

**TO COMPARE THE SEALING ABILITY OF TWO DIFFERENT SEALERS AFTER USING CHLORHEXIDINE AS FINAL IRRIGANT-An invitro study****SARANYA DHANAPAL*¹ AND NIVEDHITHA MALLI SURESHBABU²***1 Post graduate student, Department of Conservative Dentistry & Endodontics, Saveetha Dental College, Chennai, Tamil nadu, India**2 Professor and HOD, Department of Conservative Dentistry & Endodontics, Saveetha Dental College, Chennai, Tamil nadu, India***ABSTRACT**

The aim of this study was to compare the sealing ability of two different sealers after using chlorhexidine as a final irrigant. Twenty single rooted teeth were randomly divided into two groups according to different obturation materials (the AH Plus, Gutta-percha group and Acroseal, Gutta percha group). The groups were further divided into two subgroups containing five teeth each according to the irrigation regimen, and they were subjected to a universal testing machine for evaluating pushout bond strength. Post hoc pair-wise comparisons were performed using Tukey multiple comparisons for statistical analysis using SPSS 15 Software. The mean value of the AH Plus Gutta-percha group, without precipitate formation revealed the highest mean value for the bond strength, which was statistically higher ($P < 0.001$) than the remaining groups. Formation of precipitate by combination of sodium hypochlorite and chlorhexidine tends to affect the bond strength of root canal sealers when used for obturation.

KEY WORDS: Irrigation, bond strength, precipitate, root canal sealer**SARANYA DHANAPAL**Post graduate student, Department of Conservative Dentistry & Endodontics,
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INTRODUCTION

