



Original Research Article

Comparison of efficacy of natural antioxidants on the adhesive bond strength of NaOCl treated dentin

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ABSTRACT

Aim: To compare efficacy of Natural collagen crosslinkers on the adhesive bond strength of Naocl treated pulp chamber dentin.

Materials and Methods: A total of 50 Mandibular molars are randomly divided into four groups according to the solution used.

Group I: Negative Control: No treatment.

Group II: Positive control: Teeth treated with sodium hypochlorite for 30 min & Final irrigation with 17% EDTA for 3 min.

Group III: After treating teeth with Naocl and EDTA, they are treated with Propolis for 5 min.

Group IV: After treatment with Naocl and EDTA, teeth are treated with Grape seed extract for 5 min.

Group V: After treatment with Naocl and EDTA, teeth are treated with Vitamin E for 5 min.

Then, specimens are bonded with self-etch adhesive followed by composite restoration. These specimens are sectioned to produce sticks which are subjected to bond strength test.

Conclusion: Grape Seed Extract, Propolis and Vitamin E increased shear bond strength of the composite restoration to NaOCl treated dentin.

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1. Introduction

A successful composite restoration depends on the adhesive composite forming a strong, durable bond between the composite and the dentin. However, the use of sodium hypochlorite for biomechanical preparation of root canals changes the structure of dentin surface and partially removes collagen fibrils, affecting the interaction with adhesive restorative materials. Many studies demonstrated that NaOCl reduces bond strength between composites and dentin.¹⁻³ The compromised bond strength to NaOCl treated dentin could be restored by the application of an antioxidant agent before the adhesive procedure. Sodium ascorbate is the most studied antioxidant agent.^{4,5} But,

Erhardt et al showed that sodium ascorbate may either compromise or enhance the degradation of composite dentin bonds over time, depending on the adhesive used.⁴ So, there is an increased interest in evaluating new substances to neutralize effects of oxidative compounds.

2. Aim

To Compare and evaluate the effect of Grape seed Extract, Propolis and Vitamin E on the Bond strength of NaOCl treated dentin

3. Materials and Methods

Non carious human mandibular first molars collected

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Fig. 1: Specimen: Human molars

3.1. Inclusion criteria

Non carious mandibular first molars with intact crown and root.

3.2. Exclusion criteria

Teeth with Caries, Fractures, Craze lines, Development defects

3.2.1. Preparaton of 5% propolis

5g propolis powder + 100mL of distilled water



Fig. 2: Preparation of 5% propolis

3.2.2. Preparaton of 5% grape seed solution (OPC's)

5g of Grape Seed extract (powder) + 100mL distilled water

Occlusal surfaces of the teeth were flattened, which eliminates the pits and grooves. Standardized class I cavities were prepared on occlusal surfaces of tooth with following dimensions.

1. 4mm-wide (bucco-lingual))



Fig. 3: Preparation of 5% grape seed solution

2. 4mm-deep (occluso-gingival)
3. 4mm-long (mesio-distal)

Using ISO size (NO.001) round bur and ISO size (NO.112) straight fissure, under copious water coolant in a high speed hand piece.

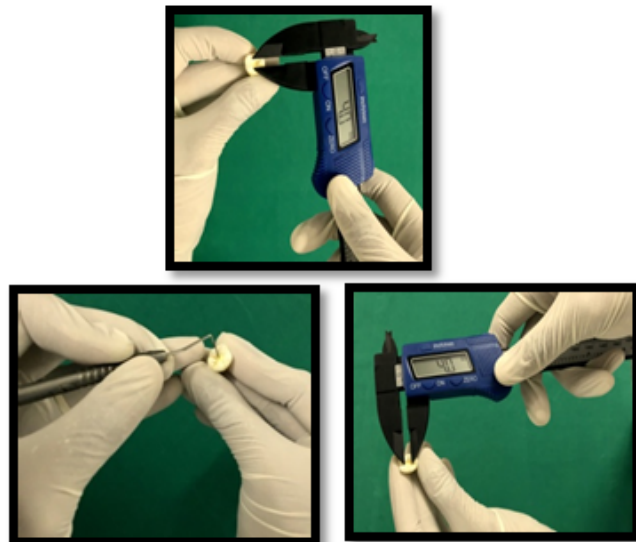


Fig. 4: Measurement of the specimen using Digital calipers

Teeth were randomly divided into five groups of 10 teeth each depending on the agent used.

1. Group I - Negative control group
2. Group II - Positive control group
3. Group III – Propolis
4. Group IV - Grape seed Extract
5. Group V – Vitamin E

After surface treatment of teeth in each group with different agents, adhesive system (Fusion bond 7) was applied to the surface of the cavities, as per the manufacturer's instructions. After bonding procedure, all teeth received a Nanohybrid composite restoration (Ivoclar) in increments.

