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A COMPARATIVE EVALUATION TO DETERMINE THE TENSILE BOND STRENGTH AND DRYING TIME OF DIFFERENT TRAY ADHESIVES ON A VINYL POLY SILOXANE IMPRESSION MATERIAL USING TWO DIFFERENT TRAY MATERIALS: AN IN VITRO STUDY

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Abstract:

Introduction: *A key goal in prosthodontics is obtaining an accurate impression. Although stock trays provide mechanical retention, manufacturers recommend using tray adhesive with both stock and custom trays. There is limited research on the adhesive bond strength between tray adhesives and both auto- and light-polymerizing custom tray materials. Manufacturers recommend using adhesive and impression materials from the same brand, and there is ongoing debate about the ideal drying time for tray adhesives before impressions.*

Aim: *The aim of this study was to do a comparative evaluation to determine the tensile bond strength and drying time of different tray adhesives on a particular vinyl poly siloxane impression material using two different tray materials.*

Materials and Methods: *A stainless-steel mold (15×15×20 mm³) was created according to ADA specification no. 19. A total of 90 samples were made, including 45 auto-polymerizing and 45 light-polymerizing resin samples, with surfaces polished using 120-grit sandpaper. An eye hook was attached to each sample, and cylindrical specimens (15 mm diameter, 20 mm height) were made from PVC to hold the impression material. Reprosil (medium-bodied) by Dentsply was used, along with three tray adhesives: Dentsply Caulk, 3M VPS, and Extreme by Medicept. A layer of adhesive was applied to the sample surfaces, dried for three intervals, and tested for tensile bond strength using a digital universal testing machine at 5 mm/min until adhesive failure. Data were then analyzed statistically.*

Results: *The mean tensile bond strength ranged from 0.168 MPa to 1.058 MPa. The VLC acrylic resin samples showed significantly higher bond strength than self-cure acrylic samples across all drying times. Dentsply Caulk performed best with Reprosil VPS, followed by 3M VPS and Medicept's Extreme tray adhesive.*

Conclusion: *Within the study's limitations, the manufacturer-recommended adhesive and impression material combination gave the best results. It is also concluded that a drying time of 10-15 minutes is optimal for VPS tray adhesives.*

Keywords: tensile bond strength, tray adhesives, vinyl poly siloxane, drying time

Introduction

A primary goal in prosthodontics is to obtain an accurate impression, which depends on factors like tray selection, impression material, technique, and how the material is retained in the tray. Various impression materials are available for different clinical situations, and achieving a precise marginal fit is essential for the durability of fixed restorations and the health of surrounding tissues.[1,2]

Vinyl poly-siloxane (VPS) is one of the most widely used non aqueous elastomeric impression materials in dentistry.[3] They offer elastic recovery, dimensional stability, and excellent detail reproduction.[3,4,5] While stock trays provide mechanical retention for elastomeric impression materials, manufacturers recommend using tray adhesive for both stock and custom trays. After application, the adhesive is allowed to dry. However, there is limited information on the compositions of adhesives used with elastomeric materials.[3] The use of adhesives offer more accurate and consistent impressions.[6,7]

The required bond strength between elastomeric impression material and tray to prevent tearing during removal is unclear. However, clinical experience suggests that a strong bond is essential to avoid undetected errors and prevent ill-fitting restorations.[8,9,10] Custom trays are most commonly fabricated using auto-polymerizing and visible light cured acrylic resins. The tray must be rigid to fully capitalize on the physical characteristics of the impression material.

The recommended adhesives for silicone impression materials consist of poly(dimethyl-siloxane) and ethyl silicate. Poly(dimethyl-siloxane) adheres to the silicone impression material, whereas ethyl silicate generates hydrated silica, creating a physical bond with the tray material. This results in precise and consistent impressions. There hasn't been much focus on attaching impression materials to trays made of poly methyl methacrylate (PMMA) or those cured with visible light. The majority of tray adhesives are produced by the same manufacturing company as that of the impression material.