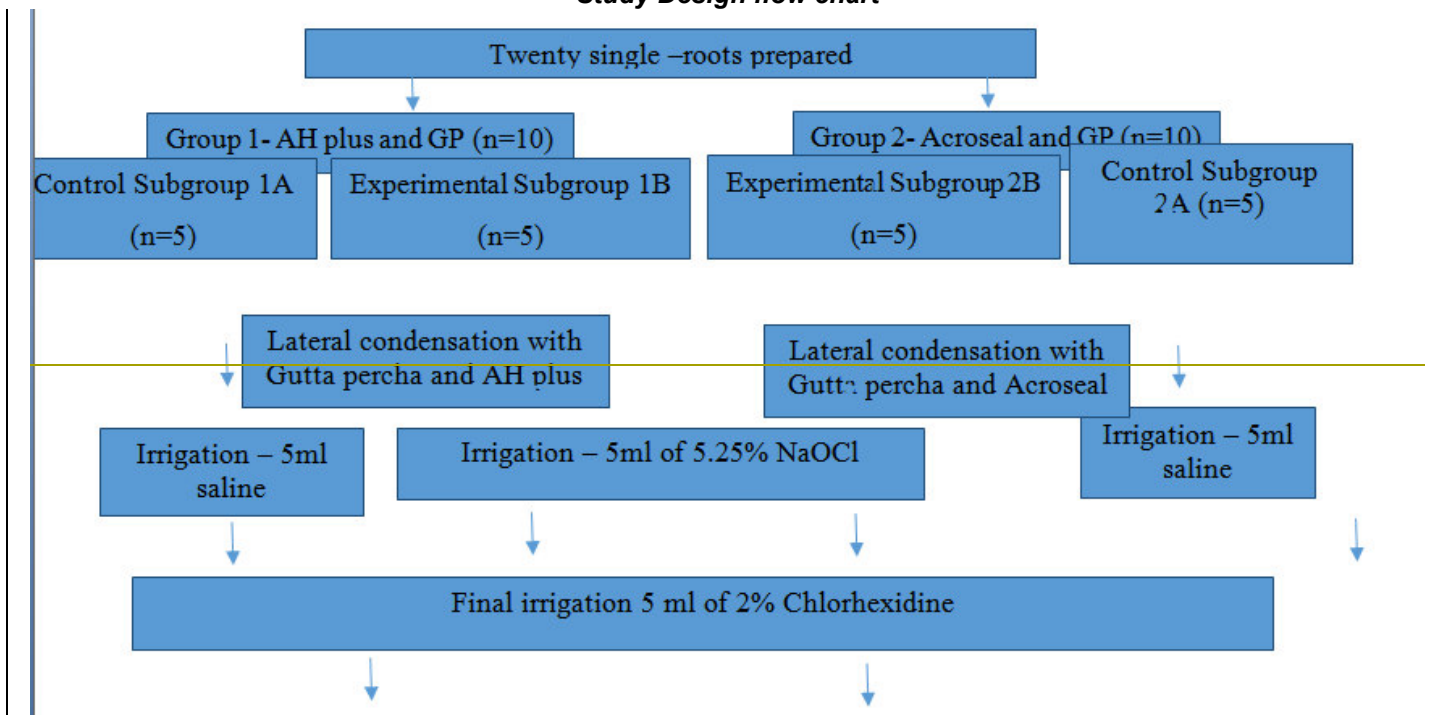
For the success of an endodontic treatment, effective cleaning and shaping and creation of apical seal is very important¹. Combination of irrigation solution and mechanical instrumentation plays an important role in removing microorganisms and other substrates². Various irrigating solutions commonly used include sodium hypochlorite (NaOCl), chlorhexidine, ethylenediaminetetraacetic acid (EDTA) and so on. Sodium hypochlorite is considered as the important irrigant because of its ability to dissolve the organic matter and enhance wide broad antimicrobial action³. One major concern about sodium hypochlorite is that when the solution is extruded periapically it results in tissue damage. Hence an alternative irrigant is suggested. Chlorhexidine (CHX), a bisguanide, is stable as a salt and is available in concentrations between 0.2% and 2% and exhibits antimicrobial activity at a pH of 5.5 to 7.0^{4, 5}. Since chlorhexidine lacks its ability to dissolve tissues a combination of sodium hypochlorite and chlorhexidine is suggested to influence their antimicrobial activity⁶. Zehnder (2006), has proposed an irrigation regimen in which sodium hypochlorite will be used throughout the instrumentation, followed by EDTA, and chlorhexidine as the final irrigant⁴. Creation of impervious seal between the root canal walls and the core material with the use of sealer is very important during obturation procedure. AH Plus root canal sealer is a resin-based formula with an excellent radiopacity, low shrinkage, low solubility and outstanding flow characteristics. Acroseal is a calcium

hydroxide-based cement, made up of two components – a BASE paste and a CATALYST paste – and designed for the permanent filling of root canals by sealing up gutta percha points. It has been shown to have better bond strength to dentin than other root canal sealers⁸. When chlorhexidine is used in the presence of residual sodium hypochlorite it leads to the formation of an orange brown precipitate and tends to occlude the dentinal tubules which will affect the sealing ability of root canal sealers⁹. The aim of this study was to evaluate the effect of the combination of irrigants in root canal and to compare the sealing ability of two root canal sealers, using push out bond strength. Null Hypothesis states that the presence of a precipitate do not affect the bond strength of the resin sealers to dentin. Alternate Hypothesis states that the presence of a precipitate might affect the bond strength of the resin sealers to dentin.

MATERIALS AND METHODS

Twenty, single rooted teeth were chosen for this study and were stored in saline solution until use. The teeth were then marked at a level of 15mm from root apex and were then decoronated using diamond disk. Working length was measured and cleaning and shaping was done using Pro Taper file system up to F3 (30/0.9). During instrumentation, irrigation was done using 5.25% sodium hypochlorite and finally 5ml of 17% Ethylenediaminetetraacetic acid were used for the removal of smear layer. Now, the samples were divided into two groups as shown in Figure 1¹³

