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BOND STRENGTH EVALUATION OF BULK FILL AND GLASS HYBRID RESTORATIVE MATERIAL UNDER MANUAL AND MICROSCOPIC PREPARATION AND RESTORATION: AN IN-VITRO STUDY

Dental Science

Dr. Sherine Ivin — Post Graduate Student, Department of Conservative Dentistry & Endodontics, P .M .N. M. Dental College and Hospital, Bagalkot - 587101, Karnataka.

Dr. Sandhya A Khasnis* — M.D.S Reader Department of Conservative Dentistry & Endodontics, P. M. N. M. Dental College and Hospital, Bagalkot – 587101, Karnataka. *Corresponding Author

Dr. Prahlad A. Saraf — Professor and Head, Department of Conservative Dentistry & Endodontics P. M. N. M. Dental College and Hospital, Bagalkot - 587101, Karnataka.

KEYWORDS

INTRODUCTION

Bulk fill composites are claimed to be restorative materials used in deep Bulk fill composites are claimed to be restorative materials used in deep preparations and effectively preparations and effectively photoactivated in layers in layers upto 4mm.[1]

Bulk-filling techniques have become more widely used following the techniques have become more widely used following the development of materials with improved curing, controlled polymerization and reduced contraction stresses, and reduced cuspal deflection.[1]

Glass hybrid restorative material represents the latest innovation in glass Glass hybrid restorative material represents the latest innovation in glass monomer and resin technologies.[2]

Recently, the introduction of nanotechnology in dentistry allowed for significant structural changes in glass structural changes in glass ionomer cements. In particular, the limits of hardness and resistance to stress of GICs have been significantly improved.

AIM

To evaluate the bond strength of bulk-fill and glass hybrid restorative material on box cavity preparations under manual and microscopic preparations and restorations.

MATERIALS & METHODOLOGY

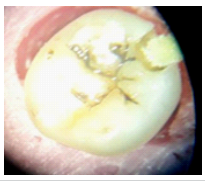
The following materials were used for the study;

- 20 freshly extracted molar teeth divided into 2 groups of 10 each
- Equia Forte
- Tetric N Flow Bulk Fill Composite
- Tetric N Bond Total Etch
- Surgiwell Dental Operating Microscope

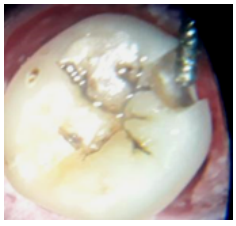
The teeth were prepared manually under naked eye for Group I and under a magnification of 2.5x. for Group II A box cavity preparation was made on the mesial and distal surface of each tooth with a buccolingual width of 4mm and an axial wall depth of 2mm. All the mesial surfaces were restored with Equia Forte and all the distal surfaces were restored with Tetric N Flow Bulk Fill Composite using Tetric N Bond Total Etch Bonding agent.

Teeth were sectioned longitudinally with diamond disc along the restorations and mounted into 4 subgroups
Group A: Bulk-fill composite restoration under microscope
Group B: Bulk-fill composite restoration under naked eye
Group C: Equia Forte restoration under microscope
Group D: Equia Forte restoration under naked eye

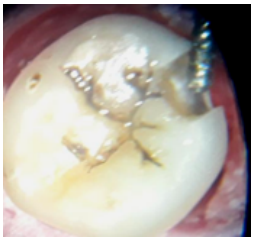
Thermocycling was done for 500 cycles following which microshear bond strength testing was done to each subgroup with a Universal Testing Machine.



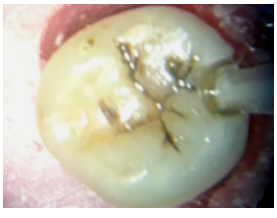
BONDING AGENT APPLICATION under 2.5X



FLOWABLE BULK-FILL COMPOSITE RESTORATION under 2.5X



BOX CAVITY PREPARATION under 2.5X



EQUIA FORTE CEMENT RESTORATION under 2.5X

RESULTS

Comparison of mean shear bond strength between study groups using One-way ANOVA test

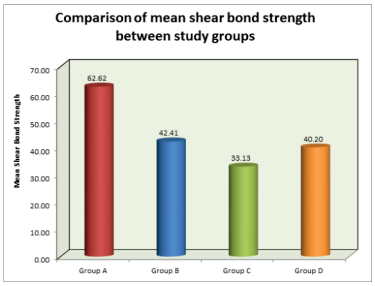
Groups	N	Mean	SD	Std. Error	Min	Max	P-Value
Group A	10	62.62	11.98	3.79	40.5	80.6	<0.001*
Group B	10	42.41	10.80	3.41	24.7	61.7	
Group C	10	33.13	7.36	2.33	23.4	45.4	
Group D	10	40.20	7.02	2.22	25.1	48.9	

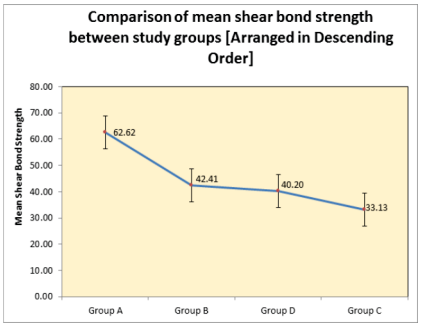
* - Statistically Significant

Multiple comparison of mean difference in shear bond strength between study groups using Tukey's HSD post hoc Test

