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# Evaluation of Effect of 0.2% Cetrimide on Antibacterial Activity of Resin Cement.

Yashpal Singh[1],YS, Monika Saini[2],MS , Suraj Suvarna[3],SS
[1]*associate Professor, Al Qassim Pvt. College, Buraydah, Ksa*
[2]*associate Professor, Al Qassim Pvt. College, Buraydah, Ksa*
[3]*professor, Sbb Dental College, Ghaziabad, U.P., India.*

***Abstract***
***Aim:*** *To evaluate the effect of 0.2% Cetrimide on antibacterial activity on Resin cement.*
***Methods:*** *A total of 100 patients of 29-56 years of age who required Fixed dental Prosthesis were selected for the study. 2 posterior teeth were prepared in each patient for All Ceramic crowns. In every patient, the 2 teeth prepared were divided in to 2 groups: Control(no antimicrobial agent applied after etching of tooth) , Test (0.2% Cetrimide applied after etching of the tooth).Bacteriologic samples were collected at 5 different sample* ***times:*** *Baseline visit,at the time of cementation,1 ,3 and 6 month after cementation.Microbiogical processing of all samples were done and the results were statistically analysed.*
***Result:*** *There was significant shift in Control group towards Gram negative,anaerobic,rod atmosphere from Baseline till 6 month post cementation. In Test group,there is shift towards aerobic ,gram positive cocci from baseline till 1 month post cementation which persists but becomes till 3 month post cementation and becomes Gram negative,anaerobic,rod after 6 month postcementation.*
***Conclusion:*** *This study shows that application of 0.2% Cetrimide on prepared tooth surface after etching definitely increases antibacterial activity of Resin cement. Substantivity of 0.2% Certrimide persists but keeps on decreasing from 1 month till 3rd month of postcementation.*

## I. Introduction

Fixed dental prosthesis is one of the mainstay in restoring missing teeth. Maintenance of periodontal health is essential for long term success of Fixed prosthesis. Poor crown margins, rough surfaces, faulty impression procedure, inadequate lab support are most common reasons for poor periodontal health around fixed prosthesis.[1-4] Good luting agent is detrimental for developing and maintaining optimal periodontal health around fixed prosthesis.Microleakage,solubility and disintegration are common issues related to most of luting agents.[5,6] Streptococcus mutans has been most commonly associated with microbial infection developed underneath fixed prosthesis causing periodontal issues. Apart from other properties, ideal luting agent should also possess antibacterial and anticariogenic properties.Luting agents like Zinc Phosphate,Zinc Polycarboxylate and Glass ionomer cements have antibacterial properties because of low ph and/or release of flouride but Resin cement does not exhibit significant antibacterial action.[5-9,13]

Role of Cetrimide as antibacterial agent has been well documented. Cetrimide have been used in past in various concentrations to improve antimicrobial activity of Glass ionomer cements,Zinc Poycarboxylate cement ,Bonding agents and root canal irrigating solutions.[17-20,22-25,28-29] There are also a few studies on positive effect of Cetrimide on bond strength of dentin and retention of fixed prosthesis without interfering in other physical properties of the cement.[14-16] Antimicorbial substantivity of Cetrimide has also been proven in past.[31-32]Considering past studies, 0.2% Cetrimide is expected to improve antibacterial activity of Resin cement.
The aim of this present clinical study was to evaluate of the effect of 0.2% Cetrimide on antibacterial activity of Resin cement.

## II. Material and Method

A total of 100 patients of 29-56 years of age who required Posterior fixed dental prosthesis were selected for the study.The Procedure was explained to the patients before starting any procedure and informed consent was taken.The patients with systemic disease or taking medications that can affect gingival health were excluded from the study.Silness Loe plaque index and Loe Silness gingival index of less than 2 and Probing sulcus depth of less than 4 mm of abutment teeth was maintained for every patient before the beginning of the study.Abutment teeth were evaluated for Preparation.2 posterior teeth were prepared in each patient for All Ceramic crowns( IPS emax CAD,Ivoclar,Mumbai,India) with minimal trauma and Shoulder finish line was given in every preparation by same clinician.Finish lines were located at the gingival margin.In every patient, the 2 teeth prepared were divided in to 2 groups:Control,Test . After preparation of the tooth,etching was done

