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Comparision of Shear Bond Strength between Ethyl Alcohol Wet Bonding and Conventional Wet Bonding of Orthodontic Brackets – An Invitro Study

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Abstract:-

- ***Aim :***

The study aimed to assess the impact of ethyl alcohol wet bonding on the shear bond strength (SBS) of orthodontic brackets compared to conventional wet bonding methods.

- ***Materials and Methods :***

12 premolar teeth were utilized and divided into two groups: conventional wet bonding and ethanol wet bonding. Each group followed its respective bonding protocol.After bonding, the teeth were immersed in water for complete polymerization.Shear bond strength was assessed using a Universal Testing Machine (UTM).Statistical analysis was performed to compare the shear bond strength between the two groups.

- ***Results :***

The mean shear bond strength observed in the ethyl alcohol wet bonding group was higher compared to the conventional wet bonding group.Statistical analysis revealed a significant difference between the shear bond strengths of the two groups, with ethyl alcohol wet bonding demonstrating superior results.

- ***Conclusion :***

The mean shear bond strength achieved with ethyl alcohol wet bonding (6.5 MPa) falls within the optimal range as indicated by Reynolds et al. (1976).Ethanol could serve as a cost-effective alternative to MIP (presumably a bonding agent or adhesive used in conventional wet bonding).

This study suggests that ethyl alcohol wet bonding may offer advantages in terms of shear bond strength compared to conventional wet bonding methods, potentially providing a viable alternative for orthodontic bracket bonding

Keywords:- *Ethyl Alcohol, Shear Bond Strength, Orthodontic Brackets.*

I. INTRODUCTION

In the past, the process of banding attachments to teeth of the entire arch was laborious and not always precise. The introduction of moisture-insensitive primer (MIP) offered a promising solution, claiming to provide high shear bond strength even in the presence of saliva.

Your study seeks to compare the effectiveness of ethyl alcohol bonding with conventional methods after moisture contamination. This research is important as it aims to understand the comparative performance of different bonding techniques under realistic conditions, potentially informing clinical practice and improving patient outcomes.

By evaluating the shear bond strength between ethyl alcohol and conventional wet bonding methods, your study may provide insights into which approach offers better performance in managing moisture-contaminated surfaces. This could lead to enhancements in orthodontic procedures and contribute to the advancement of the field.

II. MATERIALS AND METHODS

- *Sample Size Collection*

Using the formula,

$$n = \frac{2(SD)^2(Z_{1-\alpha/2} + Z_{\beta})^2}{(d)^2}$$

Where,
SD = STANDARD DEVIATION1
Z1-α/2 = 1.96 AT 95% CONFIDENCE INTERVAL
Zβ = 0.84 AT 80% power
d = Mean difference1

Substituting the values, we get

n =5.45

By adding 10% for sample loss if any n = 6.00

Therefore the total sample size is 6 per group.

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➢ *Source Of The Data*

Twelve Extracted premolars were collected that met the inclusion

Table 1: Criteria

Sl No	Inclusion criteria	Exclusion criteria
	Maxillary 1st Premolars	Carious teeth Patients who have undergone bleaching Restorations in the bonding surface Teeth that were already bonded
		Fractured teeth
		Hypoplastic teeth or teeth with fluorosis
		Malformed teeth/enamel and dentin deformities
		Patients who have undergone bleaching Restorations in the bonding surface Teeth that were already bonded

III. METHODOLOGY

Following extraction, the collected premolars were meticulously cleaned with 0.9% normal saline and then submerged in sodium hypochlorite. Each tooth was encased in autopolymerizing acrylic resin up to the cervical region. The samples were divided into two groups: Group 1 underwent ethyl alcohol wet bonding, while Group 2 followed conventional wet bonding procedures, with six samples in each group.

Both groups received etching with 37% phosphoric acid, followed by drying with a three-way syringe. Artificial saliva was applied to both groups before primer application. In Group 1, ethyl alcohol was applied after artificial saliva to facilitate evaporation of hydrophilic substances. Subsequently, Transbond XT primer was applied and cured for 15-30 seconds. Premolar brackets were then bonded to the tooth surfaces using Transbond XT composite and light cured for 30 seconds.

All samples were subjected to shear bond strength testing using a Universal testing machine.

Fig 1: Transbond XT and Etchant Gel

Fig 2: Ethyl Alcohol

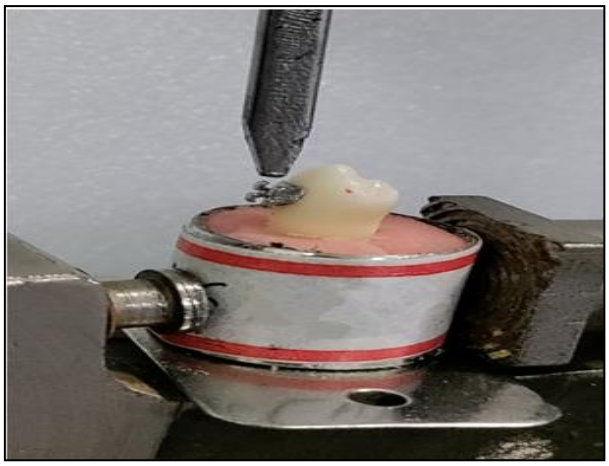

Fig 3: Measuring Shear Bond Strength using Instron Machine

IV. RESULTS

The shear bond strength between ethyl alcohol wet bonding and conventional wet bonding in orthodontic brackets was compared using 12 samples (Six samples for each category).

