

TRENDS AND CONCERNS REGARDING USING COMPOSITES AS POSTERIOR RESTORATIONS AND TECHNIQUES EMPLOYED TO MINIMIZE THEIR FAILURE

Hira Butt¹, Laiba Amer², Hania Khan³, Syeda Alizeh Hassan⁴, Amna Nauman Khan⁵, Nauman Rauf Khan⁶, Waseem Akram⁷

ABSTRACT:

OBJECTIVES:

To determine the trends and concerns of using composites as posterior restorations and the techniques employed to minimize their failure.

METHODOLOGY:

A cross sectional descriptive was conducted in 150 dentists of Sharif College of Dentistry, SMDC, Lahore from June 2019 to July 2020 after obtaining ethical approval from Sharif Medical Research Centre (SMRC). Data was collected using a pre-validated questionnaire. Data was analyzed using SPSS 23.

RESULTS:

There was no significant association between years of clinical experience and case selection ($p=0.436$). The association between reason for selection of composites as posterior restorations and clinical experience of dentists was also non-significant ($p=0.105$). Similar was the case with concerns regarding using composites and clinical experience ($p=0.950$). The association between years of clinical experience and techniques to minimize failure of composite restorations was also non-significant ($p=0.936$).

CONCLUSION:

Majority of dentists with a clinical experience of less than 5 years as well as more than 5 years selected composites as posterior restorations only for small defects while the least chose them only when centric contacts were not involved. The major concern for dentists with clinical experience less than 5 years as well as more than 5 years was polymerization shrinkage of composites while the least were worried about wearing off of the restoration and difficulty in establishing contact points. In order to tackle these concerns the dentists reported in our study that they mostly used the techniques of incremental curing and moisture control procedures.

KEYWORDS: Posterior Restorations, Composites, Polymerization Shrinkage, Micro Leakage, Contact Points

How to cite this article:

Butt H, Amer L, Khan H, Hassan SA, Khan AN, Khan NR, Akram W, Trends and Concerns Regarding using Composites as Posterior Restorations and Techniques Employed to Minimize their Failure. J Wazir Muhammad Inst Paramed Tech. 2021;1(2): 2-7

Correspondence

¹Hira Butt, Demonstrator, Sharif Medical & Dental College, Lahore

☎: +92-320-4635376

✉: hira.ah.butt@gmail.com

²Final Year BDS Student, Sharif Medical & Dental College, Lahore

³Final Year BDS Student, Sharif Medical & Dental College, Lahore

⁴Final Year BDS Student, Sharif Medical & Dental College, Lahore

⁵Professor COD, SMOC, Lahore

⁶Professor COD, SMOC, Lahore

⁷Lab Manager/Technician Sharif Medical & Dental College, Lahore

INTRODUCTION:

The rising concerns of people regarding mercury toxicity and a desire for better aesthetics has started to replace amalgam; the material of choice in posterior restorations since the last 150 years¹. Initially the use of composites was just limited to anterior restorations however, due to new mechanically improved resins and patient preference, some dentists have started using these resins in posterior restorations². Dental composites are being widely used, however, it