using Total Etch(Ivoclar,Mumbai,India) for 15s.In control group ,nothing was applied after etching,whereas in Test group 0.2% Cetrimide(Sigma-Aldrich Chemie, Steinheim, Germany) was applied through cotton pellet for 60s and then dried for 10s after etching .Resin cement (Multilink automix,Ivoclar,vivadent,Mumbai,India) was used as Luting agent.Primer A and B were mixed in 1:1 ratio and was applied to prepared tooth for 30s(as per manufacturer instruction).The All ceramic crown were thoroughly rinsed with water and dried. The crown was etched with 5% hydrofluoric acid ( IPS Ceramic etching gel,Ivoclar,Mumbai, India) for 20 seconds.Then crown was rinsed with water spray and dry it with oil free air. The bonding surface of the crown was coated with Ivoclean using a microbrush or brush for 20s. The crown was throughly rinsed with water Monobond plus was applied to inner surface of the crown for 60s and dispersed with strong stream of air.Multilink automix luting cement was applied to inner surface of crown for luting the crown.

Bacteriologic samples were collected at 5 different sample times: Baseline visit,at the time of cementation,1 ,3 and 6 month after cementation. .Patients were given oral prophylaxis treatment after bacteriologic sample were collected at the baseline visit .Sterile standardized endodontic paper points(Diadent,south korea) were used to collect bactriologic samples.The paper points were placed 30s in to gingival sulcus at 4 locations(mesibuccal,distibuccal,midbuccal and mid lingual or palatal regions) on each abutment tooth.A single broth was obtained by putting all four paper points in one pool providing one broth sample per tooth.Every patient provided 10 bacteriolgic samples(2x5) and a total of 1000 samples were collected(10x100).

**Microbiologic Processing:**

All microbiological samples were inserted in to Robertson cooked media and were sent to Microbiological department for anaerobic and aerobic culture procedures.The samples were cultured on Brucella blood agar,Kanakmycin-Vancomycin laked blood agar and Bacteroides bile esculin agar(Hi media laboratories pvt. Ltd,Mumbai,India) for anaerobic bacteria.The plates were placed in an anaerobic chamber.(Fig.1).Aerotolerance test was done for each different colony prior to gram staining to determine purities,spore formation and morphologies.Catalase and pigment activities were also observed.Identification of anaerobes was done using API 20A and ID 32A strips(Biomerieux,SA,France) were used.Bacterial pathogenicity was cateogorised according to whether the organism was associated with periodontally suspected bacteria and not periodontally suspected bacteria.5% blood agar(Figure 2),Mcconkey agar (Figure 3) and Chocolate agar(with vancomhycin,clindamycin and bacitracin)(Figure 4) in laminar flow were used for culturing aerobic bacteria(Labine instruments,Kochi,India).Standard microbiological methods and API automated systems were used to identify isolated bacteria.

The statistical evaluation was done with help of SPSS version 2016 using $X^2$ and P value.

## III. Results

A total of 1000 broth samples were collected during the study and 2925 different bacterial colonies were observed .Total percentage of Pathogenic periodontally suspected bacteria present was 22.5% and 12% in Control group, and Test group respectively.Pathogenic anaerobic gram negative bacilli were highest in Control group (8.64% ) followed by Test group(1.3%).Pathogenic anaerobic gram negative cocci were highest in Control group (5.56%) followed by Test group(1.2%).[Table 1]

