Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 4, 2021, Pages. 8640 - 8646
Received 05 March 2021; Accepted 01 April 2021.

Comparison of Shear Bond Strength of Two Porcelain Repairing System (Ivovlar Vivadent Repair System and Shofu Inc. Repair System)

Yogita Sohan Dhengar[1], Divya Kumari[2], Anand Uday Madihalli[3], Akhilesh Chandra[4], Arvind Kumar Singh[5], Bala Saraswati Bhat[6]

[1]Associate Professor Department of Oral Pathology and Microbiology. Swargiya Dadasaheb Kalmegh Smruti Dental and Hospital Wanadongri Hingna. Dist –Nagpur.
[2]Senior Lecturer Department of Prosthodontics and Crown and Bridge Vananchal Dental College And Hospital Jharkhand.
[3]Professor and HOD Department Of Prosthodontics And Crown And Bridge Vananchal Dental College And Hospital Jharkhand.
[4]Assistant Professor, Oral Pathology And Microbiology, Faculty Of Dental Sciences, IMS, BHU , Varanasi.
[5]Associate Professor , Department Of Prosthodontics Chandra Dental College And Hospital Barabanki, Lucknow.
[6]Assistant Professor, Department Of Prosthodontics, Crown And Bridge And Implantology, DR. D.Y Patil Vidyapeeth, Pimpri, Pune, Maharashtra, India.
Corresponding author: Dr. Akhilesh Chandra, Assistant Professor, Oral Pathology And Microbiology, Faculty Of Dental Sciences, IMS, BHU , Varanasi.

ABSTRACT:

Background: Dental ceramics are materials that are part of systems designed with the purpose of producing dental prostheses that in turn are used to replace missing or damaged dental structures. The present study was undertaken for comparing the bond strength of two porcelain repairing system (Ivovlar Vivadent repair system and Shofu Inc. repair system).

Materials & methods: A total of 20 specimens were included in the present study and were divided broadly into two study groups with 10 specimens in each group: Group A: P & R Repair Kit, Shofu, and Group B: Ceramic Repair N system Ivoclar. A total of 20 base metal alloy discs were prepared. To prepare 20 discs of base metal alloy of 10mm in diameter and 0.5 mm thickness, wax patterns were fabricated for standardization of metal thickness of 0.5 mm and porcelain thickness of 2 .0 mm. Universal Testing Machine was used. Data obtained were entered into MS Excel spread sheet and the statistical operations were carried out through Statistical Presentation System Software.

Results: Mean shear bond strength of specimens of Group A and Group B was 12.45 and 17.39 MPa respectively. While comparing the mean shear bond strength between group A and group B, significant results were obtained.

Conclusion: Ceramic Repair N system Ivoclar enhances the shear bond strength between intraoral repair materials and the surface of fracture metal-ceramic restoration.

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 4, 2021, Pages. 8640 - 8646
Received 05 March 2021; Accepted 01 April 2021.

Key words: Porcelain, Shear bond strength

INTRODUCTION

Dental ceramics are materials that are part of systems designed with the purpose of producing dental prostheses that in turn are used to replace missing or damaged dental structures. Now-a-days dental ceramic crown is one of the most common restorations in dentistry. Even after the introduction of metal free ceramics, metal ceramic remains the material of choice for majority of crown and bridge work. This popularity and prevalence is because of its low cost and remarkable esthetics & strength.[1, 2]

Metal-ceramic restorations are widely used in restorative dentistry with a high degree of success. On occasions, fractures do occur in ceramic as a result of trauma, metal flexure, or ceramic fatigue, and a decision on how to rectify the resultant defect needs to be made. Fractured porcelains will affect aesthetics and function of the prostheses, which may warrant patients to seek immediate treatment. One option is to remake the restoration. This is but both expensive and time consuming. Removal and reconstruction of the prostheses is a costly affair, and it is therefore worthy to attempt repair with composite resins intra-orally, especially in less severe cases. An easy alternative is to repair the deficiency using one of the many proprietary porcelain repair systems. However, for the repair to withstand functional loads, the bond between the repair material and remaining restoration must be strong and durable.[3, 4]

Three conditions which are usually suggested for repair of metal ceramic restorations are: Fracture in porcelain with no metal exposure, fracture with both porcelain and metal exposure and fracture with substantial metal exposure. Repair techniques are divided into two types of direct and indirect.[5- 7]Hence; the present study was undertaken for comparing the bond strength of two porcelain repairing system (IvovlarVivadent repair system and Shofu Inc. repair system).

MATERIALS & METHODS

The present study was undertaken for comparing the bond strength of two porcelain repairing system (IvovlarVivadent repair system and Shofu Inc. repair system).A total of 20 specimens were included in the present study and were divided broadly into two study groups with 10 specimens in each group:

Group A: P & R Repair Kit, Shofu, and

Group B: Ceramic Repair N system Ivoclar

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 4, 2021, Pages. 8640 - 8646
Received 05 March 2021; Accepted 01 April 2021.

