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Original Article

Evaluation of Quality of Anterior and Posterior Composite Resin Restorations Performed by Dentists of Union Territory of Jammu and Kashmir

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Abstract

Goal: The goal of present study was to evaluate the effectiveness of composite resin restorations placed in the Union Territory of Jammu and Kashmir, both anteriorly and posteriorly.

Material and Methods: Among 161 patients who visited the Department of Conservative Dentistry and Endodontics at the Institute of Dental Sciences Sehora between March 2023 and May 2023, a total of 300 composite restorations were assessed. California Dental Association Quality Evaluation System was used to evaluate the quality of composite restorations.

Result: A total of 49% of all restorations were deemed good and satisfactory, while the remaining 51% were not.

Conclusion: Our results highlight the need to raise the standard of composite restorations given to the average patient in Jammu and Kashmir Union Territory.

Key words: Color mismatch, Composite resin restorations, Marginal defect, Overhang restoration

INTRODUCTION

Resin composites are now thought to be appropriate for all kinds of direct restorations.[1] This material is adhesively bonded, strengthens teeth, seals teeth, and is more conservative because it does not need mechanical retention or precise preparation geometry and satisfies the patient's goal for a restoration that seems natural.[2-9] In addition, modern restorative composite resins are extremely sophisticated materials with high micro and nano filler content that optimizes excellent physical qualities and higher wear resistance, both of which are essential for long-lasting function.[10-13] The fact that in 2010, among dentists in the United States, the placement of composite resin restorations outpaced amalgam fillings by a ratio of 2:1 and that 1/3 of dentists reported not using amalgam at all is evidence of its present popularity.[14,15] Posterior resin composite restorations have been shown to be successful in controlled and clinical trials in Class I and II type restorations with annual failure rates of 0–9% over 5 years and beyond.[16-21] Furthermore, the minimal intervention dentistry concept's conceptual movement toward the preservation of tooth structure enhanced the indication of composites as adhesive materials.[22] It is anticipated that the clinical experience gained throughout that decade may have favored the clinical behavior of these restorations. Even after being deemed clinically insufficient, many restorations frequently functioned well for several more years before being replaced. Contrary to this observation, other restorations deemed adequate were occasionally replaced quickly after similar clinical evaluations were conducted.[23] According to a retrospective study by Mjor *et al.*,[24] groups of clinicians with higher clinical expertise had longer-lasting restorations. Furthermore, it must be taken into account that throughout their dental school, these dentists did not obtain adequate training in installing resin composite restorations. The teaching of posterior composite restorative techniques began in the 1980s at

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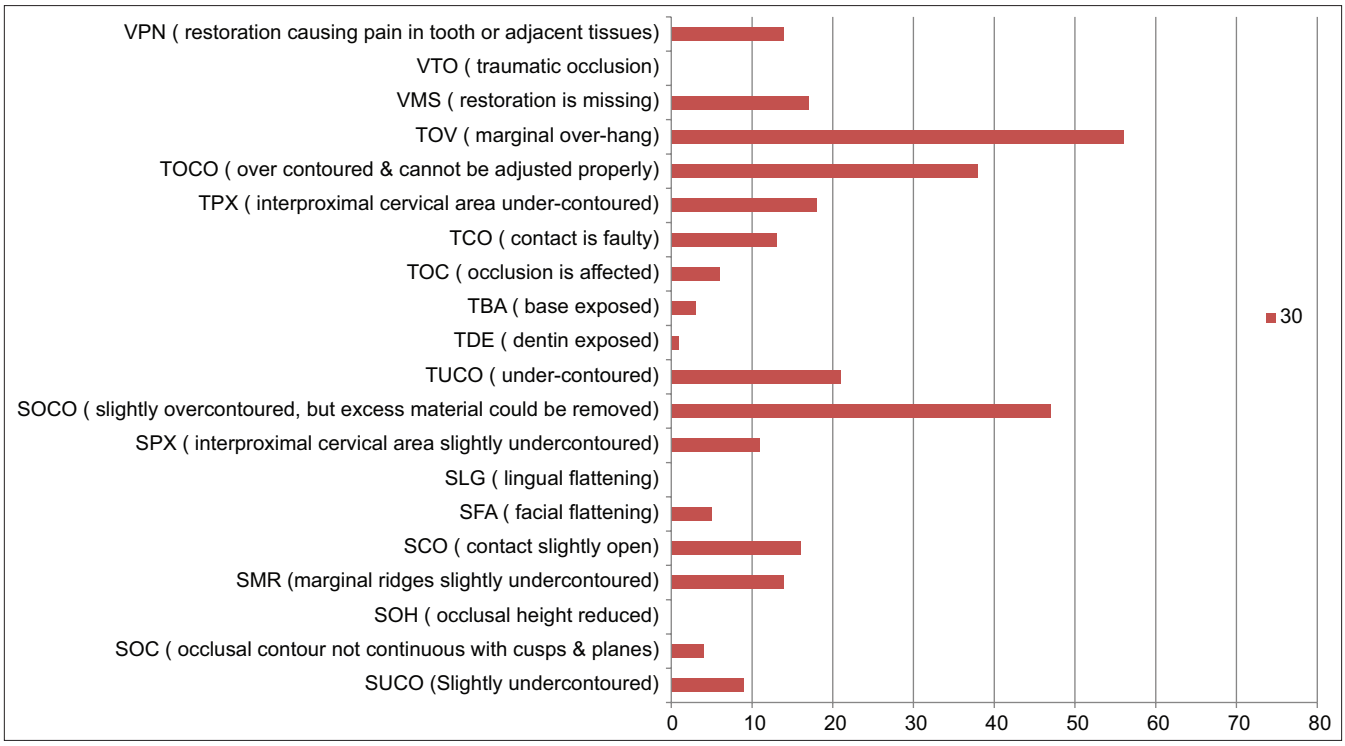