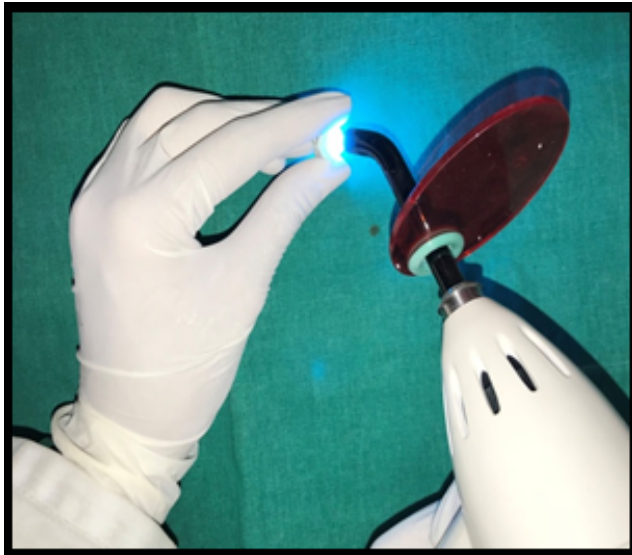


Fig. 5: Placement of adhesive restoration and curing

Each increment was light cured for 40 seconds using a light curing unit set at 1200mW/cm².

To perform the bond strength test, specimens were sectioned through centre of the restoration (both buccolingually and mesiodistally) with a water cooled slow speed diamond disc that resulted in four resin-dentin specimens from each tooth.



Fig. 6: Sectioned specimens

All the specimens were mounted in acrylic tube or mold (20 mm height & 10 mm diameter) with an auto-cure acrylic resin. The root was positioned at the centre of the acrylic tube vertically; with only crown portion exposed and allow the acrylic to set completely before doing the test.

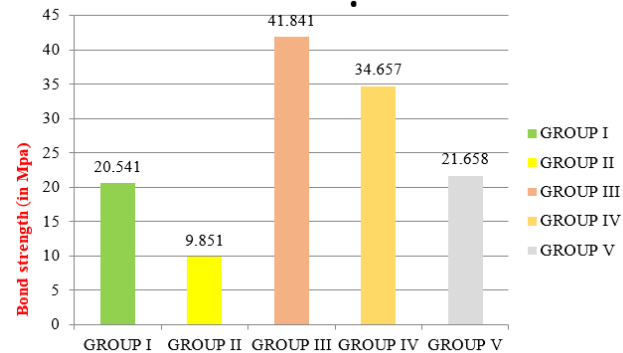
3.3. Measurement of bond strength

The Compressive bond strength values were measured with a Universal Testing Machine. A knife-edge shearing rod was used at a crosshead speed of 1 mm/min, until failure. The

values of the specimens were calculated and expressed in MPa.

4. Results

One way ANOVA test was done for statistical analysis



Graph 1: Bond strengths of different groups

The data were tabulated and statistically analysed using analysis of variance (ANOVA) test to compare the SBS between five groups. The selected level of variance was 0.05. ANOVA showed a significant difference in mean SBSs at $P < 0.05$. The mean SBS of all five groups was highest in Group III and was least in Group II

5. Discussion

In this study, the effects of Propolis, grape seed extract, Vitamin E on bond strength of self-etch adhesive to dentin are evaluated. The use of NaOCl for root canal preparation may negatively affect bond strength of post endodontic restoration of composite to dentin.¹ The current study found a reversal effect on bonding compromised by NaOCl treatment by Antioxidants. Antioxidants can act in three different ways.⁶

1. Free radical chain breaking
2. Metal chelating
3. Free radical quenching

Propolis, Also called as the Bee Glue, derived from the salivary secretion of the Honey Bees. It has Free radical scavenging ability, Anti-viral, anti-bacterial & anti-fungal agent, Anti-inflammatory action.^{3,4,6} Proanthocyanidins, extracted from Grape seed are known to increase dentin matrix mechanical properties, decrease extracellular degradation by inhibiting proteases and also have antioxidant and antibacterial properties.² Vitamin E is proven to have antioxidant property.⁷

5.1. Reasons for high bond strength in Group III (Grape seed)

1. The presence of multiple donor sites on OPCs that trap superoxide radicals.⁸
2. More affinity towards free hydroxyl radicles.

5.2. Higher bond strength for propolis than control group & group V

1. Free radical scavenging ability
2. Presence of caffeic acid.^{1,8}

6. Conclusion

Grape Seed Extract, Propolis and Vitamin E increased shear bond strength of the composite restoration to NaOCl treated dentin. Treatment with antioxidants gave bond strength superior to that of untreated dentin. They allow free radical polymerization of adhesive resin without its premature termination.

7. Conflict of Interest

The authors declare that there is no conflict of interest.

8. Source of Funding

None.

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