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Table 2: The following Table Shows the Mean and Standard Deviation Observed in the Shear Bond Strength among Each Group when Measured in Mega Pascal

SL.NO	Group	Mean	Standard Deviation
1	Ethyl alcohol wet bonding	6.16	1.74
2	Conventional wet bonding	3.91	0.51

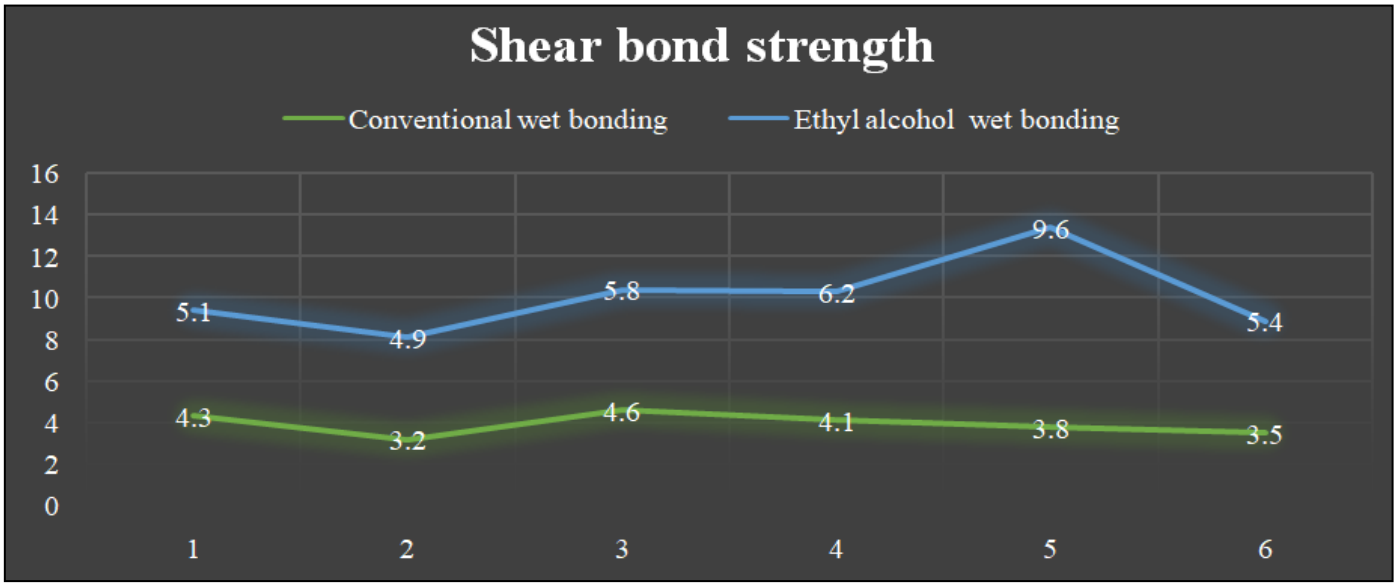

Fig 4: Represents the Shear Bond Strength of Ethyl Alcohol Wet Bonding and Conventional Wet Bonding in Orthodontic Brackets Measured in MPa.

Table 3: Independent Sample t-Test for Shear Bond Strength between Ethyl Alcohol Wet Bonding and Conventional Wet Bonding in Orthodontic Brackets

t	(p-value)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
				Lower	Upper
-3.025	0.013	-2.250	0.74	-3.90	-00.59

According to the above table the p-value is less than the set level of significance, that is 0.05. Hence it can be concluded that there is a significant difference between the shear bond strength between ethyl alcohol wet bonding and conventional wet bonding in orthodontic brackets.

V. DISCUSSION

Alcohol possesses strong dehydrating properties, capable of extracting moisture from its surroundings due to its higher vapor pressure compared to water. Ethyl alcohol has demonstrated success in bonding dentin in operative dentistry, with studies indicating its superior tolerance to moisture contamination.

However, the use of ethyl alcohol in bonding on moist enamel surfaces and its comparison with conventional primers remains unexplored. This study aimed to assess and contrast the shear bond strength between ethanol and traditional bonding methods under wet conditions.

Previous studies by Kul et al. and Thitthaweerat et al. reported an SBS of 11 – 13 Mpa with ethyl alcohol bonding, surpassing the results obtained in our study (7.3 ± 0.86 Mpa).

Overall, the mean shear bond strength observed with ethyl alcohol wet bonding for orthodontic brackets tends to be higher compared to conventional wet bonding methods.

VI. CONCLUSION

The bond strength achieved with ethyl alcohol wet bonding agent was deemed clinically satisfactory. Ethyl alcohol presents a cost-effective alternative to moisture-insensitive primer.

SCOPE OF THE STUDY

The study design is an in-vitro study and the parameters occurring in the oral cavity may be impossible to simulate in in-vitro conditions. Further invivo studies with RCTs will be required to measure the incidence of bracket debonding .

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