BIOMODIFICATION OF DEMINERALIZED DENTIN WITH AN EXPERIMENTAL FLAVONOID

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Background

Dentin structural changes induces by acid conditioning decrease microtensile strength (µTS) and elastic modulus (E) due to incomplete infiltration of resin monomers inside matrix-collagen fibrils, hydrolytic degradation and varying degree of demineralization of intertubular and peritubular dentin. It has been observed a stress concentration zone next to the exposedcollagen layer produced by the exposed collagen layer produced by the considerable reduction of elastic modulus in demineralized dentin, which contributes to decrease the longevity and stability of the resin-dentin interface.

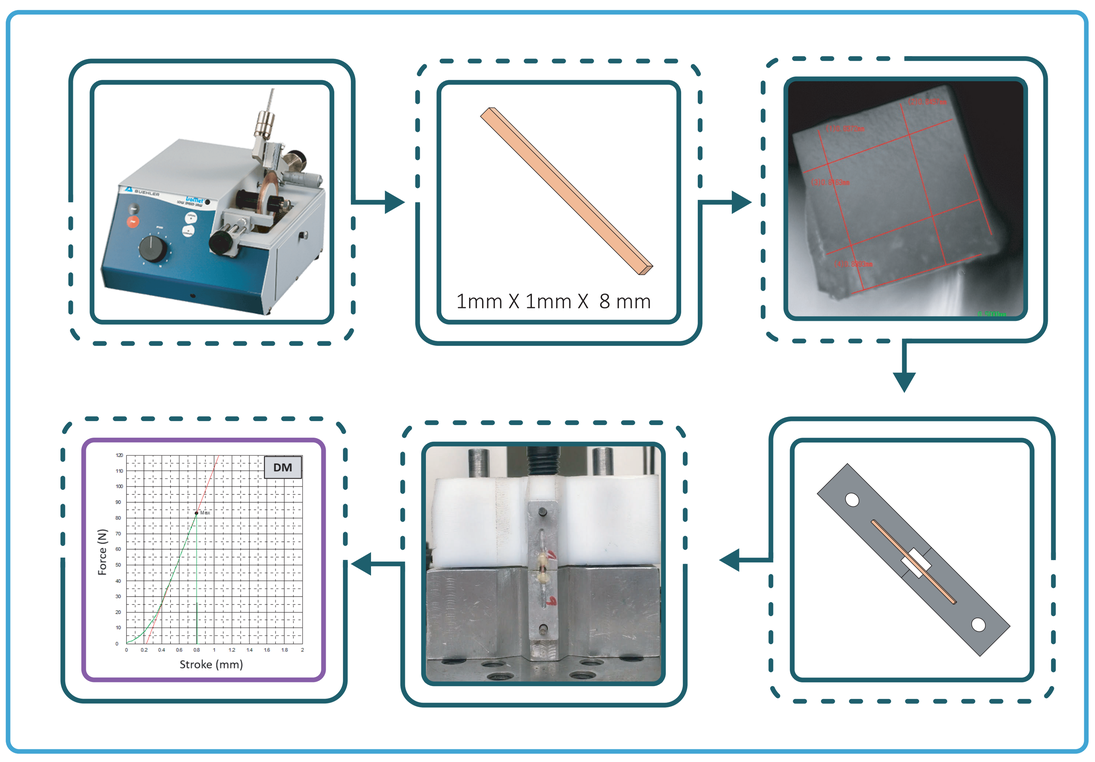
OBJECTIVE:
the aim of this study was to evaluate the effect of experimental flavonoid (COL-1) on µTS and E of demineralized dentin.

Methods

Fifteen extracted third molars were obtained with informed consent. The samples were stored in 0,9% sodium chloride and 0,02% sodium aside solution. Dentin beams of 1mm2 of adhesion area were randomly allocated into 6 groups: (DM), demineralized dentin (DD), 100% Ethanol (EtOH), 0,02% chlorhexidine (CHX), 1% glutaraldehyde (GA) and an experimental flavonoid (COL-1).

Group	Test groups	Treatments (n=15)
1	Negative control (DM)	Dentin without any previous treatment
2	Demineralized dentin (DD)	Demineralized dentin by immersion in phosphoric acid (H_3PO_4) 10% x 5 h + washing with distilled water (H_2Od).
3	Ethanol(EtOH)	Demineralized dentin by immersion in H_3PO_4 10% x 5 h + washing with H_2Od + application of EtOH 100% during 120 s.
4	Chlorhexidine (CHX)	Demineralized dentin by immersion in H_3PO_4 10% x 5 h + washing with H_2Od + application of CHX 0,02% during 60 s.
5	Glutaraldehyde (GA)	Demineralized dentin by immersion in H_3PO_4 10% x 5 h + washing with H_2Od + aplicación de GA al 1% durante 60 s.
6	Experimental flavonoid (COL-1)	Dentina desmineralizada por inmersión en H_3PO_4 al 10% x 5 h + lavado con H_2Od + application of COL-1 600 uM during 120 s.

The samples of each group were tested by the µTS test and E was calculated. The results were statistically analyzed to evaluate normal distribution by Shapiro Wilk and significant difference between groups by ANOVA, followed by Tukey post hoc and Pearson correlation test, (p≤0,05).



Results

Human dentin µTS and E were notably decreased after acid conditioning. Dentin strength significantly increased following treatment with cross-linkers.
COL-1 showed the highest µTS (14, 74 MPa) (p<0,001) followed by GA (14, 36 MPa) (p<0,001), while CHX had the lowest values (8, 00 MPa) (p<0,885). Regarding E values, GA obtained the highest (118, 10 MPa) (p<0,006) followed by COL-1 (88, 88 MPa) (p<0,237) compared to control group (DD). Additionally, a linear correlation was found between µTS and E in COL-1 group (p<0,001).