Data on the bond strength between VLC custom trays, acrylic resin materials, and VPS impression materials are inconclusive. One study found higher bond strengths when using different VPS materials, but lacked statistical analysis.[11] An alternative study found that interchanging the adhesives amongst two addition silicone impression materials significantly strengthened the bond between the tray and impression material. So, it was concluded that the manufacturer's recommended material-adhesive combination may not necessarily be the best.[12]

Reported values for the tensile adhesive bond strengths of vinyl poly-siloxane(VPS) elastomeric impression materials range from 0.20 to 2.1 MPa, depending on the tray or impression material utilized.[6,8,9,10)]

The optimal drying time for tray adhesives is unclear, with manufacturers recommending 5 to 20 minutes. Some suggest waiting at least 7 minutes, though results are controversial.[10] One author concluded that the bond strength between the tray adhesive & tray material was highest 48 hours after application.[2] According to results of an another research, bond strength was unaffected between 15 minutes and 72 hours drying time once it was applied.[13] A study concluded that Impressions should not be taken before 15 minutes of drying due to insufficient

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bond strength.[14]

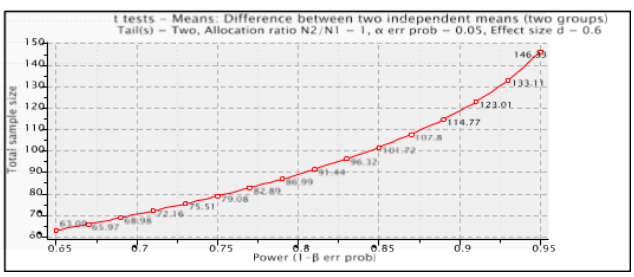
The aim of the present study was to determine the tensile-bond strength and appropriate drying- time of three different tray-adhesives of different compositions on a single brand of vinyl poly-siloxane impression material using methyl-methacrylate auto-polymerizing and visible light polymerizing tray materials.

Materials And Methodology

This in vitro study was carried out in the Department of Prosthodontics, K.D. Dental College & Hospital, Mathura in association with Spectro Analytical Labs Ltd, Ghaziabad (U.P.)

Sample size estimation: The sample size for the present study has been estimated using the software GPower v. 3.1.9.7 [Franz Faul, Universität Kiel, Germany]

Considering the effect size to be measured (d) at 60% for Two-tailed Hypotheses, power of the study at 80% and the alpha error at 5%, the sample size needed is 60. Thus, each group will comprise of 45 samples. The samples in each group will be further sub-divided into 3 sub-groups of 15 samples, allocating 5 samples each for testing the tensile strength at 3 different time intervals. [5 samples x 3 times interval x 3 Tray Adhesives x 2 Resins = 90 samples]



Power Curve Analysis

Method of data collection

The values those were obtained from the Universal testing machine while doing tensile bond strength tests, were noted down and used as data for the results and statistical analysis.

Table I Description of materials used:

S. No.	Trade Name	Type	Manufacturer	Use
Impression material				
1	Reprosil (PVS)	Medium Viscosity	Dentsply	For taking impression
Tray adhesive				
1.	Dentsply Caulk	To be used with 'A' and 'D' groups	Dentsply	Adhesion between impression tray and impression material
2.	3M VPS tray adhesive	To be used with 'B' and 'E' groups	3M Germany	
3.	Extreme tray adhesive (Medicept)	To be used with 'C' and 'F' sub-groups	Medicept UK	
Tray material				
1.	DPI RR cold cure	Auto-polymerizing poly-methyl methacrylate (PMMA)	DPI India	Sample preparation
2.	Acry Tray LC	Visible Light Cure resin (VLC)	Ruthinium	Sample preparation

Table-II Equipment used for sample testing:

S. No	Equipment	Use
1.	Digital Universal testing machine	To measure the tensile bond strength of the used tray adhesives.

Methodology

This study was done in the following manner:

- Fabrication of Stainless-steel die (according to ADA Specification no. 19)
- Preparation of custom tray test specimens,

  Self-cure acrylic resin specimens

  Visible light-cured resin specimens
- Preparation of PVC pipe open cylinders for housing the impression material.

Laboratory methods:

Testing of tensile bond strength of the prepared samples in the UTM.

- Fabrication of the stainless-steel die:

A stainless-steel mold was fabricated (15×15×20 mm^3) as per the ADA specification no. 19.

The mold creates a window measuring (15×15×20 mm^3) for preparation of the test samples. (Fig 5)

A plate is provided in the upper chamber to smooth the test sample's surface, and a screw in the lower chamber aids in the easy removal of the fabricated samples.

