

Role of Antioxidants in Shear Bond Strength: A Comparative Study

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Abstract:- Background: Cocoa bean extract are among the richest sources of antioxidant, as well as many flowers, fruits, nuts, seeds and vegetables. They have been shown to improve the mechanical properties of demineralized dentin with the potential to crosslink collagen. **Aim:** To evaluate, if cocoa extract increases the Shearbond Strength (SBS) of orthodontic resin when bonding to enamel, In this invitro study 30 extracted teeth samples were divided into two groups, which had 15 specimens each, Group I (Control) and Group II (Test). Teeth in the test group were soaked for 10 minutes in 30% cocoa extract before bonding, whereas teeth in the control group were bonded directly without immersing in cocoa extract. SBS were measured using a universal testing machine to check the bond strength. **Results:** The mean shear bond strength in test group was 6.54 Mpa with a standard deviation of 0.38 and 10.85 Mpa with standard deviation of 1.3 in control group. The shear bond strength of control group was significantly higher than the test group. This indicates that immersing in cocoa extract reduces the shear bond strength of resin used on enamel.

Keywords:- Antioxidants, Shear Bond Strength, Bonding Agent.

I. INTRODUCTION

By using the right amount of force, orthodontic mechanotherapy can move teeth. Traditionally, brackets bonded to the teeth transfer this force to the teeth. The bonding requires a dimensionally stable bonding system with outstanding binding strength that can produce sufficient flow to penetrate the conditioned enamel surface.

To achieve a strong and stable connection, the enamel surface must be meticulously prepared(1). Two important strategies were taken into consideration to enhance the dentin/resin interface qualities: the first involved developing better and more inventive adhesive methods, and the second involved establishing a tissue engineering strategy to enhance the intrinsic capabilities of the substrate.(2).

Antioxidants has been demonstrated to crosslink collagen agent, raises the mechanical properties of collagen, and increase its resistance to enzymatic degradation, according to Nivedita et al.(3). Cocoa extract contain large amounts of phenol, although it has several bioactive qualities, it is thought that its high antioxidant content is what makes it so effective in bonding mechanism. The ability of cocoa extract to bind to proteins may also aid in the remineralization of teeth(4). It has been demonstrated in restorative dentistry that grape seed extract enhances the adhesion(5).

II. MATERIALS AND METHODS

A 30% cocoa bean extract solution was made by diluting 30 mL of cocoa extract in 70 mL of ethanol and storing it in a firmly sealed bottle. The test group has 15 teeth. were soaked in 30% cocoa bean extract(CBE) for ten minutes before etching and rinsed in running water for five seconds.

Teeth were rinsed and dried with oil-free compressed air after cleaning. The buccal surfaces then were etched with a 37% phosphoric acid solution for 30 seconds, washed with water spray for 20 seconds, and dried with compressed air for 20 seconds, as directed by the manufacturer.

Transbond XT Primer was applied on the etched enamel and cured for 20 seconds and brackets were bonded.(Group 1 & Group 2) samples were subjected to measure shear bond strength by universal testing machine.

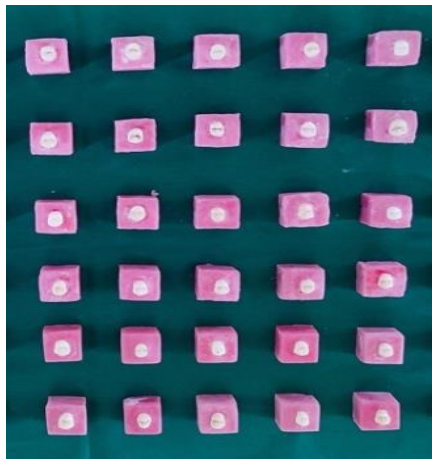


Fig 1 Samples Mounted in Acrylic



Fig 2 Cocoa Bean Extract

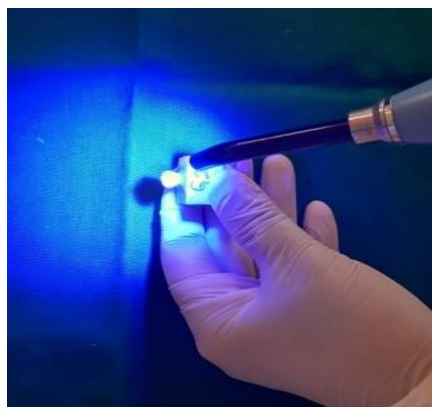


Fig 3 Light Curing

III. RESULTS

The mean debonding force in group I (control) was 129N and in group II (Test) it was 77 N. The means shear bond strength in test group was 6.54 Mpa with a standard deviation of 0.38 and 10.85 Mpa with standard deviation of 1.3 in control group. The shear bond strength of control group was significantly higher than the test group. This indicates that immersing in cocoa bean extract reduces the shear bond strength of resin used on enamel.

Table 1 Mean Values of Control and Test Groups

Table Head	Paired t-test		
	Mean	Standard deviation	p-value
Control	129.17	4.02	<0.0001,HS
Test	77.88	1.16	<0.0001,HS

IV. DISCUSSION

Due to growing interest in orthodontic treatment option for different bonding systems have been evolved (6). The existing bonding agents, though successful, have their own limitations. There could be a number of issues including tooth structure changes, restorative micro leakage, and weakened bonds between resin and tooth structure after bonding. Additionally, some studies have noted changes in the organic component of enamel, changes in porosity, changes in the way the enamel seems to be over-etched, changes in the loss of the prismatic enamel structure, changes in calcium loss, and changes in micro-hardness(7). If bonding is done right away after the bleaching procedure, one of the significant issues is a decline in the binding strength of composite resin to bleached enamel.

Cocoa is a polyphenol with proanthocyanidins, a powerful antioxidant with anticariogenic properties. Few research have been conducted to examine its cross-linking with enamel to demonstrate its bond strength when employed in orthodontics(8).

The first to identify a potential cocoa preventive effect on tooth caries was Razzano et al. The dextranucrase enzyme, which produces the plaque extracellular polysaccharides from sucrose, is inhibited by compounds found in cocoa products. Although its impact on enamel has not yet been studied, cocoa extract is a phenolic compound with the capacity to cross-link collagen, which helps to maintain the durability of the dentin collagen matrix and so improves biodegradation resistance. An orthodontic adhesive system might contain antioxidants since they can boost collagen cross linking (9).

Cocoa bean extract improves biodegradation resistance. An orthodontic adhesive system might contain antioxidants because they can strengthen collagen cross links. Through an interstitial reaction with hydroxyapatite crystals, cocoa extract has been shown to improve the hardness of dental enamel and has an ability to remineralize(10).

The remineralization potential of cocoa (Theobroma cacao) bean extract to increase the enamel micro hardnes Natural sources of antioxidants include cocoa extract, cranberries, pine bark extract, and grape seed extract. They are naturally occurring plant metabolites, and research has shown that they are safe when used in clinical settings and as dietary supplements as antioxidants. Antiviral, antibacterial, anti-allergic, and anti-inflammatory activities have been documented along with material safety studies for the extracts(11).

In this study it was found that cocoa bean extract had a lesser shear bond strength compared to control group, however it had a higher shear bond strength in comparison to other antioxidants which is in accordance to study conducted by Nair et al.

V. CONCLUSION

Within the limitations of this study cocoa bean extract has shown promising potential and has shown sufficient bond strength. However further research studies are required for it.

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