Figure 1: Anatomical form defects of the examined composite resin restoration

Nijmegen University's dental school in the Netherlands.[25] At present, Nijmegen students in the second to 5th years often place posterior composite restorations. The survival rate of resin composite restorations used in clinics however is rarely studied and is not supported by randomized, controlled, and clinical research. Despite the use of number of techniques including reciprocating pin-on-disc tribometers and tooth wear simulators, the ideal technique involves assessing long-term clinical performance.[26] Failure of a restoration can occur in a variety of ways and can be caused by serious flaws (such as fracture and loss of a significant amount of the supporting tooth or restoration) or it may result from tiny flaws such as staining, microleakage, or marginal deficiencies and after a repair has failed but does not result in tooth mass loss or restorative loss. It is unlikely that the failure would be observed by the patient unless there are symptoms or a noticeable esthetic issue.[27] Hence, the aim of study was to evaluate the quality of composite restorations placed by dentists of Jammu and Kashmir Union Territory both anteriorly and posteriorly.

MATERIALS AND METHODS

Over a 3-month period, all patients with composite resin restorations who visited the Department of Conservative Dentistry and Endodontics at the Institute of Dental Sciences Sehora, Jammu between March 2023 and May 2023 were examined. The sample size for the present study was 161 patients and a total of 300 composite restorations.

Inclusion Criteria

All composite direct anterior and posterior restorations were included in the study.

Exclusion Criteria

The following criteria were excluded from the study:

1. Composite indirect restorations
2. Amalgam and GIC restorations

With the exception of the assessment of the restoration shade, all clinical examinations were done in chair light. The restored teeth were first dried with an air-syringe before being isolated using cotton rolls. The number of teeth, G.V. Black classification of cavities, and restoration age were noted. The California Dental Association Quality Assessment System was used to assess the quality of the composite restorations.[28] The surface and color, anatomical form, and the marginal integrity of the restoration are the three main parameters taken into account in this examination. Restorations graded on a scale of excellent to completely undesirable (R, S, T, and V). The first two rates lie inside the acceptable range, whereas the latter two rates fall within the unacceptable range [Table 1]. As a result, a decision has been reached on the restoration deciding whether it should be kept or replaced either now or in the future. SPSS was used to examine the data. A 95% confidence level and a 5% level of significance were chosen

for comparing the relationship between the categorical variables using the Chi-squire test. *P*-values under 0.05 were regarded as significant.

RESULTS

A total of 300 direct composite restorations in 161 adult patients were examined. About 49% of all restorations were deemed acceptable when all three factors, including surface and color, anatomical shape, and marginal integrity were taken into account. Of all the restorations, 58% were anterior and 42% were posterior. Central incisor and molar were most frequently restored teeth in anterior and posterior group. Maxillary teeth were restored more in anteriors and premolars while mandibular teeth were restored more in molars [Table 2]. The distribution of the restorations according to cavity type (G.V. Black classification) showed that Class IV was the most frequent (30%), followed by Class III (23.3%), Class I (22.7%), and Class II (19.3%) while Class V was the least (4.7%). About 83.9% Class I restorations were found acceptable while 16.17% were non-acceptable. About 74.13% Class II restorations were acceptable while 25.9% were non-acceptable.

