

## Role Of Different Concentrations Of Chlorhexidine In Enhancing The Bond Strength Of Etch And Rinse Dentin Bonds.

### Abstract

**Aim :**To evaluate the substantivity of different concentrations of Chlorhexidine to dentin discs prepared in-vitro

**Materials And Method :** 50 dentin disks were prepared from extracted human third molars and divided into two groups (each containing 25 discs). All the discs partially demineralised as per standard procedure. Group A specimens were then treated with 10 microlitre of 0.2% Chlorhexidine while Group B specimens were treated with 10 microlitre of 2% Chlorhexidine. They were then incubated in 1ml of PBS (ph 7.4). Substantivity was evaluated after 1 hr, 6 hrs, 24 hrs and one week of incubation. CHX concentration in the eluates was spectrophotometrically analysed.

**Results :** Significant amount of Chlorhexidine was found to be retained on dentin discs in both the groups and was found to be more for the group in which the discs were treated with 0.2% Chlorhexidine

**Conclusion :** 0.2% Chlorhexidine can be clinically recommended when being used for prolonging the durability of resin-dentin bond.

### Key Words

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<sup>1</sup> Harpreet Singh  
<sup>2</sup> Pooja Kapoor  
<sup>3</sup> Daljeet Kapoor

<sup>1</sup> Reader, (Conservative Dentistry & Endodontics)  
<sup>2</sup> Sr. Lecturer (Orthodontics & Dentofacial Orthopaedics)  
<sup>3</sup> Prof. & Head (Periodontics)  
Gian Sagar Dental College And Hospital, Patiala

### Address For Correspondence:

Dr. Harpreet Singh  
Reader,  
Deptt. Of Conservative Dentistry and Endodontics  
Gian Sagar Dental College And Hospital, Patiala  
India  
Email ID : hsggentledental@gmail.com

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### Introduction:

CHX is a bisbiguanide and has been shown to possess antibacterial properties owing to its broad antimicrobial spectrum. It has been used extensively to treat endodontic infections [1] and periodontal diseases [2]. Also its role as a caries preventive agent has been evaluated and proven [3]

Of late, studies have been undertaken to analyze the role of CHX in stabilizing the organic matrix of resin-dentin bond which have shown that CHX has a beneficial role in the preservation of resin-dentin bond [4,5]. This property of CHX probably relates to its anti MMP-2, MMP -8 & MMP 9 activity. The clinical efficiency of CHX also relates to its property of substantivity which ensures its release and availability at the site delivered for a considerable period of time [6]. It is this property of CHX that makes the dentin to form hybrid layers that are more stable once treated with

CHX. [7]

Considering the importance of this property of CHX in the field of restorative dentistry, it seems necessary to evaluate the concentration of CHX which can be clinically made use of in this field. The purpose of this study was to evaluate the substantivity of CHX in two different concentrations so as to make a clinical recommendation.

### Materials And Method:

Fifty extracted non carious mandibular third molars were collected after the informed consent of the patients and were stored in 0.9% sodium chloride containing 0.02% sodium azide at 4 degree Celsius for 20 days. After the removal of debris, the roots were removed, and pulp tissue was also removed. Enamel and Cementum was removed using diamond points and water as a coolant. Diamond saw was used to make dentin discs from the remaining tooth portion. The disc size was kept

approx. to be 5mm in diameter and 2 mm in thickness (**Fig 1**). The discs were dried and then immersed in distilled water at 37 degree Celsius for one week and their wet mass was recorded. The part of the disc that was initially in contact with the pulp chamber was covered with two layers of nail varnish and dried. The dry mass was also recorded. All the discs were partially demineralised using liquid 37% phosphoric acid for 15 seconds and then washing it off with distilled water for 60 seconds.

The discs were then divided into two groups. Group A discs were

treated with 10 microlitre of 0.2% CHX (**Fig 2**) which was applied for 20 seconds (**Fig 3**) while Group B discs were treated with 10 microlitre of 2% CHX (**Fig 4**).

