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# Nanotechnology Enhanced Composites: Evaluating Longevity And Failure Modes in Posterior Restorations

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## Abstract

The duration of repairs is decided upon throughout the decision- making process. Restorative composites are no longer the focus of research into their clinical effectiveness; rather, new data reveals that other factors have a more significant role. Some of these factors may include age, the likelihood of caries and occlusal stress, one's socioeconomic status, and one's vocational traits, such as gender and clinical experience. The literature was systematically reviewed from 2010 to 2022 using databases such as PubMed, Medline, and ScienceDirect. Words like "posterior composite," "longevity of composites," and "composite failure" were consistently used. The process for choosing which articles to search is shown in the PRISMA flow diagram. Utilizing the Cochrane method to evaluate the potential for bias, the included studies were evaluated for their quality. Following extensive screening, nine research were included; most of these studies demonstrated that posterior composite restorations had a decreased failure rate and a very excellent lifetime. Composites may be effectively put for posterior cavities; nevertheless, the lifetime is mostly determined by the operator's skill and the usage of fiber post.

**Keywords:** Posterior composite, Longevity, Factors, Failure, Systematic review

## INTRODUCTION

Cosmetic restorations are in high demand, and as a result, dentists are increasingly using resin-based composite materials to repair back teeth. When it comes to aesthetic alternatives to dental amalgam, resin composite is far and by the most preferred choice. There is an increase in the frequency of replacement, failure rates, and recurrent caries with moderate to large posterior composite restorations [1- 3]. The duration of repairs is decided upon throughout the decision-making process. The therapeutic effectiveness of different composite materials used to be the main focus of study. Current restorative composites do not seem to be the problem anymore, according to more recent evidence, which implies that other factors primarily influence the clinical success of composite restorations. Factors like as age, socioeconomic status, gender, clinical history, and the likelihood of caries and occlusal stress are among them. Improving the longevity of restorations and reducing expenditures may be achieved by identifying risk signs and defining their basic causes. This will help dental practitioners make more informed restoration treatment decisions [4-6].Nowadays, less intrusive techniques are being used to treat posterior teeth using direct composite resin restorative materials (composites). composite resin systems' improved qualities, the global phase-down of dental amalgam, and the increasing desire for tooth-colored restorations among patients have all contributed to this shift. This treatment procedure is helpful since current composites have greater cosmetic features, are repairable, and may enhance the remaining tooth structure. This means that repaired teeth outperform untreated teeth in terms of prognosis and ability to endure functional loads [7].

The effectiveness of posterior composites is crucial for preserving patient confidence and gaining the faith of third- party payers such as the National Health Service (NHS) in the UK [8]. It is helpful to consider the amount of time that has passed since the last restoration or intervention on the same tooth when trying to estimate the lifespan of a dental restoration. When the same tooth requires further restoration, repair, or intervention, it is also considered a failure [9]. There are many variables that could influence the efficacy of posterior composites. The oral surgeon or dentist and the patient are both part of this. Recent worldwide studies on posterior composite education have shown that students of dentistry see composites and less invasive procedures as reliable substitutes for dental amalgam. In a similar vein, evidence suggests it may be useful for partial repair. Some dental schools focus only on teaching students how to place composites as permanent restorations in the back teeth. It has been shown that dental

students may achieve satisfactory clinical results, with an average annual failure rate of 2.8% for posterior composites [10, 11].

### *PICO Question*

P: Patients with posterior composite restorations.

I: Composite restoration
C: Restorations other than composite
O: Longevity of restoration

### *Aims of the Study*

The purpose of this systematic review was to determine the longevity of posterior composite restorations and their reasons for failure.

## MATERIALS AND METHODS

Databases including PubMed, Medline, and ScienceDirect were used to conduct a comprehensive literature analysis spanning 2010–2022. Most often used terms were "posterior composite," "composite failure," and "longevity of composites."