cannot be denied that they have their limitations³. Several studies were conducted to understand the reasons for composite failures in posterior restorations and ways adopted by dentists in Lahore to overcome these¹. Following are the reasons for failure: secondary caries, bulk fractures, marginal deficiencies and wear⁴⁻⁶. Shrinkage and sensitivity due to bonding agents were experienced by the patients as well as weak, poorly contoured and open contacts^{7,8}. The surface where the proximal surfaces of neighboring teeth come in contact is known as the contact area⁹. Failure to obtain adequate contact results in accumulation of food particles in the interproximal space resulting in inflammation, pain and periodontal trauma¹⁰. Using composites in class 2 restorations has been a major problem faced in clinical practice, as it results in micro-leakage in the area^{11,12}. Posterior fractures have also been reported more than the anterior fractures¹³. Despite these problems, the dental community has not stopped using composites and has adopted different techniques to overcome these problems¹¹. The effect of polymerization stresses at the gingival margin has been sorted after the use of glass ionomer cement¹⁴. This cement establishes a chemical bond with dentin; however, due to its low strength it made the restoration more susceptible to fracture¹⁵. Later resin modified glass ionomer became a material of choice for sandwich restorations as it not only binds chemically but micromechanical too¹¹. Polymerization stresses can also be cushioned by using flow able composites in the first increments, because of their low viscosity flow able composites are able to better adapt to the cavity walls¹⁶. To obtain an ideal contact point, it is essential to select a proper matrix system for successful proximal composite restorations¹⁷. Most dentists considered Tofflemire matrix to be the best for composite restorations and some used a circumferential matrix system as a system of lower cost^{18,19}. The aim of this study was to determine the trends and concerns of using composites as posterior restorations and the techniques employed to minimize their failure.

METHODOLOGY:

A cross sectional descriptive was conducted in 150 dentists of Sharif College of Dentistry, SMDC, Lahore from June 2019 to July 2020 after obtaining ethical approval from Sharif Medical Research Centre (SMRC). All participants irrespective of their age, gender and

clinical experience were included. Practitioners who had never used composites for posterior restorations were excluded from the study. The sample size was calculated using an online sample size calculator keeping precision at 5%, 95% confidence level with the prevalence of use of composites as posterior restoration 9.8%,¹ the sample size was calculated to be 136. Data was collected using a pre-validated questionnaire¹. Informed consent was taken from the participants. Numerical data like the age was reported as mean and standard deviation. Nominal data like gender and years of clinical experience were recorded as frequency and/or percentages. For data analysis, all recorded data was coded and entered using SPSS statistical package version 23.0. Fisher exact test was used to find the association between years of clinical experience of dentists and trends, concerns and techniques used for placement of composites in posterior restoration. P-value less than equal of 0.05 was considered significant.

RESULTS:

The mean age of the participants was 26.66 years \pm 4.514 with 39.3% males and 60.7% females. It was seen that the association between years of clinical experience and trend of dentists for case selection and their reason for choosing composites as posterior restorations were found to be non-significant ($p=0.436$ and $p=0.105$ respectively). It was evident that dentists with clinical experience of less than 5 years and 5 to 10 years predominantly selected composites as posterior restorations only for small defects while those with clinical experience greater than 10 years selected them only on patient's demand as shown in Table 1.

Table 1: Trends of Using Composites as Posterior Restorations

Trends of Posterior Composite Restorations		Years of Experience			P-value
		<5 Years	5 to 10 Years	>10 Years	
Case Selection	Every Posterior Restoration	23 (15.3%)	4 (2.7%)	0	0.436
	Only for Small Defects	48 (32%)	7 (4.7%)	1 (0.7%)	
	For Occlusal Restorations Only Not Proximal	14 (9.3%)	3 (2%)	0	
	Only When Centric Contacts are Not Involved	3 (2%)	1 (0.7%)	1 (0.7%)	
	If the Patients Demands	37 (24.7%)	5 (3.3%)	3 (2%)	
Reason for Selection of Composite as Posterior Restoration	Easy Placement	5 (3.3%)	1 (0.7%)	1 (0.7%)	0.105
	Esthetically Pleasing	35 (23.3%)	3 (2%)	0	
	Conservation of Tooth Structure	74 (49.3%)	11 (7.3%)	3 (2%)	
	Patient Preference	7 (4.7%)	4 (2.7%)	1 (0.7%)	
	Dentist Has Better Skills for Composite	4 (2.7%)	1 (0.7%)	0	

The concerns of usage of composite restorations were studied in association with the years of clinical experience of the dentists (p=0.950). It

was seen that polymerization shrinkage was the main concern for dentists of all durations of clinical experience as shown in Table 2.