Preparation of the self-cure acrylic resin test specimens (45 samples)

A thin layer of Vaseline was applied inside the die to aid in specimen removal. PMMA resin was

Fig 1:Tray adhesives of different compositions and brands

Fig 2: Reprosil medium-bodied consistency VPS impression material (Dentsply)

Fig 3: DPI RR Cold cure

Fig 4: Acry Tray LC (Ruthinium)

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mixed in a 3:1 polymer-to-monomer ratio and poured into the die. After polymerization, the samples were removed by twisting the screw at the bottom of the die. Excess resin around the edges was trimmed with an acrylic trimmer, and the test surface was polished with 120-grit sandpaper. A small carbide bur was used to prepare the area for the eye hook, which was then secured with self-curing acrylic resin. A total of 45 cube-shaped samples were made using these steps. (Fig 6)

Preparation of VLC resin test specimens (45 samples)

The VLC resin, in sheet form, was molded to fit the stainless-steel die. An eye hook was placed at the center, and the specimen was light-cured in a UV chamber. After curing, the sample was removed by rotating the screw at the bottom. A total of 45 VLC resin samples were prepared similarly. (Fig 7 & 8))

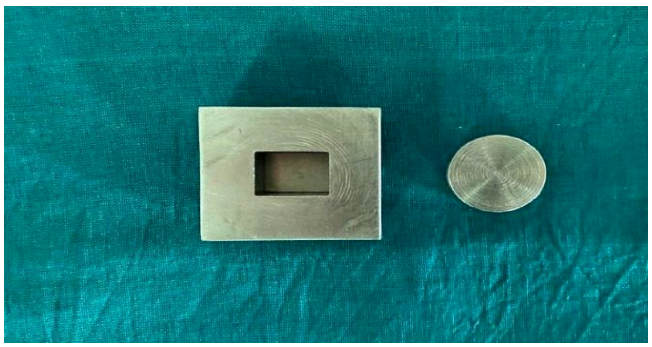


Fig 5: Stainless-steel die (Acc. To ADA Specification no. 19)

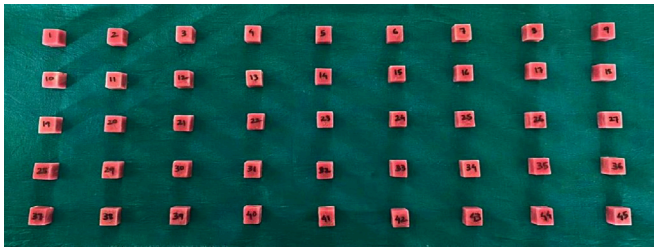


Fig 7: VLC resin test specimens

Preparation of PVC pipe open cylinders for housing of impression material

Cylindrical specimens (15 mm diameter, 20 mm height) were cut from a PVC pipe to hold the impression material. Five perforations were made around each cylinder for better retention. A metal nail was inserted through two centered holes at the bottom of each cylinder to attach a hook, providing a second fastening method for testing at the UTM. (Fig 9)

45 samples of PMMA were divided into three groups (A, B and C) of 15 test samples each, similarly 45 samples of VLC resin were divided into three groups (D, E and F) of 15 samples each.

Each group was then further subdivided into three subgroups for testing at three different drying time intervals, i.e. at 5 minutes, 10 minutes and 15 minutes respectively.