A total of 20 base metal alloy discs were prepared. To prepare 20 discs of base metal alloy of 10mm in diameter and 0.5 mm thickness, wax patterns were fabricated for standardization of metal thickness of 0.5 mm and porcelain thickness of 2 .0 mm. Wax pattern were made and a sprue was attached to the wax patterns. Investment of wax pattern was done followed by casting. After sand blasting, the samples were ultrasonically cleaned. Finally, the samples were finished and glazed.

A total of 20 samples, after the sandblasting with 50 μm alumina (Zhemack), were categorized in two groups on the basis of porcelain repair system use. Each of the repairs set was used in line with manufacturer's instructions. All samples were stored in 37°C distilled water for a week before thermocycling. Universal Testing Mechine was used. Data obtained were entered into MS Excel spreadsheet and the statistical operations were carried out through Statistical Presentation System Software.

RESULTS

Total mean shear bond strength of specimens of Group A and Group B was 12.45 and 17.39 MPa respectively. While comparing the mean shear bond strength between group A and group B, significant results were obtained.

Table 1: Mean shear bond strength

Group	Mean bond strength	SD
Group A	12.45	0.95
Group B	17.39	1.84
p- value	0.00 (Significant)	

DISCUSSION

Porcelain-fused-to-metal crowns have been used as predictable materials since the 1960s, owing to their mechanical strength and low cost. However, porcelain veneer failure has been reported as the major cause for the replacement of metal-ceramic restorations. Also, failure may often occur in the anterior regions, presenting a serious aesthetic problem. The immediate replacement of failed complex prostheses is often impossible though, as it requires additional time, effort, and expense. In this situation, repair is a suitable method to rehabilitate the contour and color of fractured restorations. Such repair demands durable bonding, even though it is not a permanent treatment. Recent advances in adhesive dentistry

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 4, 2021, Pages. 8640 - 8646
Received 05 March 2021; Accepted 01 April 2021.

offers practitioners porcelain repair systems and techniques that ensure a strong bond between the fracture site and the restorative material. These techniques allow a wide variety of PFM restorations to be repaired without remaking the entire prosthesis and offer immediate restoration of both aesthetic and function.[6- 9]Hence; the present study was undertaken for comparing the bond strength of two porcelain repairing system (IvovlarVivadent repair system and Shofu Inc. repair system).

In the present study, total mean shear bond strength of specimens of Group A and Group B was 12.45 and 17.39 MPa respectively. While comparing the mean shear bond strength between group A and group B, significant results were obtained. In a previous study conducted by Ozcan et al, authors investigated the effect of surface conditioning methods on the micro-tensile bond strength of resin composite to composite after aging conditions. Thirty-six composite blocks were obtained with a hybrid composite (Esthet.X). The composite blocks were randomly divided into three groups according to the aging procedure; a)immersion in citric acid at 37ºC for one week, b)boiling in water for 8 hours and c)thermo-cycling. After aging, the blocks were further divided into two groups depending on the surface conditioning methods prior to repair. In the 1st group, silica coating was achieved followed by silane coupling agent while in the second group, the substrates were etched with 35% phosphoric acid gel then an intermediate monomer resin (Single Bond) was applied. Resin composite was then bonded to the conditioned substrates incrementally and the specimens were stored in water for 24 hours at 37ºC then prepared for micro-tensile bond testing. They resulted that aging the composite substrates with thermo-cycling affected the repair bond strengths significantly in both surface conditioning groups compared to citric acid and boiling aging methods. After all three aging conditions, silica coated and silanized groups showed higher bond values compared to acid etching with phosphoric acid and bonding agent applications. They concluded that silica coating and silanization provided higher composite-composite repair bond values compared to acid etching with phosphoric acid followed by adhesive resin applications. Also thermo-cycling the composite substrates resulted in the lowest repair bond strength compared to citric acid and boiling in water.[10]

In another study conducted by Padipatvuthikul and Mair, authors studied the bonding of composite to water-aged composite with surface treatments. A total of 280 cylinderical composite samples were prepared for each of three composites (Spectrum, Durafil VS and Herculite XRV). Two-hundred and ten samples of each composite were placed in a deionized water as a storage media while the remaining 70 samples were divided into 7 groups of 10 each and bonded immediately. After 1,4 and 12 weeks, 70 water-aged specimens of each

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 4, 2021, Pages. 8640 - 8646
Received 05 March 2021; Accepted 01 April 2021.