Table 2: Concerns for Using Composites as Posterior Restorations

Concerns	Years of Experience			P-value
	<5 Years	5 to 10 Years	>10 Years	
Wearing Off	7 (4.7%)	1 (0.7%)	0	0.950
Micro Leakage	14 (9.3%)	2 (1.3%)	1 (0.7%)	
Polymerization Shrinkage	78 (52%)	12 (8%)	4 (2.7%)	
Establishment of Contact Points Between Teeth	4 (2.7%)	1 (0.7%)	0	
Maintenance of Isolation for Composite Restorations	22 (14.7%)	4 (2.7%)	0	

Table 3: Techniques Used for Placing Composite Restorations

Techniques for Placing Posterior Composites	Years of Experience			P-value
	<5 Years	5 to 10 Years	>10 Years	
Incremental Curing	102 (68%)	17 (11.3%)	5 (3.3%)	0.936
Use of Moisture Control Methods (Other than Rubber Dam)	8 (5.3%)	2 (1.3%)	0	
Use of Rubber Dam For Moisture Control	5 (3.3%)	1 (0.7%)	0	
Use of Dentin Bonding Agents	5 (3.3%)	0	0	
Use of Metal Matrix Band	5 (3.3%)	0	0	

DISCUSSION:

The introduction of hybrid and micro-hybrid composites has made composites suitable for application on posterior teeth²⁰. According to a research 98 out of 103 restorations reported to be successful which is a 95.1% success rate with a survival time of 12 years²¹. Our study reported that the majority of dentists (32%) with a clinical experience of less than 5 years selected composites as posterior restorations only for small defects while the least (2%) chose them only when centric contacts were not involved. According to one study, out of the 35 dentists with a clinical experience less than 5 years, the majority (26) dentists selected posterior composite restorations for only small defects while the least selected them in every posterior restoration¹. Literature reveals that the primary reason for using composites as posterior restorations is the need to conserve essential tooth structure 77.9%²². The case selection trends in our study for dentists with a clinical experience of more than 5 years revealed that the majority (4.7%) opted for composites only for small posterior restorations while the least (0.7%) selected them when centric contacts were not involved. The study cited above,¹ reported that among dentists with an experience of more than 5 years most of the dentists (19 out of 23) used composites for small posterior restorations while the least (3 out of 23) used them for every posterior restoration while 3 out of 23 never opted them for proximal restorations. Innumerable characteristics of composites make them ideal restorative materials, which include polymerization with light curing, water resistance, strength, decreased polymerization shrinkage and improved longevity⁹. Results of another study suggested that bulk fill resins could be another option for posterior restorations^{5,23}. If these composites are inserted using sensitive techniques they can function for 10 years or more²⁴. Our study reported that the major concern for dentists with clinical experience less than 5 years was polymerization shrinkage of composites (52%), followed by difficulty in maintenance of isolation (14.7%), micro leakage (9.3%), 4.7% were concerned about wearing off of the restoration while 2.7% had concerns about establishment of contact points between teeth. Naz et al in 2013 reported that out of a total of 35 dentists with a clinical experience of less than 5 years 10 had concerns about the wearing off of the restoration, 16

considered micro leakage of composites a concern, 15 reported polymerization shrinkage of composites as a problem, 16 said it was difficult to establish contact points between teeth after composite restorations while 21 said that maintenance of isolation for composite restorations is difficult¹. According to our study among the dentists with clinical experience more than 5 years the majority (8%) were concerned about polymerization shrinkage of composites while the least were worried about wearing off of the restoration (0.7%) and difficulty in establishing contact points (0.7%). Naz et al reported difficulty in establishing contact points of teeth (15 out of 23 dentists) and maintenance of isolation (15 out of 23 dentists) for composite in posterior restorations as the main concerns in dentists with clinical experience of more than 5 years while none were concerned about wearing off of restoration¹. In order to tackle these concerns the dentists reported in our study that they mostly used the techniques of incremental curing and moisture control procedures.