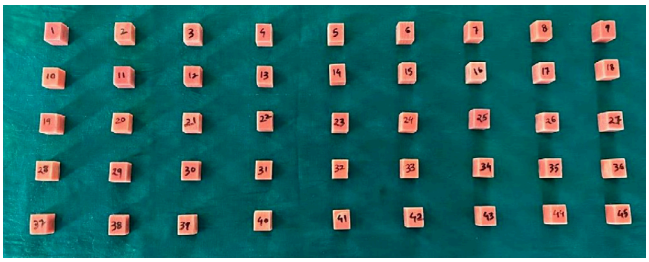


Fig 6: Self-cure acrylic resin test specimens

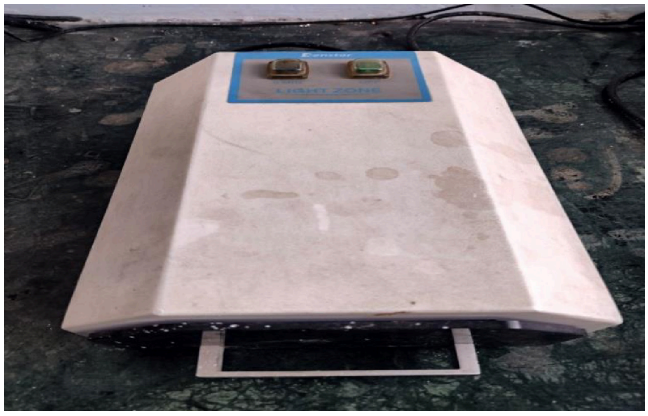


Fig 8: UV Chamber

Group A subgroups were named as a, b and c

Group B subgroups were named as d, e and f

Group C subgroups were named as g, h and i

Group D subgroups were named as j, k and l

Group E subgroups were named as m, n and o

And Group F subgroups were named as p, q and r

Testing the samples for tensile bond strength in the Universal testing machine

Under Group 'A', a thin layer of Dentsply Caulk tray adhesive was applied to the 'a' subgroup test samples according to the manufacturer's specifications using a small brush. The samples were permitted to dry for five minutes. Next, a PVC open cylinder was placed in the center of the acrylic specimen testing surface in a stone index and stabilized with rubber bands. After a five minute drying period, Reprosil medium-bodied impression material from Dentsply was combined on a glass slab using the base paste and catalyst paste with a stainless steel spatula. In order to ensure correct filling without cavities, the material was then poured into the cylinder from the bottom until surplus emerged from the vents. As directed by the manufacturer, the impression substance was allowed to polymerize. After curing, the stone index was removed. The assembly was secured in a universal testing machine by hooks on the tray and cylinder ends, preparing it for standardized mechanical testing.

Tensile bond test at cross head speed of 5 mm/min was conducted till failure of adhesive separation from the test specimen occurs.

In the similar way 'b' and 'c' subgroups test specimens were with a thin layer of Dentsply caulk tray adhesive and were dried for 10 and 15 minutes respectively before loading into the universal testing machine for the tensile bond strength tests. (Fig. 10)

Keeping the impression material same for all the groups (i.e. Reprosil medium bodied

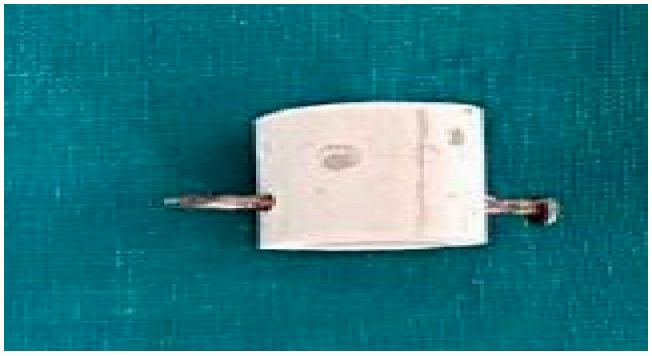


Fig 9: PVC pipe sample

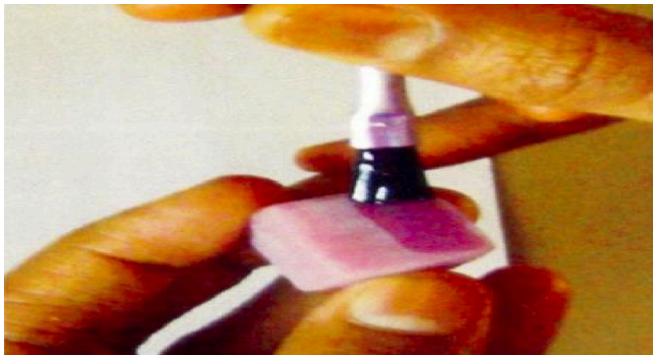


Fig 10: Application of tray adhesive on the test sample

Fig 11: Debonded test sample on Universal Testing Machine

consistency of Dentsply), group 'B' specimens were coated with 3M VPS tray adhesive and 'd', 'e' and 'f' subgroups test specimens were dried for prescribed drying time respectively before loading into the UTM. (Fig. 11)

Group 'C' Specimens were coated with Extreme VPS tray adhesive and 'g', 'h' and 'i' subgroups test specimens were dried for prescribed drying time respectively before loading into the UTM.