Figure 1
Study Design flow chart



Following obturation, all the samples were stored in distilled water for 24 hours and then the samples were sectioned into coronal and middle portions perpendicular to their long axis, to obtain 1mm thick slices. The cut sections were then subjected to push-out bond strength, using a universal testing machine loaded with a 0.76 mm diameter stainless steel plunger,

at a speed of 0.5 mm/minute until bond failure occurred. One way Anova was done to compare the mean values between the groups (Table 1). Post hoc pair-wise comparisons were performed using Tukey multiple comparisons for statistical analysis using SPSS 15 Software. (Table 3)

RESULTS

From the statistical analysis it was found that the mean value of the AH Plus Gutta Percha group, without

precipitate formation showed the highest mean value for the bond strength, which was statistically higher ($P < 0.001$) than the rest of the groups. (Table 2, Figure 2.)

Table 1
One way ANOVA to compare mean values between groups

| Group | N | Mean Bond strength (Mpa) | Std. Dev | F-Value | P-Value |
|----------------------------------------------|----|--------------------------|----------|---------|---------|
| AH plus sealer- Sodium hypochlorite & Saline | 10 | 71.3630 | 7.78160 | | |
| AH plus sealer- Sodium hypochlorite & CHX | 10 | 57.9960 | 6.88751 | | |
| Acroseal- Sodium hypochlorite & saline | 10 | 55.5210 | 5.47624 | 13.356 | <0.001 |
| Acroseal- Sodium hypochlorite & CHX | 10 | 51.2300 | 9.37850 | | |
| Total | 40 | 59.0275 | 10.49625 | | |

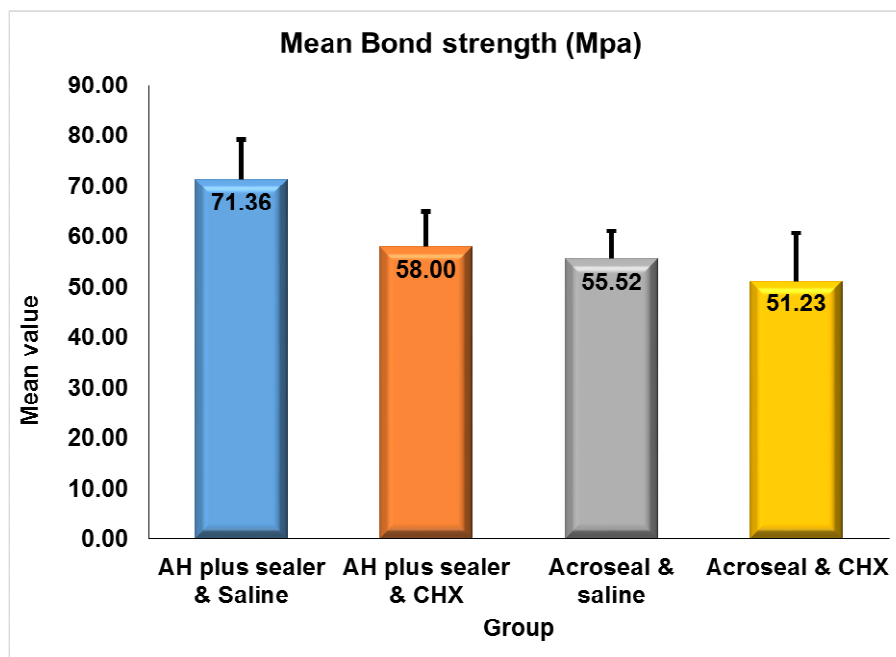
Table 2
ANOVA Table

| Source of variation | Sum of Squares | df | Mean Square | F-Value | P-Value |
|---------------------|----------------|----|-------------|---------|---------|
| Between Groups | 2263.251 | 3 | 754.417 | 13.356 | <0.001 |
| Within Groups | 2033.429 | 36 | 56.484 | | |
| Total | 4296.680 | 39 | | | |