(I) Group	(J) Group	Mean Diff. (I-J)	95% Conf. Interval		P-Value
			Lower	Upper	
Group A	Group B	20.22	8.735	31.699	<0.001*
	Group C	29.49	18.01	40.974	<0.001*
	Group D	22.42	10.94	33.904	<0.001*
Group B	Group C	9.275	-2.207	20.757	0.15
	Group D	2.205	-9.277	13.687	0.95
Group C	Group D	-7.07	-18.552	4.412	0.36

* - Statistically Significant





The Tukey's Post hoc Analysis revealed that Group A showed significantly highest mean shear bond strength as compared to other study groups at P<0.001. However, no significant differences were noted between group B, group C and group D.

DISCUSSION

Optimum Bond Strength is a prerequisite of any adhesive restorative material for its long term durability and clinical service.

Shear Bond Strength testing permits efficient screening of adhesive systems, less technical hassles as compared to microtensile bond strength testing.[3]

Equia Forte is the next generation Glass hybrid restorative material with the introduction of ultrafine, highly reactive glass particles, with higher molecular weight polyacrylic acid. They claim to build a higher strength restorative. Bonding is via the formation of an ion-exchange layer and modified hybrid zone with the tooth structure.[2]

Tetric-N-Flow Bulk Fill Composite is a flowable light curing radiopaque composite which contain fillers like ytterbium trifluoride, barium glass and copolymers at 68.2 wt %/ 46.4 vol %. It claims to have high strength as direct restorations in posterior teeth.[4]

Tetric-N-Bond Total Etch Bonding Agent is a light curing nano-filled single-component adhesive, fifth generation bonding system Bonding to dentin is via the formation of the hybrid layer via micromechanical interlocking.[5]

Equia Forte when compared for fracture resistance with capsulated materials like FUJI IX GP Extra and Miracle mix has shown superior fracture resistance.[6]

Dental Operating Microscope has the advantages of Optimal visibility, Quality services, Possibility of documentation of clinical procedures.[7] Present study showed superior bond strength with Tetric –N- Flow Bulk Fill than Equia Forte. This could be due to better adaptation of Tetric –N- Flow Bulk Fill with superior mechanical properties. Tetric-N- Bond providing adequate adhesion with hybrid layer formation, while in Equia Forte bonding was achieved only by ion exchange.

CONCLUSION

Results indicate that the application of BulkResults indicate that the application of Bulk--fill composites results in a better fill composites results in a better shear bond strength when compared to Glass Hybrid restorative materials.shear bond strength when compared to Glass Hybrid restorative materials.

Use of magnification and bonded restoration could have positive influence on Use of magnification and bonded restoration could have positive influence on the longthe long--term durability of restoration.term durability of restoration.

Further studies and long term clinical trials are recommended.Further studies and long term clinical trials are recommended.

REFERENCES

1. Benetti A, Havndrup-Pedersen C, Honoré D, Pedersen M, Pallesen U. Bulk-fill resin composites: polymerization contraction depth of cure, and gap formation. Oper Dent 2015;40(1)
2. One year comparative clinical evaluation of EQUIA with resin-modified glass ionomer and a nanohybrid composite in noncarious cervical lesions. Deepa Sunil Vaid, Nimisha Chinmay Shah, Priyanka Shripad Bilgi 2015 Journal of Conservative Dentistry.
3. Shear bond strength of bulk-fill and nano-restorative materials to dentin Hakan Colak, Ertugrul Ercan, Mehmet Mustafa Hamidi 2016 European Journal of Dentistry.
4. Evaluation of cervical marginal and internal adaptation using newer bulk-fill composites: an in vitro study, Rolly Shrivastav Agarwal, Hemlatha Hiremath, Ashish Garg, 2014 Journal of Conservative Dentistry.
5. Kumari RV, Siddaraju K, Nagaraj H, Poluri RK. Evaluation of shear bond strength of newer bonding systems on superficial and deep dentin. J Int Oral Health. 2015;7:31-5.
6. Fracture resistance of maxillary premolars with MOD cavities with capsulated restorative materials: an in vitro study. Dr Shrishail Totad, Raghu H, B S Patil, Dr Jayaprakash Patil, Dr Saritha V, Dr Sandhya Khasnis. July 2018 Indian Journal of scientific research.
7. The value of dental operating microscope in restorative dentistry: axiomatic or absurd. Arturo R Garcia. March 2006 Oral Health.
8. Comparative evaluation of shear bond strength of 3 commercially available glass ionomer cements in primary teeth. S Srinivasa Murthy, Gargi S Murthy 2015 Journal of International Oral Health.
9. Validity of bond strength tests: a critical review, part I and II. Kantheti sirisha, Thankonda Rambabu, Yalavarthi Ravishankar, Pabbati Ravikumar. Journal of conservative dentistry 2014.