For VLC resin specimens also same procedures were followed

Group 'D' specimens were coated with Dentsply Caulk tray adhesive and 'j', 'k' and 'l' subgroups test specimens were dried for prescribed drying time respectively before loading into the UTM.

Group 'E' specimens were coated with 3M VPS tray adhesive and 'm', 'n' and 'o' subgroups test specimens were dried for prescribed drying time respectively before loading into the UTM.

And Group 'F' specimens were coated with Extreme VPS tray adhesive and 'p', 'q' and 'r' subgroups test specimens were dried for prescribed drying time respectively before loading into the UTM.

The force was measured in kgF, and the calculation of tensile bond strength was done utilizing the formula:

Tensile bond strength = F/A

Here, 'F' represents the maximum force causing separation failure in kgF, A is the area of adhesion, calculated as the area of the circle (3.14× r2) in mm^2, where r denotes the radius of the circle

i.e., r = [diameter of circle/2], so, r = 15/2 = 7.5 mm

All measurements were recorded in mega pascals (MPa), and the data underwent analysis.

Statistical Analysis

Statistical Package for Social Sciences [SPSS] for Windows Version 22.0 released 2013, Armonk, NY: IBM Corp. was used to perform statistical analysis of this study.

One-way ANOVA test followed by Tukey's post hoc test was used to compare the mean tensile bond strength between tray adhesives in each acrylic group at different drying time intervals.

Repeated measures of ANOVA followed by Bonferroni's post hoc test was used to compare the mean tensile bond strength between different drying time intervals for each tray adhesive and acrylic material.

The level of significance was set at $p<0.05$ in this study.

Results

The mean tensile bond strength ranged from 0.168 MPa to 1.058 MPa. The VLC acrylic resin samples showed significantly higher bond strength than self-cure acrylic samples across all drying times. Dentsply Caulk performed best with Reprosil VPS, followed by 3M VPS and Medicept's Extreme tray adhesive. The mean tensile bond strength significantly increased with increase in dry time for different tray adhesives for both the acrylic groups, however, no significant changes were observed between 10 and 15 minutes drying time intervals.

Table I. Comparison of mean Tensile Bond Strength (in MPa) between three Tray Adhesives in Group 1 at different drying time intervals using One-way ANOVA Test followed by Tukey's post hoc Test

Time	Tray Adhesives	N	Mean	SD	p-value [a]	Sig. Diff	p-value [b]
5 mins	Dentsply	5	0.368	0.051	<0.001*	DP vs 3M	<0.001*
	3M	5	0.204	0.023		DP vs Ex	<0.001*
	Extreme	5	0.168	0.032		3M vs Ex	0.31
10 mins	Dentsply	5	0.612	0.117	<0.001*	DP vs 3M	0.002*
	3M	5	0.364	0.068		DP vs Ex	<0.001*
	Extreme	5	0.260	0.058		3M vs Ex	0.17
15 mins	Dentsply	5	0.764	0.080	<0.001*	DP vs 3M	<0.001*
	3M	5	0.424	0.057		DP vs Ex	<0.001*
	Extreme	5	0.276	0.042		3M vs Ex	0.007*

Table II. Comparison of mean Tensile Bond Strength (in MPa) between three Tray Adhesives in Group 2 at different drying time intervals using One-way ANOVA Test followed by Tukey' s post hoc Test

Time	Tray Adhesives	N	Mean	SD	p-value [a]	Sig. Diff	p-value [b]
5 mins	Dentsply	5	0.460	0.067	<0.001*	DP vs 3M	<0.001*
	3M	5	0.268	0.061		DP vs Ex	<0.001*
	Extreme	5	0.228	0.026		3M vs Ex	0.50
10 mins	Dentsply	5	0.852	0.090	<0.001*	DP vs 3M	<0.001*
	3M	5	0.480	0.068		DP vs Ex	<0.001*
	Extreme	5	0.332	0.056		3M vs Ex	0.02*
15 mins	Dentsply	5	1.058	0.121	<0.001*	DP vs 3M	<0.001*
	3M	5	0.540	0.052		DP vs Ex	<0.001*
	Extreme	5	0.324	0.058		3M vs Ex	0.004*

