as glutaraldehyde fixes tissue instantly and an excess of solution is unnecessary.[4]

In spite of the proven ability of glutaraldehyde to function as a neutral fixative, there are disadvantages and limitations which have prevented the widespread use of glutaraldehyde as a pulpotomy agent. The most serious of these limitations is a result of the chemical properties of glutaraldehyde. In aqueous solution, glutaraldehyde is mildly acidic, relatively inert, and very stable. Elevation of the pH of an aqueous glutaraldehyde solution increases the microbicidal action of the glutaraldehyde. Unfortunately, at high pH, glutaraldehyde polymerizes, thereby losing that microbicidal activity. A buffer can be used to maintain the pH of the solution at a mildly alkaline level, i.e., at near physiological pH, and sodium phosphate buffer has been used for that purpose[5]

A sodium bicarbonate buffer can also be used for that purpose. However the results are less satisfactory because that buffer reacts too easily with the protons that are available in the solution to form carbon dioxide, decreasing buffering capability. However, even in a buffered, mildly alkaline solution, glutaraldehyde loses microbial activity eventually as a result of increased polymerization over time, thereby limiting the shelf life of the solution. It has a shelf life of one year [6]

Such solutions are also sensitive to temperature; exposure to heat increases polymerization such that aqueous glutaraldehyde solutions are routinely stored at cold temperature even for short periods of time.

One alternative that can be utilized to overcome that instability is to prepare a fresh glutaraldehyde solution, buffered to the proper pH, immediately before use of the reagent as a fixative for each pulpotomy procedure. However, a solution which can be used directly without the need for further mixing or additional constituents is far preferable for convenience and has the further advantage of eliminating the potential for addition of improper proportions or incorrect constituents at the time of use. It is, therefore, an object of the present invention to provide a glutaraldehyde-containing pulpotomy agent which retains a high level of fixative activity for long periods of time, there by insuring that it is immediately and conveniently, available for the effective fixation of tissues and the treatment of infected pulp tissue.

Formulation of 2% Glutaraldehyde

Glutaraldehyde was Prepared in Department of Paedodontics and Preventive Dentistry J.S.S Dental College (J.S.S UNIVERSITY), Mysore and JSS Pharmacy College, Mysore.

Fig 1

Glutaraldehyde 25% l.R-16ml Dilute to 200 ml with phosphate Buffer. To Prepare 7.2 pH Buffer-
2 Components –
1) Pottasium Dihydrogen phosphate 50 ml of .2M
2) Sodium Hydroxide 34.7ml of.2M
Mix it and dilute to 200ml with water.
To make .2M Pottasium dihydrogen Phosphate. 2.72 gm------100ml of water
To make .2M Sodium Hydroxide. 8 gm---------100ml of water
An aliquot of a 25% stock solution of commercial glutaraldehyde (pH 2.9) pure was diluted with either distilled water to make 2% unbuffered solution (pH- 5.8) or with .2 M phosphate buffer (pH 7.2) to make 2 % buffered solution.

To make 200ml of 2% buffered glutaraldehyde
Glutaraldehyde stock 25% solution. 16ml
Phosphate buffer pH 7.2. 84 ml
Mix it and dilute to 200ml with distil water **(Fig. 1)**

Unbuffered dilute preparation remain stable regardless of temperature, but buffered dilute solution is benefited from cold storage. Buffered preparation must be stored in cold to slow deterioration.[7]
Buffering glutaraldehyde increase the concentration , and applying it for longer period all inhanced the degree of fixation. They concluded buffered glutaraldehyde best when 4% for 4 min and 8% for 2 minutes.[8]

There is limited diffusion from tooth structure into adjacent tissue. Binding with protein tissue is irreversible.There is less pulpal irritation because of less apical diffusion.
Cold, buffered, 2% glutaraldehyde is more stable

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