In Control group,at Baseline level,Predominantly *Hemophilus spp*.(13.8%),*Neisseria spp*.(10.9% ) and *Streptococci spp*. (33.4%) were found with Aerobic/Facultative gram positive cocci atmosphere.At cementation,predominantly *Clostridiumspp*(12%), *Hemophilusspp*.(10%) and *Streptococc spp*. (30%) were found with Aerobic/Facultative gram positive cocci atmosphere.After 1 month post cementation,predominantly *Fusobacteriumspp*.(15%),*Prevotellaintermedia spp*.(14.2%),*Veillonellaparvula spp*.(16.8%) and *Streptococci spp* (17.6%) were found with Anaerobic gram negative rod atmosphere.After 3 month post cementation,predominantly *Fusobacterium nucleatum spp*.(17%),*Prevotellaintermedia spp*.(14.5%),*Veillonellaparvula spp*.(18.8%) and *Streptococci spp.* (16.6%) were found with Anaerobic gram negative rod atmosphere.After 6 month postcementation,predominantly *Fusobacteriumnucleatum(*15%),*Veillonellaparvula spp*.(14.8%) and Streptococci spp. (20.6%) were found with Anaerobic gram negative rod atmosphere. In Control group, there is Aerobic atmosphere at Baseline(51%) and at cementation (53%),that becomes Anaerobic at 1 month post cementation(56%) and remains Anaerobic 3 months (59%) and 6 month post cementation(58%).There is Gram positive atmosphere at Baseline(64%) and at Cementation(66%) that becomes Gram negative at 1 month post cementation(66%) and remains Gram negative 3 months (62%) and 6 months (55%) Post cementation.There are more number of Cocci at Baseline level (63%)and at time of cementation(61%) but number of Rods increase at 1 month after cementation(62%) and remains increased at 3 months post cementation(55%) and 6 months post cementation(51%) .Thus there was Aerobic gram positive cocci atmosphere in control group till time of cementation which became Anaerobic

gram negative atmosphere after 1 month post cementation and continued till 6 months of post cementation.[Table 2,3,4 ]

In Test group,at Baseline level,Predominantly Diptheroid bacilli spp.(10.3%),Campylobacter rectus spp.(9 % ) ,Hemophilus spp(7.9%) and Streptococci spp. (35%) were found with Aerobic/Facultative gram positive cocci atmosphere.At cementation,predominantly Clostridiumspp(11.9%), Staphylococcus aureus spp.(10.5%) ,Neisseriaspp(5.6%) and Streptococc spp. (33%) were found with Aerobic/Facultative gram positive cocci atmosphere.After 1 month post cementation,predominantly Bifidobacterium spp.(7.2%),Coagulase negative Staphlococci spp.(6.9%),Streptococci spp (54.1%) were found with Aerobic gram positive cocci atmosphere.After 3 month post cementation,predominantly Coagulase negative Staphylococccus spp.(5.5%), Campylobacterrectus spp(6.2%) and Streptococci spp. (65.7%) were found with Aerobic gram positive cocci atmosphere.After 6 month postcementation,predominantly Hemophilus spp.(7.5%), Treponemadenticolaspp.(10.4%) and Streptococci spp. (53.6%) were found with Anaerobic gram negative cocci/rod atmosphere. There is Aerobic atmosphere at Baseline(61%) and at cementation (64%),that remains Aerobic at 1 month post cementation(69%) ,and at 3 months (61%) but becomes Anaerobic at 6 month post cementation(60%).There is Gram positive atmosphere at Baseline(55%) and at Cementation(59%) that becomes more Gram positive at 1 month post cementation(78%) and at 3 months (64%) and becomes Gram negative at 6 months (58%) Post cementation.There are more number of Cocci at Baseline level (59%)and at time of cementation(56%) and number of Cocci increase at 1 month after cementation(72%) and decreases slightly at 3 months post cementation(59%) and even lesser at 6 months post cementation(44%).Thus there was Aerobic gram positive cocci atmosphere in Test group till 3 months postcementation which became Anaerobic gram negative cocci/rod atmosphere after 6 month post cementation.[Table 2,3,5]

## IV. Discussion

Fixed dental prosthesis are frequently associated with development of periodontal problems in patients. Development of caries within the restoration,faulty crown margin design,improper embrasure design are one of the most common reasons for this.[1-4] Use of luting cement with good antibacterial activity is always preferred to reduce or control periodontal diseases due to fixed dental prosthesis.Cements like Zinc phosphate,Glass ionomer cement,Zinc polycarboxylate have good antibacterial activity but Resin cement shows poor antibacterial activity.[19,20,24-25] Different antibacterial agents have been used with Dentin bonding agents,Root canal irrigating solutions,Luting cement to affect antibacterial activity. Cetrimide is proven antibacterial agents[13,26-27].It has been used in different concentration to study their influence on antibacterial activity and other physical properties of luting cements.[28,29,33-34] Cetrimide has reported to have positive influence on flexural strength and antibacterial activity of conventional luting cement.[25] Gram positive facultative rods and cocci are found in periodontally healthy site with predominance of Capnocytophaga,Neisseria and Veillonella spp.In chronic gingivitis sites,there are equal proportions of gram positive species(56%) and gram negative species(44%) with facultative anaerobic microorganisms with predominance of Fusobacterium nucleatum,P intermedia,.[1,2,19,20]