CONCLUSION:

Majority of dentists with a clinical experience of less than 5 years selected composites as posterior restorations only for small defects while the least chose them only when centric contacts were not involved. The case selection trends in our study for dentists with a clinical experience of more than 5 years revealed that the majority opted for composites only for small posterior restorations while the least selected them when centric contacts were not involved. The major concern for dentists with clinical experience less than 5 years was polymerization shrinkage of composites, followed by difficulty in maintenance of isolation, micro leakage, wearing off of the restoration and then difficulty in establishment of contact points between teeth. Majority of dentists with clinical experience more than 5 years were concerned about polymerization shrinkage of composites while the least were worried about wearing off of the restoration and difficulty in establishing contact points. In order to tackle these concerns the dentists reported in our study that they mostly used the techniques of incremental curing and moisture control procedures.

LIMITATIONS:

A larger sample size and data collection from dentists from other dental hospitals would have helped us get a more elaborate view on the topic.

CONFLICT OF INTEREST: None

FUNDING SOURCES: None

REFERENCES:

1. Fareed MA, Bashir AF, Yousaf U, Baig QA, Jatala UW, Zafar MS. Trends in resin composite restoration repair teaching in dental colleges in Pakistan. *Eur J Gen Dent.* 2021;10(1):14-8.
2. Rao LN, Hegde MN, Shetty A. Evaluation of polymerization shrinkage of 2 types of posterior composite resins. *J Health Allied Sci NU.* 2017;7(1):25-8.
3. Al-Sheikh R. Effects of different application techniques on nanohybrid composite restorations clinical success. *Open Dent J.* 2019;13(1).
4. Tanner J, Tolvanen M, Garoushi S, Säilynoja E. Clinical evaluation of fiber-reinforced composite restorations in posterior teeth-results of 2.5 year follow-up. *Open Dent J.* 2018;12:476.
5. Veloso SR, Lemos CA, de Moraes SL, do Egito Vasconcelos BC, Pellizzer EP, de Melo Monteiro GQ. Clinical performance of bulk-fill and conventional resin composite restorations in posterior teeth: a systematic review and meta-analysis. *Clin Oral Invest.* 2019;23(1):221-33.
6. Ghiorghe CA, Iordache C, Topoliceanu C, Galina P, Moldovan A, Andrian S. Methods for the assessment of esthetic posterior direct restorations. *Rom J Oral Rehabil.* 2018;10(4):130-5.
7. Naz F, Naz S, Tariq U, Mir S. Evaluation of microleakage of nano-composites using three different restorative techniques. *Pak Oral Dent J.* 2018;38(3):358-61.
8. Sabbagh J, Fahd JC, McConnell RJ. Post-operative sensitivity and posterior composite resin restorations: a review. *Dent Update.* 2018;45(3):207-13.
9. Ali S, Iqbal K, Asmat M, Farooq I, Khan AM, Alam MK. Dental resin composite restoration practices amongst general dental practitioners of Karachi, Pakistan. *World J Dent.* 2019;10(2):129-34.
10. Peumans M, Venuti P, Politano G, Van Meerbeek B. Effective protocol for daily high-quality direct posterior composite restorations: the interdental anatomy of the class-2 composite restoration. *J Adhes Dent.* 2021;23(1):21-34.
11. Naz F, Yousaf O, Chattha MR, Raza SM. Preference regarding technique selection for posterior composite restorations among the dentists in Lahore. *Pak Oral Dent J.* 2015;35(3).
12. Arandi NZ, Rabi T. Cavity bases revisited. *Clin Cosmet Invest Dent.* 2020;12:305.
13. Montagner AF, Sande FH, Müller C, Cenci MS, Susin AH. Survival, reasons for failure and clinical characteristics of anterior/posterior composites: 8-year findings. *Braz Dent J.* 2018;29(6):547-54.
14. Suzuki S, Takamizawa T, Imai A, Tsujimoto A, Sai K, Takimoto M, et al. Bond durability of universal adhesive to bovine enamel using self-etch mode. *Clin Oral Invest.* 2018;22(3):1113-22.
15. Worthington HV, Khangura S, Seal K, Mierzwinski-Urban M, Veitz-Keenan A, Sahrman P, et al. Direct composite resin fillings versus amalgam fillings for permanent posterior teeth. *Cochrane Database Syst Rev.* 2021;(8).
16. Salem MA, Awad M, Magdy N. Two-year clinical evaluation of smart dentin replacement flowable resin composite as a liner under class II resin composite restorations. *J Adv Med Dent Sci Res.* 2017;5(2):99.
17. Ahmad MZ, Gaikwad RN, Arjumand B. Comparison of two different matrix band systems in restoring two surface cavities in posterior teeth done by senior undergraduate students at Qassim University, Saudi Arabia: a randomized controlled clinical trial. *Indian J Dent Res.* 2018;29(4):459.
18. Aslam M, Yousaf A, Bhangar F, Zahra SF, Iftikhar N, Khan LS. Most commonly used matrix band system for class II restoration. *Pak Oral Dent J.* 2021;41(1):32-4.