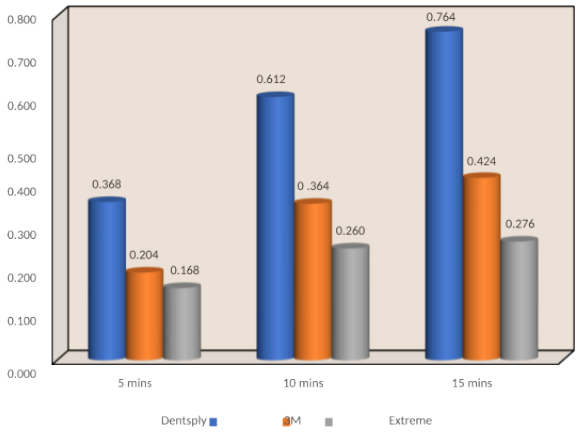
Table III. Comparison of mean Tensile Bond Strength (in MPa) between different drying time intervals for each Tray Adhesives in Group 1 using Repeated Measures of ANOVA Test followed by Bonferroni's' s post hoc Test

Tray Adhesives	Time	N	Mean	SD	p-value [a]	Sig. Diff	p-value [b]
Dentsply	5 mins	5	0.368	0.051	<0.001*	5 vs 10	0.02*
	10 mins	5	0.612	0.117		5 vs 15	0.001*
	15 mins	5	0.764	0.080		10 vs 15	0.14
3M	5 mins	5	0.204	0.023	0.003*	5 vs 10	0.02*
	10 mins	5	0.364	0.068		5 vs 15	0.008*
	15 mins	5	0.424	0.057		10 vs 15	0.77
Extreme	5 mins	5	0.168	0.032	0.01*	5 vs 10	0.13
	10 mins	5	0.260	0.058		5 vs 15	0.04*
	15 mins	5	0.276	0.042		10 vs 15	1.00

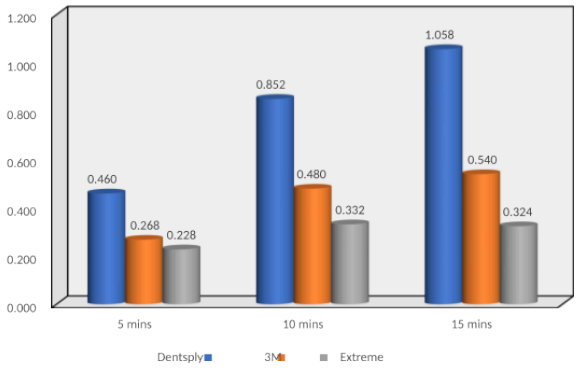
Table IV. Comparison of mean Tensile Bond Strength (in MPa) between different drying time intervals for each Tray Adhesives in Group 2 using Repeated Measures of ANOVA Test followed by Bonferroni's' s post hoc Test

Tray Adhesives	Time	N	Mean	SD	p-value [a]	Sig. Diff	p-value [b]
Dentsply	5 mins	5	0.460	0.067	<0.001*	5 vs 10	0.002*
	10 mins	5	0.852	0.090		5 vs 15	0.004*
	15 mins	5	1.058	0.121		10 vs 15	0.07
3M	5 mins	5	0.268	0.061	0.004*	5 vs 10	0.03*
	10 mins	5	0.480	0.068		5 vs 15	<0.001*
	15 mins	5	0.540	0.052		10 vs 15	0.65
Extreme	5 mins	5	0.228	0.026	0.04*	5 vs 10	0.04*
	10 mins	5	0.332	0.056		5 vs 15	0.18
	15 mins	5	0.324	0.058		10 vs 15	1.00