**(Table 1)**. The procedure for choosing the articles to be searched was shown by a PRISMA flowchart **(Figure 1)**.

**Table 1.** Inclusion and exclusion criteria for the studies

| Inclusion criteria | Exclusion criteria |
|---|---|
| Case-control and randomized control studies | Meta-analyses, narrative reviews, systematic reviews, or expert opinions |
| Published between 2010 and 2022 | outside of the time frame indicated |
| Studies including posterior composite restorations | studies including non-composite restorations |
| English language of publication | a language besides English |

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In vivo (humans) In vitro

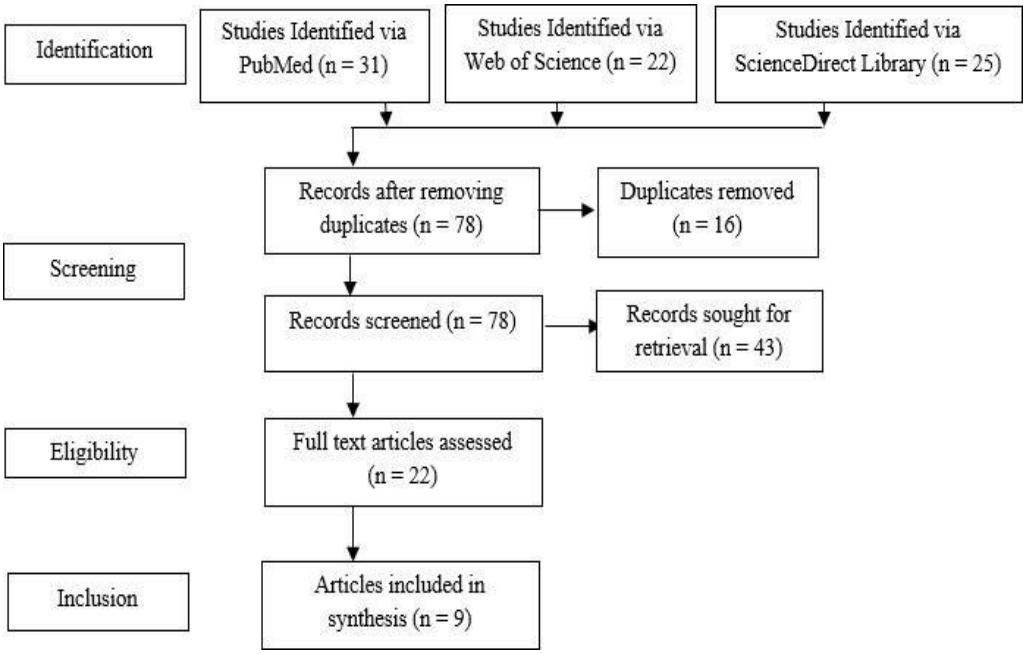


**Figure 1.** PRISMA Flow Diagram

### *Risk of Bias Assessment*

The Cochrane risk of bias assessment method was used to assess the quality of the studies included **(Table 2)**.

**Table 2.** Summary of Cochrane Risk of Bias Assessment

| Study | Selection Bias/Appropriate control selection/baseline characteristics similarity | Selection bias in randomization | Selection bias in allocation concealment | Performance-related bias in blinding | Reporting bias/Selective reporting of outcomes | Detection bias Blinding outcome assessors | Accounting for confounding bias |
|---|---|---|---|---|---|---|---|
| [12] | + | + | + | + | + | + | - |
| [13] | + | + | + | + | + | + | - |
| [14] | + | + | + | + | + | _ | + |
| [15] | + | + | + | + | + | + | - |
| [16] | + | + | + | + | - | + | + |
| [17] | + | + | + | - | + | + | + |
| [18] | + | + | + | + | + | + | + |
| [19] | + | - | + | + | + | + | - |
| [20] | + | + | + | + | + | - | + |

## RESULTS AND DISCUSSION

Two percent of restorations using the base material and one percent without the foundation material had postoperative sensitivity,

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according to prospective follow-up study by Pallesen et al. (2013) [12]. Of the 456 restorations, 125 were repairs and the remaining 56 were replacements. After eight years, the cumulative survival rate was 84.3%, with a failure rate of 2% each year, as shown by Kaplan-Meier analysis. More restorations per patient, patients who had a base material put, patients who were younger, and patients who had RC placed on molars, in cavities with multiple surfaces, or lower jaw teeth all had much greater failure rates. The process of replacing or repairing the resin composite restorations was greatly affected by the patient's age, the operator's age, the form of the jaw, the kind of tooth, and the size of the cavity. Adolescents and younger patients treated at Public Dental Health clinics for RC restorations showed yearly failure rates similar to adult patients in randomized controlled trials, indicating excellent durability.

