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Comparison of Marginal Integrity of Class-1 Restorations With Spectrum Tph-3 Versus Nexcomp In Mandibular Molars - A Quasi-Experimental Study

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ABSTRACT

Objective: To compare the marginal integrity of Class-1 restorations with Spectrum TPH-3 vs Nexcomp in mandibular molars.
Study Design: Quasi-experimental study.
Place and Duration of Study: Operative Dentistry Department of Armed Forces Institute of Dentistry (AFID), Rawalpindi, Pakistan, from Sep 2020 to May 2021.
Methodology: A total of 60 candidates were enrolled and allocated randomly to one of two groups, A and B. Group-A received spectrum TPH3 and Group-B received Nexcomp composite. Patients were followed up after 2 and 6 months for evaluation of marginal fractures with the help of loupes, probes, mouth mirrors and bitewing radiographs.
Result: The rate of marginal fractures in Nexcomp were greater (27% at 2 months and 30% at 6 months) as compared to Spectrum TPH3 (73% at 2 months and at 77% 6 months) yielding a statistically significant difference between the two groups (*p* value= 0.004 and 0.001).
Conclusion: Spectrum TPH gives a better quality of posterior restoration as compared to Nexcomp, contributing positively towards better quality of oral health for patient.

Keywords: Composite Resins, Dental Restoration, Dental Restoration Failure.

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INTRODUCTION

The use of composites has overgrown amalgam restorations in the past few years for more conservative cavity preparations and esthetic benefits as dental restorations substitute the esthetic and functional attributes of the residual tooth structure after fracture or carious lesion.[1] Various generations of composites have been devised according to the shape and size of their filler particles, such as, microhybrids, which have fillers of about 0.4–1.0 microns whereas nanohybrids are composed of nanosized particles and owing to their good strength and polishability, they are used in anterior as well as posterior restorations with microhybrids, being stronger than simple microfilled composites, being used universally as well.[2] Nano composites, with more compressive strength and resistance to wear as well as greater esthetic properties due to the highest filler content and arrangement of silane agents, are being used widely in dental practices for posterior restorations.[3] However, nanoclusters manifest greater propensity towards fractures as compared to conventional composites.[4] One shortcoming of the composite material is its propensity towards polymerization and shrinkage, specially in cavities with greater configuration factor.[5] The dimensions of the material are reduced, leading to creation of marginal defect and loosening of bonds, causing discoloration and secondary caries between the interface of restoration and tooth.[6,7] To safeguard against such circumstances and fracturing of enamel and restoration on the margins, the stresses need to be less as compared to the enamel strength[8] as greater damage is directly proportional to the intensity of the polymerization shrinkage.[9,10] Thus, the aim of this study was to compare a nanohybrid composite with a micro hybrid composite in Class 1 restoration with regard to marginal integrity over time.

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METHODOLOGY

The quasi-experimental study was conducted at the Operative Dentistry Department of Armed Forces Institute of Dentistry (AFID), Rawalpindi, Pakistan from September 2020 to May 2021, after gaining approval of institutional Ethics Committee (IRB number 90/ Trg – ABP1K2). Informed consent was taken from all patients prior to enrollment in the study.

Inclusion Criteria: Patients of either gender, aged 20 to 35 years, presenting to OPD with symptoms of reversible pulpitis, having carious lesion involving the occlusal surface of mandibular permanent molars,

with good oral hygiene, having no active periodontal diseases and willing to return on follow-up examination were included.

Exclusion Criteria: Patients with caries extending in interproximal areas, pulp exposures and those having clinical and radiographic signs and symptoms of irreversible pulpitis, periapical periodontitis, chronic apical abscess, and other conditions involving pulp and periodontium were excluded.

Using consecutive sampling method, 60 patients were selected. Sample size was calculated using OpenEpi sample size calculator. Patients were divided into two equal groups, A and B. Group-A received Spectrum TPH-3, a sub-micro hybrid composite (brand name- Dentsply) whereas Group-B received Nexcomp, a nano hybrid composite (brand name Meta-Biomed) (Figure). Post operative and follow up instructions were given to the patients. Patients from both groups called for follow-up at 2 months and 6 months intervals for the assessment of the marginal integrity in terms of fractured margins and ditching. The marginal integrity and fractures were examined by a trained examiner, who was unaware of the resin restoration used in the restored teeth. The examination on each recall visit included checking with a dental mirror and probe, along with the help of Loupes with 4x magnification and a bitewing radiograph to check for the marginal fractures.