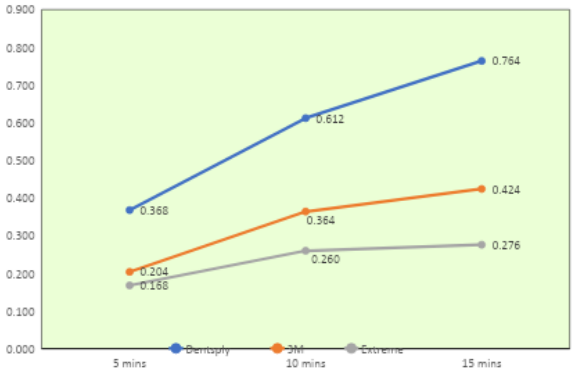
0.368



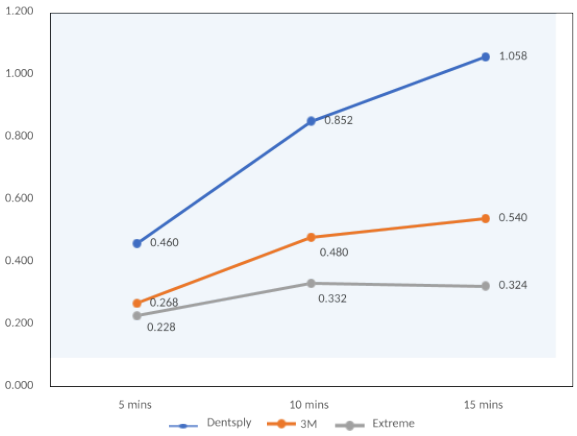
Graph no. 1 Mean Tensile Bond Strength (in Mpa) between three Tray Adhesives in Group 1 at different drying time intervals



Graph no. 2 Mean Tensile Bond Strength (in Mpa) between three Tray Adhesives in Group 2 at different drying time intervals



Graph no. 3 Mean Tensile Strength (in MPa) b/w diff. time intervals for each tTrray Adhesives in Grou 1



Graph no. 4 Mean Tensile Bond Strength (in Mpa) between different drying time intervals for each Tray Adhesives in Group 2

Discussion

Vinyl poly-siloxane (VPS) is a commonly used non-aqueous elastomeric impression material in dentistry, known for its elastic recovery, dimensional stability, and detail reproduction. Stock trays provide mechanical retention, but manufacturers recommend using tray adhesive with both stock and custom trays to strengthen the bond and prevent detachment during removal. Using adhesives ensures more accurate and consistent impressions, with the adhesive applied and allowed to dry before use.

Controversial results are reported regarding to the recommended drying time of tray adhesive after the application. According to the manufacturers, the drying time for tray adhesives ranges from 1 to 20 minutes.

A study concluded that the manufacturer's recommended material-adhesive combination may not always be the best, as there's no clear threshold for bond strength between impression materials and trays. Stronger adhesion reduces the risk of interface failure, which can affect the dimensional accuracy of prostheses. Dental professionals should select compatible materials to ensure the strongest bond. Davis

et al. found that elastomeric adhesive bonding was insufficient, requiring significant force to separate the material in undercuts.[13]

Depending on tray or impression material used, the tensile adhesive bond strength ranged between 0.20 to 2.1 MPa for VPS impression materials.

In the present study, mean tensile bond strength values ranged between 0.168 MPa-1.058 MPa. The tray adhesives used in this study had different compositions from each other. At 5 and 10 minutes drying time, VLC acrylic samples showed significantly higher tensile bond strength than self-cure acrylic samples with Dentsply, 3M, and Extreme tray adhesives. At 15 minutes, VLC samples had higher bond strength with Dentsply and 3M adhesives, but no significant difference was found with Extreme adhesive.

At the 15-minute drying time, Dentsply adhesive significantly outperformed 3M and Extreme adhesives in self-cure acrylic samples ($P<0.001$), followed by 3M, which showed higher bond strength than Extreme. In VLC acrylic samples, there was a significant difference in tensile bond strength among the three adhesives ($P<0.001$).

Dentsply Caulk adhesive showed significantly higher tensile strength than 3M and Extreme adhesives ($P<0.001$). 3M adhesive also had greater tensile strength than Extreme, with a significant difference ($P=0.004$).

Similar results were found in various studies conducted by different researchers. A. Peregrina et al. found that mean adhesive values ranged from 0.13 MPa to 1.09 MPa. Most impression materials showed higher adhesive strength with VPS adhesive (GC Universal), except for Take I material, which showed no significant difference from GC. Spray-on adhesive resulted in lower bond strength. No differences were found based on tray material for any of the materials or adhesives tested.[3]

B.L. Ashwini et al. compared three VPS impression materials with auto-polymerizing and VLC trays, using adhesives from GC America, Zhermack, and a universal adhesive. Adhesive values ranged from 0.2 to 1.41 MPa. Polyvinyl siloxane showed stronger bond strength to VLC trays than acrylic resin, except with 3M ESPE. The universal adhesive outperformed manufacturer-recommended adhesives. Dixon et al. found Triad trays had the highest bond strength compared to Fastray (PMMA).[2]