There was significant shift in Control group towards Gram negative,anaerobic,rod atmosphere from Baseline till 6 month postcementaion.It is evident as percentage of Fusobacterium nucleatum spp. Increased from 2.3% at baseline level to 15% after 6 months postcementation.Porphyromonas gingivalis was missing in control group at baseline level and reach to 3.2% till 6 months post cementation.Prevotella intermedia increased from 1.3% at baseline level to 12.5% after 6 month postcementation.Veillonella parvula increased from 1.2% at baseline to 14.8% after 6 month of postcementation.

In Test group,there is stronger shift towards aerobic ,gram positive cocci from baseline till 1 month postcementation but becomes lesser in 3 month post cementation and becomes Gram negative,anaerobic,rod (even more than Control group) after 6 month postcementation.Hemophilus spp was 7.9% at baseline which dropped till 4.9% after 3 monrh postcementation to rise again till 7.5% after 6 month post cementation.Similarly Treponeamdenticola spp was 5.4% % at baseline which disappeared after 3 monrh postcementation to appear again after 6 month post cementation(4.8%). This can be co-related by the fact that 0.2% Cetrimide is effective antibacterial agent but its substantivity declines after 30 days and remains till 90 days after which it has no effect on antibacterial activity.[17-18,22,31-32]

## V. Conclusion

This study shows that application of 0.2% Cetrimide on prepared tooth surface after etching definitely increases antibacterial activity of Resin cement and promotes development of Gram positive,Aerobic, Cocci atmosphere.The effect of 0.2% Cetrimide decreases after 1 month postcementation but it persists till 3 months.

