Research Article

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To Assess Disinfecting Efficacy of Chlorhexidine on Orthodontics Brackets: An Invitro Study

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ABSTRACT

Background: The present study was conducted to assess disinfecting efficacy of chlorhexidine on orthodontics brackets.

Materials & Methods: The present in vitro study was conducted on 50 orthodontics brackets kits from different manufacturer kits. All the brackets were divided into 5 groups. Group I comprised of American Orthodontics (10), group II had 3M Unitek (10), group III had Ortho Organizers (10), group IV had negative control (10), and group V had positive control (10).

Results: Bacterial contamination was present in 4 in group I, 3 in group II, 5 in group 5, 0 in group IV and 10 in group V. The difference was significant (P< 0.05). The most commonly isolated organism was K. pneumonia seen in 4 cases followed by S. aureus, Lactobacilli, S. epidermidis and B. cereus in 2 cases each. The difference was significant (P< 0.05). After phase I decontamination, organisms present were 2 in group I, 1 in group II and 2 in group III. The count became 0 after phase II decontamination.

Conclusion: Authors found that disinfecting ability of 2% chlorhexidine proved highly effective in destroying both gram-positive and gram-negative bacteria.

Keywords: Chlorhexidine, Orthodontic brackets, gram-negative bacteria.

INTRODUCTION

Dental plaque forms naturally on the teeth, in the absence of adequate oral hygiene it can accumulate beyond the levels that are compatible with dental health and at susceptible sites dental caries or periodontal disease or both can occur.[1] Effective removal of dental plaque is one of the main strategies for the prevention of these two diseases.[2] Plaque control by mechanical debridement is highly labor intensive whether professionally administered or practiced personally, satisfactory home care further demands a measure of manual dexterity and a high degree of motivation, which many individual do not possess. Not surprisingly, a large number of chemical agents have been tested for their ability to reduce plaque accumulation.[3] Introduction of fixed or removable orthodontic appliances in the oral cavity may cause specific variations in the oral microflora by decreasing the pH, increasing the dental plaque accumulation, and raising the microbial count in saliva. Further, these changes contribute to the increased risk of cross-contamination.[4] In addition, infection in the oral cavity might also be due to the use of contaminated instruments or straight use of orthodontic appliances received from the manufacturer's packaging without disinfection. Chlorhexidine is the

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most favorable disinfectant due to its broad-spectrum bactericidal action against both the gram-positive and gram-negative bacteria.[5] The present study was conducted to assess disinfecting efficacy of chlorhexidine on orthodontics brackets.

MATERIALS & METHODS

The present in vitro study was conducted in the department of Orthodontics. It comprised of 50 orthodontics brackets kits from different manufacturer kits. The study was approved from institutional ethical committee. Data such as name, age, gender etc. was recorded. All the brackets were divided into 5 groups. Group I comprised of American Orthodontics (10), group II had 3M Unitek (10), group III had Ortho Organizers (10), group IV had negative control (10), and group V had positive control (10). Various microbiological and biochemical tests were conducted on the brackets to detect the type and growth of bacteria. Brackets that showed microbial contamination were then subjected to disinfection using 0.01% and 2% chlorhexidine solutions for 5 minutes. Results thus obtained were subjected to statistics. P value less than 0.05 was considered significant.

RESULTS

Table I: Microbial contamination in different groups.

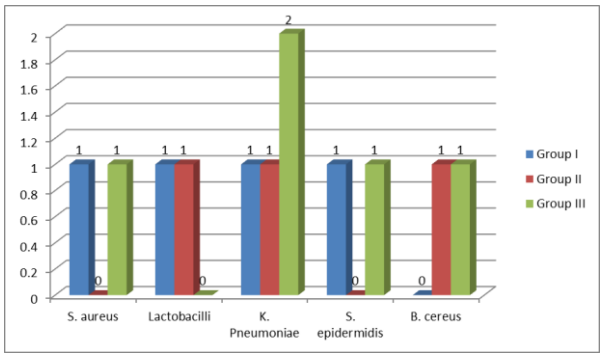
Groups	**Absent**	**Present**	**P value**
Group I	6	4	0.01
Group II	7	3	
Group III	5	5	
Group IV	10	0	
Group V	0	10	

Table I shows that bacterial contamination was present in 4 in group I, 3 in group II, 5 in group 5, 0 in group IV and 10 in group V. The difference was significant (P< 0.05).