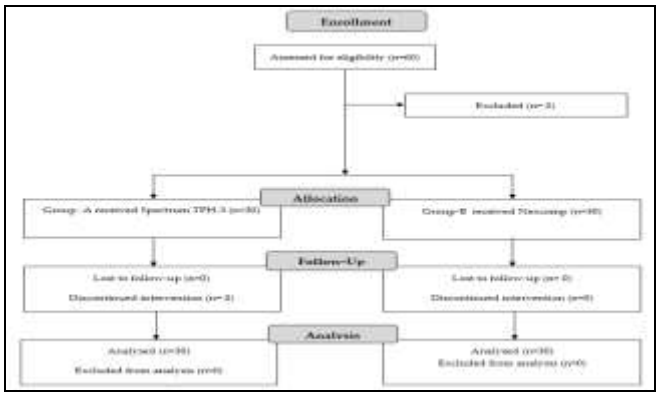

Figure: Patient Flow Diagram (n= 60)

The data was recorded on a specially formulated data collection tool. Statistical Package for Social Sciences (SPSS) version 23.0 was used for the data analysis. Quantitative variables with normal distribution were expressed as Mean±Sd and qualitative variables were expressed as frequency and percentages. Chi-square test was applied to explore the inferential statistics

RESULTS

Out of 60 analyzed patients, there were 28(47%) males and 32(53%) females out of which marginal fracture was present in 54% males and 56% females at 6 months with no statistically significant difference. Table I shows details of these findings.

As shown from Table-II, long term results of Group B were inferior to Group A, having a statistically significant difference between the two restorations over 2 and 6 months. Our study displayed loss of marginal integrity in Nexcomp restoration in 19(73%) of the cases as compared to Spectrum TPH3 having only 7(27%) marginal fractures at 2 months duration. Similarly, on 6 months recall, Group A (spectrum TPH) and B (Nexcomp) revealed loss of marginal integrity in 9(30%) and 23(77%) restorations respectively with a *p*-value of 0.001.

DISCUSSION

Composites give desirable results in posterior teeth when rigorous adhesive technique along with layering of the restorative material is done.[11,12] A prime difficulty, in attaining a steady technique for posterior composite restorations, is the phenomenon of polymerization shrinkage jeopardizing the interface of the bonded surfaces causing strain and shrinkage creating marginal gaps.[13,14] If the bonded tooth structure does not have enough elastic compliance, it breaks to compensate for the reduced volume of restorative material, ultimately causing leakage leading to secondary caries and pulpal inflammation.[6,15] In our study, marginal integrity of two composites, Spectrum TPH (micro hybrid) and Nexcomp (nano hybrid), in Class 1 restorations of permanent molars were compared at different time frames. On two months recall, our study revealed that 27% of restorations done with Spectrum TPH3 lost their marginal integrity whereas 73% of Nexcomp restorations had marginal fractures. Upon six months recall, comparable results were seen with statistically significant loss of marginal integrity in Nexcomp restoration as compared to Spectrum TPH3. Unlike our results, a study conducted on Nigerian population revealed no difference in the marginal integrity of the micro and nanohybrids.[7], Similarly a meta-analysis reported that 20 out of 403 and 45 out of 610 nanohybrid and micro hybrid restorations had a faulty marginal adaptation at a 12-year recall respectively.[8-17] Another study using microhybrid (Filtek Z250) and a nanohybrid composite (Esthet-X) after 12 months revealed 4.8% and 4.6% marginal fractures but having

Table-I: Gender and Age Distribution in Relation to Presence of Marginal Fracture at 2 Months and 6 Months (n=60)

Variables		At 2 months			At 6 months		
		No Fracture n (%) (n =34)	Fracture Present n (%) (n=26)	*p*-value	No Fracture n (%) (n =34)	Fracture Present n (%) (n=26)	*p*-value
Gender	Males	14(41)	14(54)	0.44	11(39.3)	17(60.7)	0.30
	Females	20(59)	12(46)		17(53.1)	15(46.9)	
Age (years)	20 – 27	8(23.5)	4(15)	0.53	7(58.3)	5(41.7)	0.60
	28 – 35	26(76)	22(85)		21(43.8)	27(56.3)	

Table-II: Comparison of Presence of Fracture between Group A and B at 2 and 6 months (n=60)

Groups	At 2 Months			At 6 Months		
	No fracture n (%) n=34	Fracture Present n=26	*p*-value	No Fracture n (%) n=28	Fracture Present n (%) n=32	*p*-value
Group-A	23(68)	7(27)	0.004	21 (70)	9(30)	0.001
Group-B	11(32)	19(73)		7(23)	23(77)	

no statistically significant difference.6 Another research performed on eighty-four Spectrum TPH restorations demonstrated that all restorations were intact at margins at 12 months recall with an excellent clinical performance.[9,18]

LIMITATION OF STUDY

We were only able to enroll a small sample size owing to the ongoing COVID-19 restrictions on dental practice and subsequently encountered less patient flow. Scoring for the marginal integrity was also not performed for both groups and follow-up period was limited. However, the merit of the study includes the elimination of bias due to blinded operator examination on subsequent follow ups.

CONCLUSION

The quality of composite restoration can be greatly increased in terms of marginal integrity by the right choice of composite material. We found the longevity of Spectrum TPH3 restoration in Class 1 restorations to be far greater than Nexcomp composites with better marginal stability thus reducing failures and improving patient quality of life.

Conflict of Interest: None.

Authors Contribution

Following authors have made substantial contributions to the manuscript as under:

NJB & FA: Conception, study design, drafting the manuscript, approval of the final version to be published.