Among patients seeking treatment in a primary care dental outreach setting over an 11-year period, Wong et al. (2021) sought to determine the dental, patient, and operator characteristics that affected the survival rate (time to re-intervention) of composite restorations in posterior teeth [13]. Dental treatment, patient demographics, and service delivery details gleaned from electronic health records pertaining to individual patients' primary dental care. During that time, 1086 people had posterior composites implanted. There were 3,194 completed repairs and 308 that required more work over the 11-year study period. Five years, 10.2 years, and one year after the restoration was installed, the average yearly failure rate was 16.78%, 16.78%, and 18.74%, respectively.

A logit regression analysis revealed that compared to the fifth quintile, which had the lowest poverty level, the first two quintiles with the highest rates of poverty were 49.2% ($p = 0.022$) and 53.2% ($p = 0.031$) less likely to get a re-intervention. Kubo et al. (2011) investigated the variables linked to the durability of resin composite restorations implanted by 24 dentists in 97 patients (mean age 58) at Nagasaki University Hospital from 1995 to 2005 [14]. Over the course of 11 years, all patients were overseen by the primary investigator (SK), who ensured that the majority of them had routine checkups. In terms of ten-year survival rates, there was a statistically significant difference between the SK group (84.2% vs. 71.8% for the other groups). Survival time was unaffected by gender or age at placement, although retreatment risk was. Traditional two-step etch-and-rinse and two-step self-etch adhesives showed no significant difference in survival rates when tested with and without previous enamel etching. The variety of cavities had a far greater influence on it than the tooth type, which was insignificant.

The major purpose of the research by Pummer et al. (2020) [15] was to determine the cumulative survival rates of class II resin-based composite and compomer restorations in primary molars throughout a 5-year observation period. An additional objective was to determine the effect of anesthetic type and restoration site on these survival rates. Every patient who was six years old or older when their restoration was placed was given one at random. Final Product Out of the 260 repairs, about 43% used

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resin-based composites and 57% used composites overall. Cumulative survival rates of restorations produced with polymer and resin-based composite did not vary significantly after five years. A better possibility of surviving was present for restorations placed under general anesthesia or N2O inhalation sedation. Compared to those implanted mesially, composite restorations placed distally had significantly poorer survival rates ($p = 0.003$).