19. Malik T, Malik T, Mahmood A, Naz S, Sajid M. Choice of matrix system for class II composite restoration; a cross sectional survey among the dentists of Multan Dental College. *Pak J Med Health Sci.* 2020;14(4):829-31.
20. Pedreira PR, Damasceno J, Pierote J, Dressano D, Marchi GM. Minimally invasive aesthetic rehabilitation in composite resin: report of two clinical cases. *Braz Dent Sci.* 2019;22(1):135-42.
21. Borgia E, Baron R, Borgia JL. Quality and survival of direct light-activated composite resin restorations in posterior teeth: a 5-to 20-year retrospective longitudinal study. *J Prosthodontics.* 2019;28(1):e195-203.
22. Akbar I. Knowledge and attitudes of general dental practitioners towards posterior composite restorations in Northern Saudi Arabia. *J Clin Diagn Res.* 2015;9(2):ZC61.
23. Loguercio AD, Rezende M, Gutierrez MF, Costa TF, Armas-Vega A, Reis A. Randomized 36-month follow-up of posterior bulk-filled resin composite restorations. *J Dent.* 2019;85:93-102.
24. Sabbagh J, Fahd JC, McConnell RJ. Post-operative sensitivity and posterior composite resin restorations: a review. *Dent Update.* 2018;45(3):207-13.

CONTRIBUTORS

1. **Hira Butt** - Concept & Design; Data Acquisition; Data Analysis/Interpretation; Drafting Manuscript; Critical Revision; Supervision; Final Approval
2. **Laiba Amer** - Concept & Design; Data Acquisition; Data Analysis/Interpretation; Drafting Manuscript; Critical Revision; Supervision; Final Approval
3. **Hania Khan** - Concept & Design; Data Acquisition; Data Analysis/Interpretation; Drafting Manuscript; Critical Revision; Supervision; Final Approval
4. **Syeda Alizeh Hassan** - Concept & Design; Data Acquisition; Data Analysis/Interpretation; Drafting Manuscript; Critical Revision; Supervision; Final Approval
5. **Amna Nauman Khan** - Concept & Design; Data Acquisition; Data Analysis/Interpretation; Drafting Manuscript; Critical Revision; Supervision; Final Approval
6. **Nauman Rauf Khan** - Concept & Design; Data Acquisition; Data Analysis/Interpretation; Drafting Manuscript; Critical Revision; Supervision; Final Approval
7. **Waseem Akram** - Concept & Design; Data Acquisition; Data Analysis/Interpretation; Drafting Manuscript; Critical Revision; Supervision; Final Approval