MJAR & MA: Data acquisition, data analysis, drafting the manuscript, critical review, approval of the final version to be published.

MAR & MA: Data acquisition, critical review, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

REFERENCES

1. Nour Eldeen HM, Noaman K, Wakwak MA. Nanoleakage evaluation of nano-filled resin composite using different adhesive systems at different dentin depth. Al-Azhar J Dent Sci 2021; 24(1): 33-40. https://doi.org/10.21608/ajdsm.2020.38577.1091
2. De Andrade AK, Duarte RM, Medeiros e Silva FD, Batista AU, Lima KC, Monteiro GQ, Montes MA. Resin composite Class I restorations: a 54-month randomized clinical trial. Oper Dent 2014; 39(6): 588–594.
3. Beun S, Glorieux T, Devaux J, Vreven J, Leloup G. Characterization of nanofilled compared to universal and microfilled composites. Dent Mater 2007; 23(1): 51-59.
4. Alzraikat H, Burrow M, Maghaireh G, Taha N. Nanofilled resin composite properties and clinical performance: a review. Oper Dent 2018; 43(4): E173-E190. https://doi.org/10.2341/17-208-t
5. Jandt K, Watts D. Nanotechnology in dentistry: present and future perspectives on dental nanomaterials. Dent Mater 2020; 36(11): 1365-1378. https://doi.org/10.1016/j.dental.2020.08.006
6. De Andrade AK, Duarte RM, Guedes Lima SJ, Passos TA, Lima KC, Montes MA. Nanohybrid versus nanofill composite in class I cavities: margin analysis after 12 months. Microsc Res Tech 2011; 74(1): 23-27.
7. Enone LL, Awotile AO, Adegbulugbe CI, Agbaje LO, Odogun LA, Oyapero A. Comparison of the clinical performance of a nanohybrid and a microhybrid resin composite in the restoration of posterior teeth in Nigerians. Odontostomatol Trop 2017; 7(3): 130-136.
8. Maran BM, De Geus JL, Gutiérrez MF, Heintze S, Tardem C, Barceleiro MO, et al. Nanofilled/nanohybrid and hybrid resin-based composite in patients with direct restorations in posterior teeth: a systematic review and meta-analysis. J Dent 2020; 99: 40-47. https://doi.org/10.1016/j.jdent.2020.103407
9. Loguercio AD, Reis A, Hernandez PA, Macedo RP, Busato AL. 3-year clinical evaluation of posterior packable composite resin restorations. J Oral Rehabil 2006; 33(2): 144-151.
10. Soares CJ, Faria-E-Silva AL, Rodrigues M, Fernandes Vilela AB, Pfeifer CS, Tantbirojn D, et al. Polymerization shrinkage stress of composite resins and resin cements - What do we need to know? Braz Oral Res 2017; 31(8): 49–63.

https://doi.org/10.1590/1807-3107bor-2017.vol31.0081
11. Zhou W, Liu S, Zhou X, Hannig M, Rupf S, Feng J, et al. Modifying adhesive materials to improve the longevity of resinous restorations. Int J Mol Sci 2019; 20(3): 1-20. https://doi.org/10.3390/ijms20030572
12. Al-Zain AO, Eckert GJ, Lukic H, Megremis S, Platt JA. Polymerization pattern characterization within a resin-based composite cured using different curing units at two distances. Clin Oral Investig 2019; 23(11): 3995–4010. https://doi.org/10.1007/s00784-019-02882-w
13. Suda S, Tsujimoto A, Barkmeier WW, Nojiri K, Nagura Y, Takamizawa T, et al. Comparison of enamel bond fatigue durability between universal adhesives and two-step self-etch adhesives: effect of phosphoric acid pre-etching. Dent Mater J 2018; 37(2): 244–255. https://doi.org/10.4012/dmj.2017-120
14. Alencar MF, Pereira MT, De-Moraes MDR, Santiago SL, Passos VF. The effects of intrinsic and extrinsic acids on nanofilled and bulk fill resin composites: roughness, surface hardness, and scanning electron microscopy analysis. Microsc Res Tech 2020; 83(2): 202–207. https://doi.org/10.1002/jemt.23376
15. Ali RH, Niazy MA, Naguib EA, Abdel Ghany OS. Effect of application technique and mode of curing on nanoleakage of universal adhesive system. Futur Dent J 2018; 4(2): 253–261.
16. Van Dijken JW, Pallesen U. Posterior bulk-filled resin composite restorations: a 5-year randomized controlled clinical study. J Dent 2016; 51: 29–35. https://doi.org/10.1016/j.jdent.2016.05.008
17. Chandrasekhar V, Rudrapati L, Badami V, Tummala M. Incremental techniques in direct composite restoration. J Conserv Dent 2017; 20(6): 386-391. https://doi.org/10.4103/JCD.JCD_189_17
18. Mahajan V, Bhondwe S, Doot R, Balpande R, Bhandari S, Dahiwale S. Failures in composite restoration. Int J Dent Res 2015; 3(2): 10. https://doi.org/10.14419/ijdr.v3i2.4442