Table II: Organisms isolated from the different groups.

Organisms	Group I	Group II	Group III	P value
S. aureus	1	0	1	0.01
Lactobacilli	1	1	0	
K. Pneumoniae	1	1	2	
S. epidermidis	1	0	1	
B. cereus	0	1	1	

Table II, graph I shows that most commonly isolated organism was K. pneumonia seen in 4 cases followed by S. aureus, Lactobacilli, S. epidermidis and B. cereus in 2 cases each. The difference was significant (P< 0.05).



Graph I: Organisms isolated from the different groups

Table III Phase I and II decontamination in different groups

Groups	Absent	Present	P value
Phase I decontamination			0.14
Group I	2	2	
Group II	2	1	
Group III	3	2	
Phase II decontamination			
Group I	2	0	-
Group II	1	0	
Group III	2	0	

Table III shows that after phase I decontamination, organisms present were 2 in group I, 1 in group II and 2 in group III. The count became 0 after phase II decontamination.

DISCUSSION

Chlorhexidine is a bisbiguanide formulation with cationic properties. The molecule is symmetric with two chlorophenyle rings and two bigunide groups connected by a central hexamethylene chain. It is a strong base and is most stable in the form of salts. The most common preparation is the digluconate salt because of its water solubility. Chlorhexidine was developed in late 1940s as a result of search for

antiviral agents. It was found that chlorhexidine does not possess antiviral activity but instead it possesses antibacterial activity.[6] The use of chlorhexidine was begun as a general disinfectant with a broad antimicrobial spectrum. Its antimicrobial spectrum include most of the microbials such as gram positive and gram negative organism including bacterial spores, lipophilic viruses, yeasts and dermatophytes etc. Chlorhexidine is extensively used in various medical fields such as gynecology, urology, ophthalmology and treatment of burns etc.[7] The present study was conducted to assess disinfecting efficacy of chlorhexidine on orthodontics brackets.

In present study, we included 5 brackets system. All the brackets were divided into 5 groups. Group I comprised of American Orthodontics (10), group II had 3M Unitek (10), group III had Ortho Organizers (10), group IV had negative control (10), and group V had positive control (10). Bacterial contamination was present in 4 in group I, 3 in group II, 5 in group 5, 0 in group IV and 10 in group V.

Aithel et al[8] found that microbial contamination was detected on brackets of all the four groups. Bacteria, including Staphylococcus aureus, S. epidermidis, Lactobacilli, Klebsiella pneumoniae, Bacillus licheniformis, and B. cereus, were identified in these groups. Upon disinfection with 0.01% chlorhexidine solution, brackets in group 2 displayed complete decontamination, while all brackets in the other groups containing gram-negative bacteria exhibited complete decontamination with 2% chlorhexidine.

We found that most commonly isolated organism was K. pneumonia seen in 4 cases followed by S. aureus, Lactobacilli, S. epidermidis and B. cereus in 2 cases each. After phase I decontamination, organisms present were 2 in group I, 1 in group II and 2 in group III. The count became 0 after phase II decontamination.

Speer et al[9] reported that chlorhexidine did not affect the bond strength of metal brackets; however, it reduced the bond strength of ceramic brackets. Research has further reported that chlorhexidine does not affect the shear bond strength of orthodontic brackets and clinically exhibits acceptable bond strength. Catalbas et al[10] included forty-four freshly extracted human premolars were collected and stored in distilled water. The teeth were etched with 37% phosphoric and were rinsed and dried. The teeth then were divided into four equal groups. While Group 1 served as a control, Groups 2 to 4 were treated before bonding with a chlorhexidine formulation that included solution (2%), gel (1%), and mouthwash (0.2%). Orthodontic brackets were bonded with Transbond XT (3M Unitek, Monrovia, Calif). Modes of failures were verified by means of scanning electron microscopy. Although no statistically significant difference was observed between Groups 1 and 4 (P .05), both were statistically superior to Groups 2 and 3 (P .05). In this in vitro study, the observed measures for Groups 2 and 3 (14.5–10.6 MPa) were lower than those for Groups 1 and 4 (27.3–24.9 MPa), but these values were much higher than those required for clinical use (6–8 MPa).

CONCLUSION

Authors found that disinfecting ability of 2% chlorhexidine proved highly effective in destroying both gram-positive and gram-negative bacteria.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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