Table 3
Tukey HSD Post Hoc Tests for Multiple Comparisons

| Group | Mean Difference | P-Value |
|----------------------------------------------|----------------------|---------|
| AH plus sealer- Sodium hypochlorite & Saline | AH plus sealer & CHX | 0.002 |
| | Acroseal & saline | <0.001 |
| | Acroseal & CHX | <0.001 |
| AH plus sealer- Sodium hypochlorite & CHX | Acroseal & saline | 0.882 |
| | Acroseal & CHX | 0.202 |
| Acroseal - Sodium hypochlorite saline | Acroseal & CHX | 0.583 |

Graph 1
Mean values and standard deviation for bond strength (MPa) of different groups ($P < 0.001$)

**DISCUSSION**

The ideal success for endodontic treatment is achieved through effective cleaning and shaping followed by obturation with an impervious, biocompatible and

dimensionally stable material¹⁰. Single irrigating solution alone does not have the capacity to remove the organic and inorganic debris, hence a combination of irrigating solution like sodium hypochlorite and chlorhexidine have been recommended to enhance the antimicrobial

activity⁴. Gutta Percha serves as a “Gold standard” root canal filling material to which newer materials can be compared when used they are used with different sealers. In this study attention is given to the orange–brown, discoloured precipitate formed by the interaction of residual sodium hypochlorite and chlorhexidine. The orange–brown color of the precipitate could be explained by the acid-base reaction when sodium hypochlorite and chlorhexidine are mixed. Chlorhexidine is a dicationic acid (pH 5.5-6) can donate protons to sodium hypochlorite. On the other hand, sodium hypochlorite is alkaline in nature (pH 7-9) and can accept protons from chlorhexidine. This results in the formation of a neutral and insoluble substance referred to as the “precipitate”. Chlorhexidine gets hydrolyzed into smaller fragments, due to breakage of the bond between carbon and nitrogen, forming a by-product called as Para ChloroAniline (PCA). PCA is toxic; as an aromatic amine, the primary toxic effect is methemoglobin formation⁹. In the root canal system, formation of this precipitate tend to occlude the dentinal tubules.¹¹ In our present study, statistically significant difference was noted when AH plus sealer with Sodium hypochlorite & Saline combination was compared with AH plus sealer with Sodium hypochlorite & CHX and Acroseal with Sodium hypochlorite & saline combination (P<0.05) . (Table 3). AH plus group without precipitate formation showed the highest bond strength which was found to be similar as in the previous studies of Mathew et al, 2007¹² and A Sanjana Patil, 2013¹³. Mathew et al, (2007) compared the bond strength of various Obturation materials to root canal dentin using push out test design. The AH plus group exhibited the highest bond strength¹². Similarly, A Sanjana Patil, (2013) conducted “An in vitro comparison of the bond strengths of Gutta-percha/AH Plus, Resilon/Epiphany

self-etch and EndoREZ obturation system to intraradicular dentin using a push-out test design in which Gutta-percha/AH Plus root fillings showed significantly highest bond strength. The possible reasons for increase in bond strength of AH plus may be due to the formation of a covalent bond by an open epoxide ring to any exposed amino groups in the collagen, very low shrinkage while setting, long term dimensional stability, inherent volume expansion of AH plus^{12, 14}. On the other hand, the lower bond strength of Acroseal may be attributed to presence of voids between dentinal walls and endodontic obturation, polymerization shrinkage¹⁵.

CONCLUSION

Thus the null hypothesis was rejected revealing that the precipitate formed will significantly affect the bond strength.

Within the limitations of the study, it can be concluded that

1. The combination of sodium hypochlorite and chlorhexidine affected the bond strength in both the sealers whereas the combination of sodium hypochlorite and saline did not affect the bond strength
2. Calcium hydroxide based sealers showed the least bond strength when precipitate formation occurred.
3. While, AH plus without precipitate formation showed the highest bond strength

CONFLICT OF INTEREST

No potential conflict of interest relevant to article was reported.

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