The discs were then transferred to 2 ml plastic centrifuge tubes having 1 ml of PBS and incubated at 37 degree Celsius



Fig 1 : Dentin Disc



Fig 2 : 10 Microlitre Of Chlorhexidine Solution

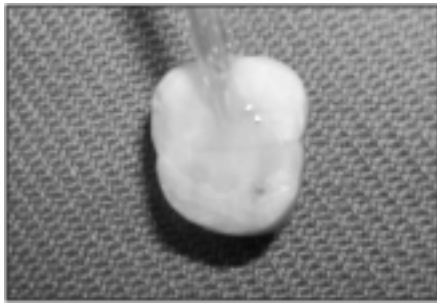


Fig 3 : 0.2 % Chlorhexidine Solution Being Applied On Dentin Disc

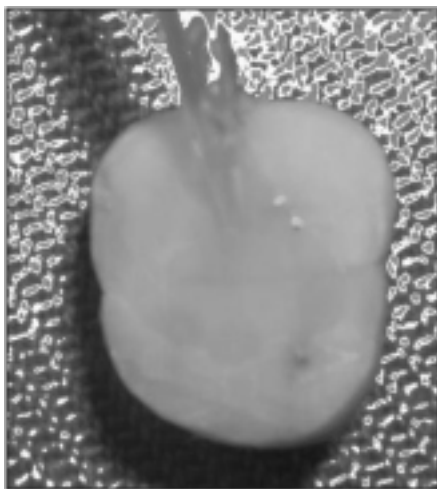


Fig 4 : 2 % Chlorhexidine Solution Being Applied On Dentin Disc

[8]. One ml of PBS solution was taken from each tube and spectrophotometric analysis was done at 260 nm after 1 hr, 24 hr and one week of incubation to estimate the concentration of CHX (in percentage) in the solution.

**Observations And Results:**

UV absorbance was recorded for all specimens (in terms of percentage of CHX remaining bound) and is shown in Table 1. Higher substantivity was observed for specimens in Group A as compared to Group B ( $p < 0.05$ , statistically significant).

**Discussion:**

Use of CHX for its antibacterial action in the field of endodontics as well as periodontics is world wide accepted. However, of late, its use to stabilize the resin-dentin bond is being researched upon so that it can be used in day to day clinical practice. CHX has the potential to bind to both organic and inorganic components of the dentin when it is applied after acid etching on the prepared tooth surface. Thereafter it is not washed off and the dentin bonding agent is applied.

The substantivity of CHX to hydroxyapatite of dentin is believed to be by the formation of a phosphate salt [9]. However, studies in the field of periodontology have also revealed that salivary glycoproteins have an additional role to play in retaining CHX [10]. The mode of interaction of CHX to organic component of dentin is now revealed to be via binding to Type I collagen. The results of our study are in consent with this theory which has revealed the highest substantivity of CHX in dentin discs which were partially demineralized. This implies that CHX got bound to both the organic and inorganic components of dentin in the specimens of this group and hence the better results. This binding of CHX to dentin matrix component is made to advantage in adhesive dentistry as CHX thus bound inhibits the collagen bound proteases and thus exhibits its antiproteolytic action, which in turn enhances the life span of adhesive bonded restorations.

It has already been analysed that the binding of CHX to partially demineralised dentin is better as compared to the totally demineralised one and so the same protocol was applied to this lab test as well [11].

It seems worthwhile to analyse that at which concentration, CHX can best be made use of for enhancing the longevity of bonded restorations

0.2% of CHX was chosen for the study for the fact that at this concentration, it exhibits definite anti MMP-2, -8 and -9 activity [12] and at the same time forms a relatively stable monolayer of retained CHX on the dentin in such a way that an additional increase in the percentage of CHX if used, would provide just an over saturation and not provide any further clinical advantage. However some studies have also mentioned the use of 2% CHX for the similar purpose[7]. Both the concentrations were used in this study in a similar way and the results when interpreted fell in favour of 0.2% CHX.

Therefore, as far as the clinical application is concerned, it is recommended to apply 0.2 %CHX to acid etched dentin, followed by application of dentin bonding agent. Thus the CHX gets sandwiched between the dentin and the adhesive. This phenomenon is responsible for the longevity of the bond of CHX treated hybrid layers [13, 14, 15, 16].

**Conclusion**

Within limits it can be concluded from our study that 0.2% CHX has a better tendency to bind to partially demineralized dentin and thus can be used clinically to enhance the stability of dentin-adhesive interface.

Table 1: Percentage of chlorhexidine remaining bound

Specimen	One hour	24 hours	One week
Group A	83.1	82.7	79.9
(0.2% CHX)			
Group B	78	74.3	72.6
(2% CHX)			

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