## References


1. Lang NP. Periodontal considerations in prosthetic dentistry. Periodontol 2000 1995;9:118–131.
2. Valderhaug J. Periodontal conditions and carious lesions following the insertion of fixed prosthodontics: A 10-year follow-up study. Int Dent J 1980;30:296–304.
3. Valderhaug J, Ellingsen JE, Jokstad A. Oral hygiene, periodontal conditions and caries lesions in patients treated with dental bridges. A 15-year clinical and radiographic follow-up study. J Clin Periodontol 1993;20:482–489.
4. Singh Y, Saini M. Designing crown contour in fixed prosthodontics: a neglected arena. Annal and Essence of clinical den-tistry 2011; **3**: 142-147 [DOI: 10.5368/aedj.2011.3.1.4.7]
5. Pameijer CH. A review of Luting agents.Int J dent 2012;2012: 752861.
6. Rosenstiel SF , Land MF, Crispin BJ. Dental Luting agents: A review of current literature.J Prosthet dent 1998 sep ;80(3): 280-301.
7. Shafiei F,Memarpour M: Antibacterial activity in adhesive dentistry : A literature review.Gen dent 2012 nov-dec; 60(6):e346-56.
8. Dauquela P,Oziunas R,Zekonis G.Antibacterial potential of contemporary dental luting cements.Stomatologija 2008;10(1):16-21.
9. Amir K Hassan.Antibacterial activity of dental luting cements.J minim interv dent 2009;2(4):220-22.
10. Vermeersch G, Leloup G,Delmee M,Vreven J.Antibacterial activity of glass ionomer cements,compomers and resin composites:Relationship between acidity and and material setting phase.J oral rehabil 2005 May;32(5):368-74.
11. Imazato S. Antibacterial properties of resin composites and dentin bonding systems.Dent mater 2003 sep;19(6): 449-57.
12. Palenik CJ,Setcos JC.Antimicrobial abilities of various dentine bonding agents and restorative materials.J dent 1996 jul; 24(4):289-95.
13. Unosson E,Cai Y,Jiang X,Loof J,Welch K,Enqqvist H.Antibacterial properties of dental luting agents:Potential to hinder the development of secondary caries.Int J dent 2012;2012:529495.
14. Cal E,Turkun LS,Turkun M,Toman M,Toksavul S.Effect of antibacterial adhesive on adhesive bond strength of three different luting resin composite agents.J dent 2006 Jul;34(6):372-80.
15. Tuzuner T,Ulusu T.Effect of antimicrobial agents on surface hardness of conventional glass ionomer cement.J appl oral sci 2012 Feb;20(1):45-9.
16. Malkoc S,Demir A, Sengun A,Ozer F.Effect on shear bond strength of different antimicrobial agents after acid etching.Eur J orthod 2005 Oct; 27(5):484-8.
17. Mcdonnell G, Rusell AD. Antiseptics and Disinfectants:Activity,Action and Resistance.Clin Microbiol Rev 1999 Jan;12(1):147-49.
18. Ruiz-Linares M, Ferrer Luque CM,Arias Molis T, de castro P,Aquado B,Baca P.Antimicrobial activity of alexidine,chlorhexidine and cetrimide against streptococcus mutans biofilm.Ann Clin MicrobiolAntimicrob 2014 Aug;13:41.
19. Monika Saini, Yashpal Singh, Rishabh Garg, Anita Pandey.Priming the tooth surface with chlorhexidine and antibacterial activity of resin cement.World J Clin Cases 2013 Nov;1(8)249-55.
20. Orug BO, Baysallar M, Cetiner D, Kucukkaraaslan A, Dogan B, Doganci L, Akca E, Bal B.Increased antibacterial activity of Zinc Polycarboxylate cement by addition of chlorhexidine gluconate in fixed prosthodontics.Int J Prosthodont 2005 Sep;18(5):377-82.
21. Onçağ O, Hoşgör M, Hilmioğlu S, Zekioğlu O, Eronat C, Burhanoğlu D. Comparison of antibacterial and toxic effects of various root canal irrigants.Int Endod J 2003 Jun;36(6):423-32.
22. Shailaja S, Bhat SS, Hegde SK.Comparison between antibacterial efficacies of three root canal irrigating solutions:antibiotic containing irrigant,Chlorhexidine and Chlorhexidine + Cetrimide.Oral Health Dent Manag 2013 Dec;12(4):295-9.
23. Soares CJ, Pereira CA, Pereira JC, Santana FR, do Prado CJ.Effect of Chlorhexidine application of microtensile bond strength to dentin. Oper Dent. 2008 Mar-Apr;33(2):183-8.
24. Arias-Moliz MT, Ferrer-Luque CM, González-Rodríguez MP, Valderrama MJ, Baca P. Eradication of Enterococcus faecalis biofilms by cetrimide and chlorhexidine. J Endod 2010 Jan;36(1):87-90.
25. Korkmaz FM, Tüzüner T, Baygin O, Buruk CK, Durkan R, Bagis B.Antibacterial activity ,surface roughness,flexural strength and solubility of conventional luting cements containing Chlorhexidine diacettate and Cetrimide mixtures.J Prosthet Dent 2013 Aug;110(2):107-15.
26. Hebling J, Pashley DH, Tjäderhane L, Tay FR.Chlorhexidine arrests subclinical degradation of dentin hybrid layer in vivo.J Dent Res 2005 Aug;84(8):741-6.
27. Carrilho MR, Geraldeli S, Tay F, de Goes MF, Carvalho RM, Tjäderhane L, Reis AF, Hebling J, Mazzoni A, Breschi L, Pashley D.In vivo preservation of hybrid layer by chlorhexidine.J Dent Res 2007 Jun;86(6):529-33.
28. Stanley A, Wilson M, Newman HN.The in vitro effects of chlorhexidine in subgingival plaque bacteria.J clin Periodontol 1989 April;16(4):259-64.
29. Lewinstein I, Chweidan H, Matalon S, Pilo R.Retention and marginal leakage of Provisional crowns cemented with provisional cements enriched with chlorhexidine diacetate.J Prosthet Dent 2007 Nov ; 98(5):373-8.
30. Hiraishi N, Yiu CK, King NM, Tay FR.Effect of chlorhexidine incorporation in to a self etching primer on bond strength of luting cement.J Dent 2010 Jun;38(6):496-502.
31. Souza M, Cecchin D, Farina AP, Leite CE, Cruz FF, Pereira Cda C, Ferraz CC, Figueiredo JA.Evaluation of Chlorhexidine substantivity on human dentin : A Chemical analysis.J Endod 2012 Sep;38(9):1249-52.
32. Baca P, Junco P, Arias-Moliz MT, Castillo F, Rodríguez-Archilla A, Ferrer-Luque CM.Antimicrobial substantivity over time of chlorhexidine and cetrimide.J Endod 2012 Jul;38(7):927-30.