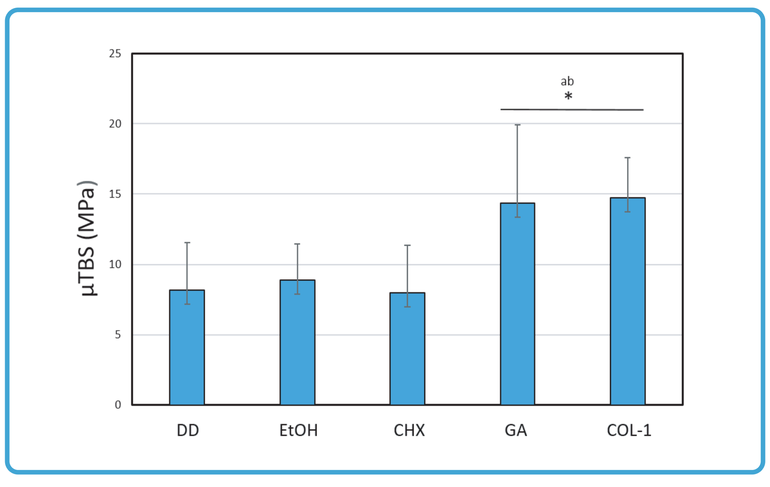


Figure 1. Comparison of the microtensile strength values of demineralized dentin (DD) conditioned with the different treatments.

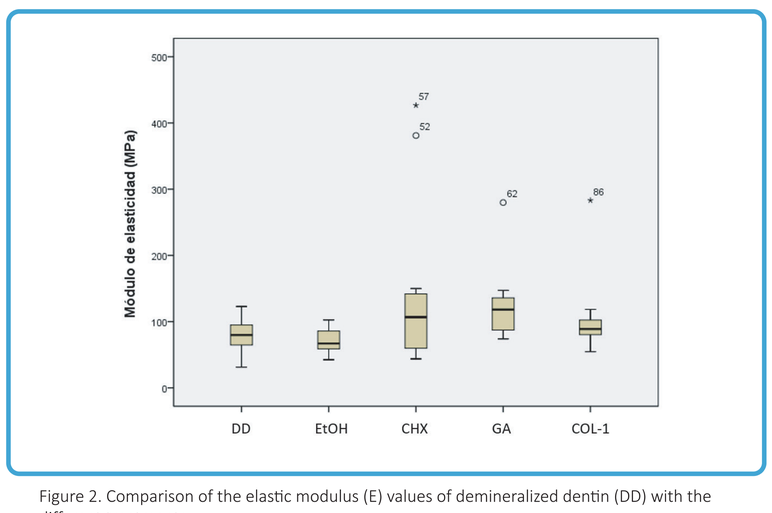


Figure 2. Comparison of the elastic modulus (E) values of demineralized dentin (DD) with the different treatments.

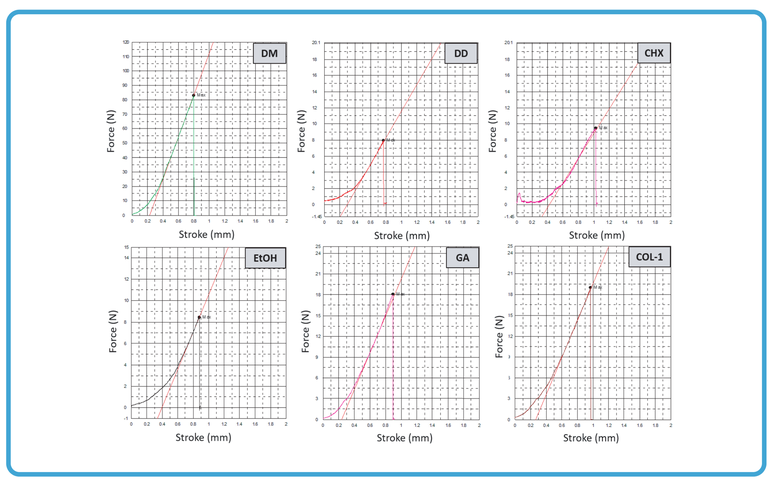


Figure 3. Stress-strain curve of dentin treated with different substances subjected to tensile stress.

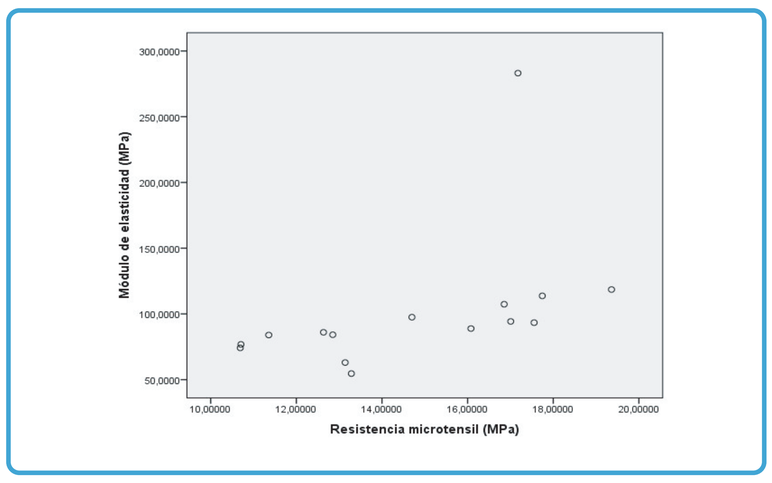


Figure 4. Correlation between µTS and E of the experimental flavonoid COL-1.

Conclusions

Increased mechanical properties and stability of dentin matrix can be achieved by the use of cross-linkers like COL-1. Dentin matrix has been modified positively concerning the µTS and E.

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