Table 1: Quality evaluation criteria according to the California Dental Association

Assessment	Rating scale	Criteria
Satisfactory	R "Romeo"	Excellent clinical quality or performance
	S "Sierra"	Acceptable clinical quality or performance
Non-satisfactory	T "Tango"	Clinical quality or performance, which must be repeated, replaced, repaired, or corrected to avoid future damage for the patient
	V "Victor"	Clinical quality or performance, which had to be repeated, replaced, repaired, or corrected immediately due to a damage occurring for the patient at that time

Table 2: Distribution of examined restorations

Tooth	Jaw	Frequency	Percentage
Central incisor	Upper	83	27.7
	Lower	3	1
Lateral incisor	Upper	51	17
	Lower	2	0.7
Canine	Upper	25	8.3
	Lower	10	3.3
Premolars	Upper	34	11.3
	Lower	23	7.7
Molars	Upper	30	10
	Lower	39	13
	Total	300	100

About 68.57% Class III and 68.88% Class IV restorations placed were acceptable while 31.43% and 31.12% were not accepted in Class III and Class IV. About 85.72% Class V restorations were acceptable while 14.28% were non acceptable [Table 3]. About 27.3% examined restorations were placed in <1 year from the data collection time while 4.7% were placed 4–5 years back from data collection time. Restoration placed between 4 and 5 years and above 5 years recorded highest percentage in unacceptable area in terms of anatomical form [Table 4].

DISCUSSION

Esthetic dental restorations are definitely in demand, yet flawless direct restorations have long been elusive due to the defective optical characteristics of composite resins and partly due to incorrect clinical practice. One of most frequently discovered flaw (30.8%) was color mismatch within the spectrum of tooth shade. The composite material's color should be carefully matched to the natural tooth's color. Before the teeth are subjected to any prolonged drying, the shade of the teeth should be determined because dehydrated teeth become lighter

Table 3: Association between cavity class and marginal integrity quality (Quality Evaluation Criteria according to CDA)

Cavity	Acceptable	Non-acceptable	Total
Class I	57	11	68
	83.9% "R"	16.17% "T"	100%
Class II	43	15	58
	74.13% "R, S"	25.9% "V"	100%
Class III	48	22	70
	68.57% "R, S"	31.43% "V"	100%
Class IV	62	28	90
	68.88% "R, S"	31.12% "V"	100%
Class V	12	2	14
	85.72% "R, S"	14.28% "V"	100%
Total	222	78	300
	74%	26	100%

Table 4: Association between the anatomical form quality and the age of the restoration

Age	Acceptable (%)	Non-acceptable (%)	Total
0–1 year	58 (70.73)	24 (29.27)	82
1–2 years	56 (71.80)	22 (28.20)	78
2–3 years	60 (69.78)	26 (30.22)	86
3–4 years	14 (82.35)	3 (17.65)	17
4–5 years	4 (28.67)	10 (71.43)	14
Above 5 years	8 (34.78)	15 (65.22)	23
Total	198	102	300

P=0.001

in shade as a result of a decrease in translucency.[29] The tertiary amine accelerator's chemical reaction and surface deterioration are particularly important factors in how optical characteristics of resin composites evolve over time.[30] The results of this study's surface and color analysis are different from those obtained by Brukiene *et al.* in Lithuania (2004).[31] In the present study, 42.3% of the restorations were found to be anatomically undesirable, which is comparable to the result published by Brukiene *et al.*[31] in Lithuania (47.58%) and Ijaimi *et al.*[32] (44.3%) after evaluation of the anatomical form of the restorations. Rather than causing mechanical irritation, overhanging restorations are known to induce gingivitis or cause periodontal illnesses because to the nearby buildup of bacterial plaque. These iatrogenic variables and the etiology of local periodontal diseases have been shown to be closely associated in epidemiological and clinical experimental research.[33-35] In the present study, proximal overhang was detected in 19% of the restorations [Figure 1]. There was relevant correlation found between the age of the restoration and anatomical form of the restoration. Old done restorations showed highest unacceptability. A 4–5-year-old done restoration showed unacceptability of 71.43% while 5 and above years old restorations showed unacceptability of 65.2% [Table 4]. Reduced water resistance of composites may be linked to this problem. With resin composite materials, discoloration is still a significant clinical issue, and esthetic failure is one of the leading causes of restoration replacement.[36] In the present study, Class III and Class IV and Class II represented highest unacceptable marginal integrity percentage compared to other classes. There could be a moisture control issue, or there could be a lack of knowledge and experience with Class II composite applications. Only 2% of Sudanese practitioners employ the rubber dam for root canal therapy, according to Ahmed *et al.*[37] In addition to restoration techniques, the caries risk factor is crucial to the success of the restoration. In a recent study by Opdam *et al.*, the results showed that both composite and amalgam restorations performed similarly in the high-risk patient group, with amalgam performing better on smaller restorations. The same study came to the conclusion that patients' caries risk significantly influences restoration survival.[38] Further research into the types of restorative materials utilized in relation to the caries risk factor is advised because the sample size for this study was rather small.

CONCLUSION

Based on the evaluation of the composite restorations, it was decided within the constraints of the study that 48% of the composites were of poor quality and need to be replaced. The biggest factor indicating the necessity for replacement (42.3%) was anatomic shape that was not acceptable. In this study's composite restorations color mismatch, surface roughness and overhang were the most typical flaws. Result of present study showed that 49% of total restorations were acceptable while remaining 51% were of unacceptable quality and had to be replaced.

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