**Table 1:** Overall Distribution of Bacteria Isolated in Control and Test group n(%)

| Bacteria type | Control n=1800(40%) | | 0.2% Cetrimide n=1125(25%) | |
|---|---|---|---|---|
| | PSB | N-PSB | PSB | N-PSB |
| Facultative GNB | 39(2.2) | 153(8.5) | 47(4.2) | 118(10.5) |
| Aerobic GPB | 61(3.4) | 105(5.84) | | 152(13.5) |
| Aerobic GNC | | 116(6.46) | | 92(8.2) |
| Facultative GPC | 48(2.7) | 647(35.9) | 60(5.3) | 540(48) |
| Anaerobic GNB | 155(8.64) | 194(10.8) | 15(1.3) | |
| Anaerobic GPB | | 135(7.5) | | 88(7.8) |

| | | | | |
|---|---|---|---|---|
| Anaerobic GNC | 102(5.56) | | 13(1.2) | |
| Anaerobic GPC | | 45(2.5) | | |
| Totals | 405(22.5%) | 1395(77.5%) | 135(12%) | 990(88%) |

**Table 2:** Distribution of Bacteria(%) in Control and Test group n(%) for Gram Stain,Atmosphere of Growth,Morphological Properties and Pathogenicity

| Type of Bacteria | Control | 0.2% Cetrimide | $X^2$ | P value |
|---|---|---|---|---|
| **Baseline** | | | | |
| N-PSB | 75 | 68 | 2.284 | 0.319 |
| PSB | 25 | 32 | | |
| Aerobic/facultative | 51 | 61 | 2.06 | 0.357 |
| Anaerobic | 49 | 39 | | |
| Gram-positive | 64 | 55 | 1.73 | 0.419 |
| Gram-negative | 36 | 45 | | |
| Cocci | 63 | 59 | 0.776 | 0.678 |
| Rods | 37 | 41 | | |
| **At Cementation** | | | | |
| N-PSB | 80 | 79 | 1.635 | 0.441 |
| PSB | 20 | 21 | | |
| Aerobic/facultative | 53 | 64 | 2.496 | 0.287 |
| Anaerobic | 47 | 36 | | |
| Gram-positive | 66 | 59 | 1.051 | .591 |
| Gram-negative | 34 | 41 | | |
| Cocci | 61 | 56 | 1.061 | 0.588 |
| Rods | 39 | 44 | | |
| **1 month Post Cementation** | | | | |
| N-PSB | 65 | 91 | 26.654 | 0.0000 |
| PSB | 35 | 9 | | |
| Aerobic/facultative | 44 | 69 | 15.485 | 0.0000 |
| Anaerobic | 56 | 31 | | |
| Gram-positive | 34 | 78 | 16.103 | 0.0004 |
| Gram-negative | 66 | 22 | | |
| Cocci | 38 | 72 | 25.424 | 0.0000 |
| Rods | 62 | 28 | | |
| **3 month Post Cementation** | | | | |
| N-PSB | 68 | 81 | 9.207 | 0.0100 |
| PSB | 32 | 19 | | |
| Aerobic/facultative | 41 | 61 | 12.651 | 0.0017 |
| Anaerobic | 59 | 39 | | |
| Gram-positive | 38 | 64 | 22.603 | 0.0000 |
| Gram-negative | 62 | 36 | | |
| Cocci | 45 | 59 | 10.118 | 0.0063 |
| Rod | 55 | 41 | | |
| **6 months Post Cementation** | | | | |
| N-PSB | 70 | 65 | 1.924 | 0.3821 |
| PSB | 30 | 35 | | |
| Aerobic/facultative | 42 | 40 | 0.763 | 0.6828 |
| Anaerobic | 58 | 60 | | |
| Gram-positive | 45 | 42 | 0.19 | 0.9093 |
| Gram-negative | 55 | 58 | | |
| Cocci | 49 | 44 | 1.308 | 0.5199 |
| Rod | 51 | 56 | | |