Surender Kumar et al. found a significant interaction between impression materials and tray adhesives, with no notable effect from tray materials on tensile strength ($p>0.05$). GC adhesive consistently showed the highest bond strength, and 3M impression material exhibited the greatest tensile strength. The best combination was 3M impression material with GC adhesive.[24]

The purpose of John A. Payne et al.'s study was to evaluate the bonding of two thermoplastic tray resin materials and two non-aqueous imprint materials. The combinations of Hydrosil imprint material and Hydrotray resin (smooth) produced the highest bond strength, 0.797 MPa, in standard tensile specimens that were manufactured. The mean tensile bond strength was measured 0.726 MPa in this investigation.[11]

The tensile bond strength of the addition reaction silicone used in the Ben E. Grant et al. investigation ranged from 0.434 MPa to 0.789 MPa. The majority of failures occurred at the interface between the adhesive and addition silicone impression material.[6]

Myong Hee Yi et al. found that the mean tensile bond strength ranged from 0.12 to 0.47

MPa, consistent with previous research. The combination of VPS (3M) adhesive with Imprint II and Silfix-Aquasil significantly increased bond strength at 10 and 15 minutes, respectively. Using adhesives and impression materials from different manufacturers resulted in lower bond strength than using a combination from the same manufacturer. [22]

George E. Cho and colleagues studied the time-dependent bond strength of two polyvinyl siloxane impression materials on acrylic resin disks, using matching adhesives ($p<0.05$). Reprosil's bond strength started at 16.54 lb, doubled to 33.96 lb at 15 minutes, and reached 42.11 lb after 15 minutes. After 60 minutes, it remained steady at 42.11 lb, but dropped to 34.62 lb after 8 hours. The bond strength quickly increased to 15 minutes and then plateaued.[10] It was determined by G. B. Davis et al. that drying times shorter than fifteen minutes are clinically unwise due to their inadequacy in strengthening bonds. In elastomer bond strength to tray material, no discernible variation was seen for drying intervals ranging from 15 minutes to 72 hours.[13] Catherine M. Leung et al. studied the effect of drying time on the cleavage bond strength of irreversible hydrocolloid adhesive. The bond strength increased from 32 kPa at 1 minute to 37 kPa at 5 minutes, then decreased. The study concluded that while adhesive improves the bond strength to stainless steel, it should not be left to dry for more than five minutes.[19]

Based on these studies, the universal tray adhesive consistently performed better with various manufacturers' addition silicone impression materials. In this study, Reprosil (Dentsply) showed significantly higher tensile bond strength with Dentsply Caulk tray adhesive compared to 3M and Extreme adhesives, with manufacturer-supplied combinations yielding better results than different brand adhesives.

A significant increase in mean tensile bond strength was noted from 5 to 10 minutes, after which it plateaued at 15 minutes. Earlier studies suggest that there is no substantial additional enhancement in tensile bond strength beyond the 15-minute drying time. Consequently, the study results indicate that the optimal drying time for effective outcomes should be within the range of 10 to 15 minutes.

Clinical Significance

When removing impressions from undercut areas, separation from the tray can compromise accuracy. To enhance adhesion and prevent detachment, various tray adhesives have been developed. Universal adhesives typically provide higher tensile bond strength than manufacturer-recommended ones for VPS materials with auto-polymerizing and VLC resin trays. Using adhesives and impression materials from the same manufacturer often gives better results. Studies show that bond strength rarely increases beyond 15 minutes of drying, so a 10-15 minute drying time is recommended for effective results with VPS materials.

Conclusion

1) The VLC acrylic resin group test samples had significantly higher tensile bond strength than the self-cure acrylic test samples when used with different adhesives at all the three different drying time intervals.

2) Overall, in both self-cure and VLC acrylic resin groups the Dentsply Caulk tray adhesive showed best results with Reprosil medium bodied consistency VPS impression material (Dentsply) in comparison to the other tray adhesives used, followed by 3M VPS tray adhesive and then the Extreme VPS tray adhesive at different drying time intervals.

3) The mean tensile bond strength significantly increased with increase in dry time for different

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tray adhesives for both the acrylic groups, however, no significant changes were observed between 10 and 15 minutes drying time intervals.

4) As per the results of this study, it can be concluded that the recommended drying time should be 10-15 minutes for VPS tray adhesives.

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