material were removed, divided into groups and treated as follows; the 1st group was left untreated, the 2nd group was abraded using pumice in a rubber cup, the 3rd group was coated with Prime & Bond, the 4th group was abraded and treated with Prime & Bond, the 5th group was coated with Optibond Solo Plus, the 6th group was abraded and treated with Optibond and finally the 7th group was treated with bis-GMA/TEGDMA resin (bis-GMA= bisphenol A-glycidyldimethacrylate, TEGDMA=tryethylene glycol dimethacrylate). The repair composite was added after treatment and the bonded specimens were stored in water for 24 hours. The light and scanning electron micrograph study indicated that when the bond strength was low, most specimens fractured through the interface (adhesive failure) while all the fractures were cohesive with high bond strengths. They concluded that the treatment that provided a strong bond between the new and the water aged composite was treatment with the dentin bonding agents; Optibond and Prime & Bond regardless abraded or not. With the two microhybrid composites, there was no bond between the new and the water aged composite after 7 days immersion in water.[11]Rathke et al studied the effect of different surface treatments on the composite-composite repair bond strength. A total of 280 composite discs were fabricated from a micro-hybrid resin composite (Spectrum TPH). The exposed test surfaces of the repair groups were wet-polished with silicon carbide paper to remove the oxygen-inhibited layer. Aging of the composite discs was achieved by storing them in 0.9% sodium chloride solution at 37ºC for 24 hours or 6 months. The test surfaces in each aging group were treated with three mechanical treatments as follows: in the 1st group; the surfaces were roughened with a diamond bur followed by cleaning with 34.5% phosphoric acid, in the 2nd group; the surfaces were sandblasted with aluminium oxide powder, and the 3rd group; silica-coated aluminum oxide powder was used. The three mechanical treatment groups were divided into four adhesive treatment subgroups which were performed with the components of a multi-step bonding system (Optibond FL Prime and Adhesive) or with one-bottle primer-adhesive (Excite). They found that, in all mechanical treatment groups, the use of an adhesive tended to enhance repair bond strengths compared to the controls. With one exception (CoJet Sand/OptiBond FL Adhesive), adhesive treatments significantly increased repair bond strengths to 6-month-old composite when compared to the controls. SEM examination of surfaces sandblasted with aluminum oxide powder as well as Cojet Sand revealed an irregular composite surface. They concluded that, for optimal repair bond strength, mechanical roughening of the old composite should be followed by application of an adhesive. The age of pre-existing composite had no significant effect on bond strength.[12]

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 4, 2021, Pages. 8640 - 8646
Received 05 March 2021; Accepted 01 April 2021.

CONCLUSION

Ceramic Repair N system Ivoclar enhances the shear bond strength between intraoral repair materials and the surface of fracture metal-ceramic restoration. Further clinical studies with larger sample size are required to evaluate shear bond strength of various repair systems with various other surface treatment to generalize the results and to verify the systems that offer the best performance.

REFERENCES

1. Papacchini F, Magni E, Radovic I, Mazzitelli C, Monticelli F, Goracci C, Polimeni A, Ferrari M: Effect of intermediate agents and preheating of repairing resin on composite-repair bonds. Oper. Dent. ,2007 b; 32(4): 363-371.
2. Leibrock A, Degenhart M, Behr M, Rosentritt M, Handel G. In vitro study of the effect of thermo- and load-cycling on the bond strength of porcelain repair systems. J Oral Rehabil. 1999;26:130–137.
3. GulsumSayin Ozel1, OzgurInan. Comparison of the Shear Bond Strength of Three Different Composite Materials to Metal and Ceramic Surfaces . International Journal of Composite Materials 2016; 6(4): 121-128.
4. Ghasemi AAZ, Panahandeh N, Golmohammadi F, Kavyani A. Effect of Silane on Shear Bond Strength of Two Porcelain Repair Systems. Journal of Dental School 2016; 34(1): 9-18.
5. dos Santos JG, Fonseca RG, Adabo GL, dos Santos Cruz CA. Shear bond strength of metal-ceramic repair systems. J Prosthet Dent. 2006;96:165–173.
6. Furuse AY, Cunha LF, Benetti AR, Mondelli J. Bond strength of resin-resin interfaces contaminated with saliva and submitted to different surface treatments. J. Appl. Oral Sci., 2007; 15(6):501-505.
7. Oztas N, Alcam A, Bardakcy Y. The effect of air abrasion with two new bonding agents on composite repair. Oper. Dent. 2003; 28: 149-154.
8. Shen C, Mondragon E, Gordan VV, Mjor IV. The effect of mechanical undercuts on the strength of composite repair. J. Am. Dent. Assoc.2004; 135: 1406-1412.
9. Tabatabaei MH, Alizade Y, Taalim S. Effect of various surface treatments on repair strength of composite resin. J. Dent. TUMS. 2004;1(4): 5-11.
10. Ozcan M, Barbosa SH, Melo RM, Prado Galhana GA, and Bottino MA: Effect of surface conditioning methods on the microtensile bond strength of resin composite to composite after aging conditions. Dent. Mater., 2007; 23: 1276-1282.

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 4, 2021, Pages. 8640 - 8646
Received 05 March 2021; Accepted 01 April 2021.

11. Padipatvuthikul P and Mair LH: Bonding of composite to water aged composite with surface treatments. Dent. Mater., 2007; 23: 519-525.
12. Rathke A, Tymina Y and Haller B: Effect of different surface treatments on the composite- composite repair bond strength. Clin. Oral Investig., 2009; 13:317-323.