**Table 3:** Distribution of Bacteria(%) isolated in Control and Test group at all sample times

| Type of Bacteria | Control | 0.2% Cetrimide | $X^2$ | P value |
|---|---|---|---|---|
| **Baseline** | | | | |
| PSB | 25 | 32 | 3.979 | 0.679 |
| Anaerobic | 49 | 39 | | |
| Gram-negative | 36 | 45 | | |
| Rods | 37 | 41 | | |
| **At Cementation** | | | | |
| PSB | 20 | 21 | 3.353 | 0.763 |
| Anaerobic | 47 | 36 | | |
| Gram-negative | 34 | 41 | | |

| | | | | |
|---|---|---|---|---|
| Rods | 39 | 44 | | |
| **1 month Post Cementation** | | | | |
| PSB | 35 | 9 | 5.894 | 0.435 |
| Anaerobic | 56 | 31 | | |
| Gram-negative | 66 | 22 | | |
| Rods | 62 | 28 | | |
| **3 month Post Cementation** | | | | |
| PSB | 32 | 19 | 1.355 | 0.968 |
| Anaerobic | 59 | 39 | | |
| Gram-negative | 62 | 36 | | |
| Rod | 55 | 41 | | |
| **6 months Post Cementation** | | | | |
| PSB | 30 | 35 | 0.765 | 0.999 |
| Anaerobic | 58 | 60 | | |
| Gram-negative | 55 | 58 | | |
| Rod | 51 | 56 | | |

**Table 4:** Distribution and Bacterial isolated in Control group at all sample times

| Type of Bacteria | Control(n=1800) | | | | |
|---|---|---|---|---|---|
| | Baseline | At Cementation | 1 month Post cementation | 3 month Post cementation | 6 month Post cementation |
| Actinomycesnaeslundii FG+veR | 14(3.2%) | | 7(2%) | 8(3%) | 21(5%) |
| Actinomycesviscosus FG+veR | 13(2.9%) | | 5(1.5%) | 5(2.5%) | 14(3.5%) |
| Bifidobacterium spp FG+veR | 23(5.6%) | 23(6%) | 5(1.5%) | 7(1.5%) | 7(2.5%) |
| Clostridium spp FG+veR | | 45(12%) | | | |
| Diphtheroid bacilli AG+veR | 11(2.6%) | 19(5%) | 24(7.3%) | 12(4.3%) | 29(7.3%) |
| Escherichia coli FG-veR | | 11(3%) | | | |
| Eubacterium spp FG+veR[1] | 8(1.8%) | | | | |
| Fusobacteriumnucleatum AnG-veR[1] | 10(2.3) | 15(4%) | 48(15%) | 45(17%) | 60(15%) |
| Haemophilus spp FG-veR | 59(13.8%) | 38(10%) | 25(8.1%) | 22(8.1%) | 24(6.1%) |
| Coagulase-negative Staphylococci FG+veC | 9(2.2%) | 19(5%) | | | |
| Neisserria spp AG-veC | 47(10.9) | 8(2%) | 6(1.7%) | 5(1.7%) | 11(2.7%) |
| Peptostreptococcus AnG+veC | 29(6.7%) | | | | |
| Porphyromonasgingivalis AnG-veR[1] | | | 17(5.2%) | 14(5.2%) | 13(3.2%) |
| Prevotellaintermedia AnG-veR[1] | 6(1.3%) | 11(3%) | 46(14.2%) | 38(14.5%) | 49(12.5%) |
| Propionibacteriumgranulosum FG+veR | | | | | |
| Staphylococcus aureus FG+veC | 8(2.1%) | 22(6%) | | | |
| Veillonellaparvula AnG-veC[1] | 5(1.2%) | 22(6%) | 54(16.8%) | 51(18.8%) | 59(14.8%) |
| Streptococci AG-veC | 143(33.4%) | 115 (30%) | 57(17.6%) | 44(16.6%) | 82(20.6%) |
| Campylobacter rectus FG-veR | 34(7.8%) | 15(4%) | 24(7.4%) | 14(5.1%) | 12(3.1%) |
| Treponemadenticola AnG-veC[1] | 7(1.7%) | 11(3%) | | | |
| Gemella spp FG+veC | | | | | |
| Filifactoralocis FG+veR | 6(1.3%) | 4(1%) | 6(1.7%) | 5(1.7%) | 15(3.7%) |
| Total (n) | 432 | 378 | 324 | 270 | 396 |
| P value | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |

**Table 5:** Distribution and Bacterial isolated in 0.2% Cetrimide group at all sample times

| Type of Bacteria | 0.2%Cetrimide (n=1125) | | | | |
|---|---|---|---|---|---|
| | Baseline | At Cementation | 1 month Post cementation | 3 month Post cementation | 6 month Post cementation |
| *Actinomycesnaeslundii* FG+veR | | - | 8(3.4%) | 4(1.8%) | |
| *Actinomycesviscosus* FG+veR | | - | 11(4.8%) | 4(1.6%) | |
| *Bifidobacterium* spp | 13(7%) | 7(3.2%) | 16(7.2%) | 5(2.2%) | 9(3.3%) |

| | | | | | |
|---|---|---|---|---|---|
| FG+veR | | | | | |
| *Clostridium* spp FG+veR | | 25(11.9%) | - | - | |
| *Diphtheroid bacilli* AG+veR | 19(10.3%) | 9(4%) | 6(2.5%) | 5(2%) | 8(3%) |
| *Escherichia coli* FG-veR | | 9(4.2%) | - | - | |
| *Eubacterium* spp FG+veR[1] | | 6(2.9%) | - | - | |
| *Fusobacteriumnucleatum* AnG-veR[1] | | 19(9%) | - | - | |
| *Haemophilus* spp FG-veR | 14(7.9%) | 12(5.6%) | 13(5.9%) | 12(4.9%) | 19(7.5%) |
| Coagulase-negative *Staphylococci* FG+veC | 9(5.1%) | 6(2.8%) | 16(6.9%) | 14(5.5%) | 5(2%) |
| *Neisserria* spp AG-veC | 7(4%) | 12(5.6%) | - | - | 12(4.8%) |
| *Peptostreptococcus* AnG+veC | | - | - | - | |
| *Porphyromonasgingivalis* AnG-veR[1] | | - | - | - | |
| *Prevotellaintermedia* AnG-veR[1] | 5(2.8%) | 4(1.9%) | - | - | 5(2%) |
| *Propionibacteriumgranulosum* FG+veR | 4(2.1%) | - | - | - | 6(2.4%) |
| *Staphylococcus aureus* FG+veC | 4(2%) | 22(10.5%) | 15(6.7%) | 4(1.8%) | 3(1.6%) |
| *Veillonellaparvula* AnG-veC[1] | 5(3%) | 5(2.2%) | 3(1.4%) | 12(4.9%) | 6(2.3%) |
| *Streptococci* AG-veC | 63(35%) | 71(33%) | 122(54.1%) | 163(65.7%) | 141(53.6%) |
| *Campylobacter rectus* FG-veR | 16(9%) | - | 5(2.2%) | 15(6.2%) | 27(10.4%) |
| *Treponemadenticola* AnG-veC[1] | 10(5.4%) | 4(2%) | - | - | 12(4.8%) |
| *Gemella* spp FG+veC | | - | 6(2.6%) | 5(1.9%) | |
| *Filifactoralocis* FG+veR | 13(6.4%) | 3(1.2%) | 5(2.3%) | 4(1.5%) | 6(2.3%) |
| Total (*n*) | 180 | 214 | 225 | 247 | 259 |
| *P* value | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |