



# COMPARISON OF SHEAR BOND STRENGTH OF TOUCH CURED RESIN CEMENT TO ZIRCONIA & TITANIUM IMPLANT ABUTMENT

## BACKGROUND

This study compares the shear bond strength of two touch-cured resin cements and a dual-cured resin cement in bonding zirconia and titanium alloy in dentistry. Resin cement is commonly used in fixed prosthodontics and can be categorized by mode of polymerization, including light-cured, self-cured, and dual-cured. The study uses G-CEM ONE™, PANAVIA™ V5, and RelyX™ Universal as the resin cements, with shear bond strength as the test. The aim is to evaluate the polymerization of touch-cured resin cement and compare it with dual-cured resin cement.

## OBJECTIVE

To compare the shear bond strength of touch cured resin cements and conventional dual cured resin cement that bond between zirconia with Titanium alloy.

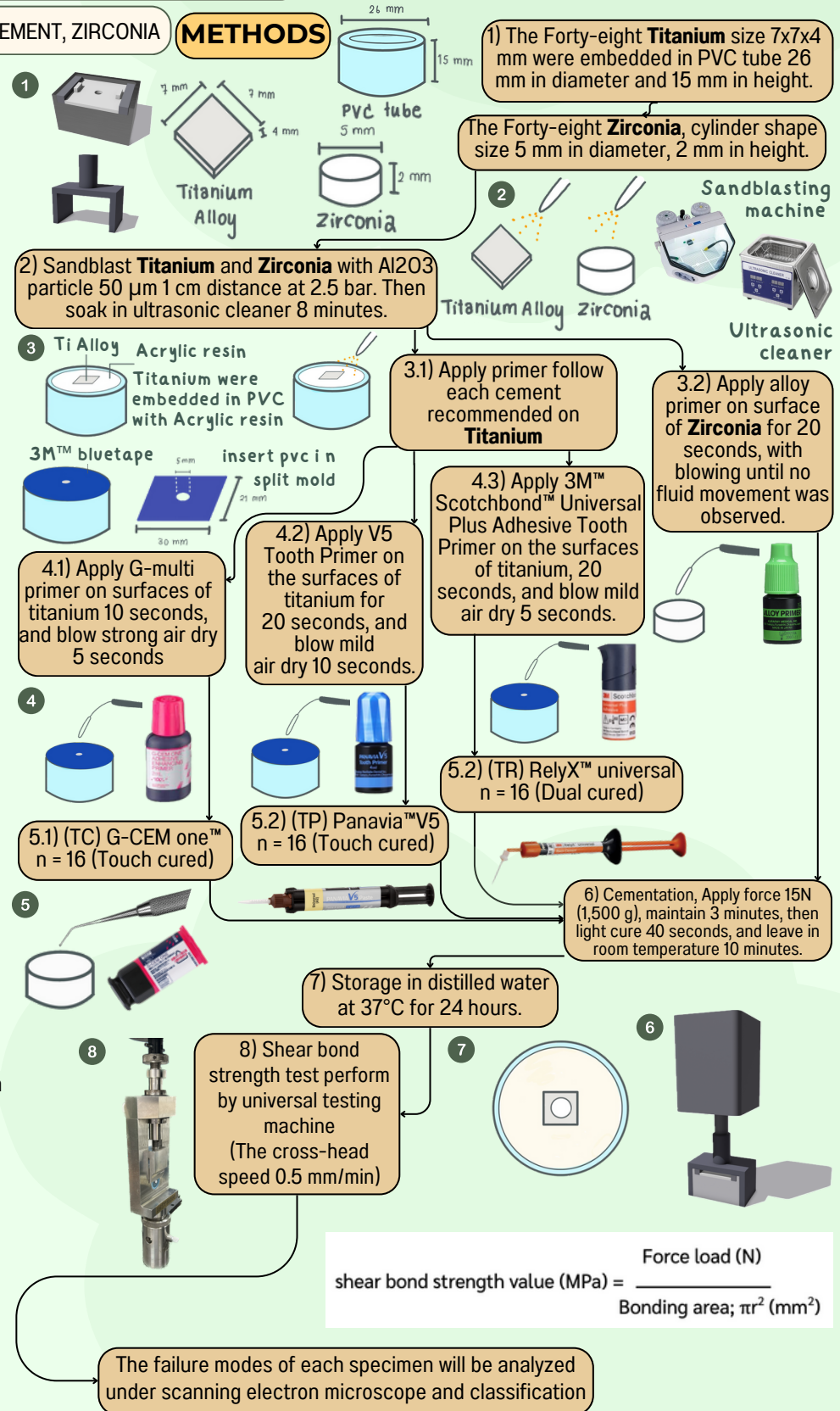
## KEYWORDS

DUAL CURED RESIN CEMENT, SHEAR BOND STRENGTH, TITANIUM, TOUCH CURED RESIN CEMENT, ZIRCONIA

## METHODS

**Table 1:** Resin cement will be used in this study, materials, compositions and manufacturers.

Material	Primer	Cement
<b>G-CEM ONE™</b>	G-CEM one adhesive enhancing primer ethanol, 10-MDP, 10-methacryloyloxydecyl dihydrogen thiophosphate, 4-META, 2-hydroxy-1, 3 dimethoxypropane, vanadyl acetylacetonate, 2, 6-di-tert-butyl-p-cresol	Paste A: fluoroaluminosilicate glass, UDMA, dimethacrylate, initiator, stabilizer, pigment, silicon dioxide, MDP Paste B: SiO <sub>2</sub> , trimethoxysilane, UDMA, 2-hydroxy-1, 3-dimethacryloxypropane, MDP, 6-tert-butyl-2,4-xyleneol, 2, 6-di-tert-butyl-p-cresol, EDTA disodium salt dehydrate, vanadyl acetylacetonate, TPO, ascorbic acid, camphorquinone, MgO
<b>PANAVIA™ V5</b>	Panavia V5 tooth primer 10-MDP, HEMA, hydrophilic aliphatic dimethacrylate, Accelerators, Water Clearfil ceramic primer plus 3-metacryloxypropyl trimethoxysilane, 10-MDP, Ethanol	Paste A: Bis-GMA, TEGDMA, hydrophobic aromatic dimethacrylate, hydrophilic aliphatic dimethacrylate, silanated barium glass filler, fluoroaluminosilicate glass filler, colloidal silica, accelerator, initiator Paste B: Bis-GMA, hydrophobic aromatic dimethacrylate, hydrophilic aliphatic dimethacrylate, silanated aluminium oxide filler, accelerator, dl-camphorquinone, pigments
<b>RelyX™ Universal</b>	Scotchbond universal adhesive Bis-GMA, HEMA, decamethylene dimethacrylate, ethyl methacrylate, propenoic acid, methyl-reaction products with decanediol and phosphorous oxide, copolymer of acrylic and itaconic acid, dimethylaminobenz oate, methyl ethyl ketone, ethanol, water, silane-treated silica, initiator	BPA derivative-free dimethacrylate monomers, Phosphorylated dimethacrylate adhesion monomers, Photoinitiator system, Novel amphiphilic redox initiator system, Radiopaque fillers and rheological additives, Pigments



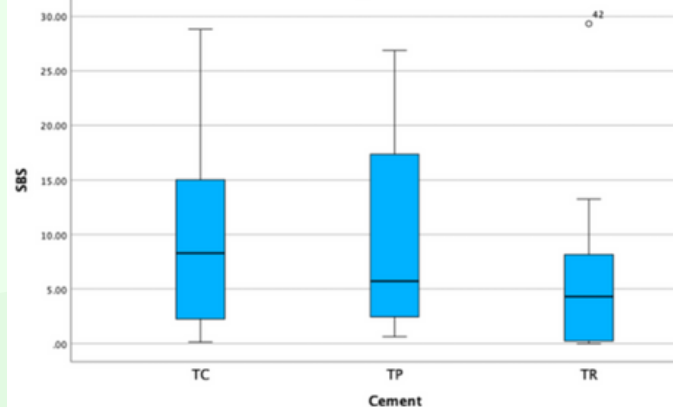
## RESULT

Comparing the shear bond strength among three types of cements bonding zirconia with titanium alloy, the table indicates no zirconia with titanium alloy, the table indicates no significant difference in shear bond strength (P-value = 0.208). The values for TC, TP, and TR were  $8.30 \pm 8.28$ ,  $5.72 \pm 8.25$ , and  $4.31 \pm 8.04$  respectively.

**Table 2:** shear bond strength (SBS) values are expressed in MPa (Median  $\pm$  SD), n=16 for each group.

Material	Shear bond strength
<b>G-CEM ONE™ (TG)</b>	$8.30 \pm 8.28$
<b>PANAVIA™ V5 (TP)</b>	$5.72 \pm 8.25$
<b>RelyX™ Universal (TR)</b>	$4.31 \pm 8.04$

**Figure 1:** Median of shear bond strength (SBS) Boxes were shown the first quartile, median, mean and third quartile MPa of shear bond strength. Whiskers denote minimum and maximum values.



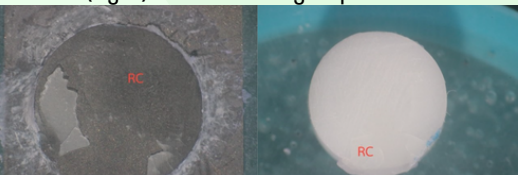
**Table 3:** shows failure mode of each group.

Cement	Adhesive Failure	Mixed Failure
<b>G-CEM ONE™ (TC)</b>	10	6
<b>PANAVIA™ V5 (TP)</b>	11	5
<b>RelyX™ Universal (TR)</b>	8	8

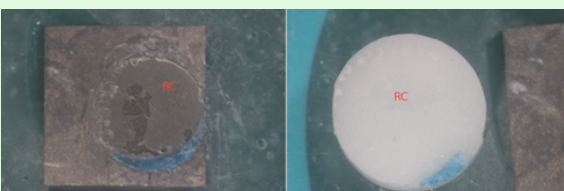
**Figure 2:** Mixed fracture pattern between titanium-resin cement (RC) (left) and zirconia (Zr)-resin cement (right) interfaces of group TC



**Figure 3:** Mixed fracture pattern between titanium-resin cement (RC) (left) and zirconia (Zr)-resin cement (right) interfaces of group TP



**Figure 4:** Mixed fracture pattern between titanium-resin cement (RC) (left) and zirconia (Zr)-resin cement (right) interfaces of group TR



## REFERENCES

Aldhafyan et al. (2022). Influence of curing modes on dual-cure resin-cement properties. *Dental Materials*, 38(1), 194-203. Al-Thobity, A. M. (2022). Titanium Base Abutments in Implant Prosthodontics: *European journal of dentistry*, 16(1), 49-55. Curtis & Watson (2008). *Dental Biomaterials: Imaging, Testing and Modelling*. Woodhead Publishing. G-CEM ONE™ | GC America. (n.d.). GC America. Kawano et al. (2015). Microtensile bond strength of a newly developed resin cement to dentin. *Dental Materials Journal*, 34(1), 61-69. Kim et al. (2020). Effect of Exclusive Primer and Adhesive on Microtensile Bond Strength of Self-Adhesive Resin Cement to Dentin. *Materials (Basel)*, 13(10). RelyX Universal Resin Cement | 3M. (2022). Rohr & Fischer (2017). Tooth surface treatment strategies for adhesive cementation. *J Adv Prosthodont*, 9(2), 85-92. Serichetaphongse et al. (2022). Shear bond strength comparison of composite resins with zirconia and titanium using different cements. *J Prosthodont Res*, 66(1), 109-116. Stawarczyk et al. (2017). Three generations of zirconia: From veneered to monolithic. *Quintessence Int*, 48(5), 369-380. Sudsangiam & van Noort (1999). Dentin bond strength tests. *The journal of adhesive dentistry*, 1(1), 57-67. Visuttawattanakorn et al. (2015). Shear bond strength of zirconia to different adhesive resin cements. *M Dent J*, 35(3), 127-136. Wittneben et al. (2016). Screw retained vs. cement retained implant-supported fixed dental prosthesis. *Periodontology 2000*, 73(1), 141-151.

## DATA ANALYSIS

The shear bond strength values for each group will be transformed into mean values. The failure modes of each specimen will be analyzed under a stereomicroscope and classified as adhesive, cohesive, and mixed failure. SPSS version 29.0 will be used for statistical analysis. Normality of the data distribution will be verified using the Kolmogorov-Smirnov test, while the Shapiro-Wilk test and Levene's test will verify the homogeneity of variation. As the data showed non-parametric distribution, the Kruskal-Wallis test will be used to statistically analyze the median of shear bond strength values in all groups. The significance level is  $\alpha=0.05$ .

## CONCLUSION

Within the limitation of this study, limitations in controlling the amount of cement in the experimental process, the shear bond strength values in the experimental groups using the same type of cement were quite different. Therefore, it is still not possible to definitively conclude which type of cement has the greater shear bond strength. In the future, if a method can be found to control the amount of cement in the experimental process with certainty, it may be possible to find the shear bond strength that is closest to the true value of each type of cement.

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