Two separate analyses were conducted by Montagner et al. (2018) for the investigation. The first analysis involved a clinical examination of 133 restorations from 30 patients to determine clinical features and failure type distribution. The second analysis used 100 patients' dental electronic records to determine factors affecting survival [16]. The average age of the group was 55, with patients ranging in age from 21 to 76. This research looked back at the frequency, causes, and variables that affected how long it took for undergraduates' composite restorations to last after they were implanted. There was a significant difference in the AFR between anterior and posterior restorations (p=0.005). Income (p0.001), caries activity (p0.001), caries risk (p0.001), and occlusal risk (p0.001) were among the factors that affected the efficacy of restorations. The AFR of restorations placed by first-year dental students after eight years was satisfactory, taking after account patient risk factors and tooth location within the dental arch (restorations placed anteriorly failed more often than those placed posteriorly). Undergraduate restorations had a respectable AFR after eight years, although the AFR varied according on the patient's risk factors and the tooth's location in the arch (back restorations failed more often than front ones). A research was conducted by Laegreid et al. (2012) about the parameters linked to restoration extent and their performance [17]. Patients' ages varied from 25 to 76, with a mean of 43.9. The clinical scores of all clinical criteria changed between the baseline and the 1- and 3-year recall. With a three-year survival rate of 87.7 percent and an average yearly failure rate of 4.2 percent, nine restorations were determined to be insufficiently functioning. There was no significant relationship between restoration survival and age, caries risk, restoration extension, or the presence of cervical enamel, with the exception of gender ($p = 0.022$). Clinical evaluations conducted three years following placement of extensive direct posterior composite restorations indicated satisfactory results. Restoration failure was much more common in men compared to females.After 36 months, the clinical efficacy of a highly filled flowable composite and a typical paste-type composite in direct posterior restorations was evaluated in a randomized controlled trial by Kitasako et al. After 36 months, a total of 42 restorations were examined in 21 individuals. Highly filled flowable restorations did not vary significantly from conventional restorations at 36 months according to any of the assessment criteria ($p > 0.05$). Not a single indication of secondary tooth decay. After 36 months of use in posterior restorations, the highly filled flowable composite was shown to be therapeutically as beneficial as the traditional paste composite. The clinical success rates of the two bonding procedures for posterior composite resin restorations, etch-and-rinse (ER) and self-etch (SE), were examined in this randomized controlled experiment by Loguercio et al. (2019) [19]. The duration of both approaches was 36 months. No one receiving orthodontic treatment at the time of the study; all participants were adults (over the age of 18) with a full set of back teeth in occlusion. Seventy-two individuals ($n = 236$) with back tooth cavities that were at least three millimeters deep were divided into four groups at random. Tetric N-Bind ER and Tetric N-Bond SE were used to bond the repairs. To inject the composite resin Tetric N-Ceram Bulk-Fill, IF or BF were used. Two certified evaluators checked the restorations at baseline, twelve, twenty-four, and thirty-six months after installation using FDI standards. With a p-value of just 0.05, the statistical analysis was carried out using the Wilcoxon Signed Rank test. Minor fractures occurred in 14 of the 36 restorations, adaptations were marginal in 21, and color mismatches occurred in 33 ($p > 0.05$). At 36 months, there was a significant difference between ER and SE in marginal darkening among 33 restorations (3 for ER-IF and 3 for ER-BF; p 0.05). Scotti et al. (2015) looked at the results of endodontic treatments and compared the survival rates of teeth that were fixed with fiber posts to those that were repaired with direct resin composite without cusp covering. A more favorable outcome was anticipated for direct restorations that included fiber posts as opposed to those that did not. Nevertheless, further investigation proved that this theory was flawed. From 2008 through 2011, the participants were seen by the University of Turin's Department of Cariology and Operative Dentistry. A total of 247 patients who underwent root canal therapy and obtained 376 posterior teeth restored with direct resin composite were called for a follow-up appointment. The average age of the 128 patients in Group A was 46.2%; there were 68 men and 60 women. The 178 teeth, consisting of 90 molars and 88 premolars, were evaluated after being followed for an average of 34.44 months. Group B's 119 patients were 48.7 years old on average. The number of men in this group was 54, while there were 65 women. After an average of 35 months of monitoring, the status of 198 teeth—92 premolars and 106 molars—was assessed. Due to improved marginal discolouration, marginal integrity, and restoration integrity, direct restorations using fiber posts had a significantly higher success rate (95.12% success) compared to those without (80% success). Direct post-endodontic restorations with fiber posts demonstrated superior functionality compared to restorations devoid of posts after three years of chewing. As a result, we accept the null hypothesis (Table 3).

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**Table 3.** Summary of the included studies.

| Author's name | Participants | Age (years) | Observation period (years) | Objective | Results |
|---|---|---|---|---|---|
| Pallesen *et al*. (2013) [12] | 2881 | 13.7 mean age | 8 years | The goals of this research were (1) to determine how long patients' posterior resin composites (RC) last in their permanent teeth, and (2) to examine the durability of composite restorations in the back teeth in terms of time to re-intervention. | Kaplan-Meier estimates that the yearly failure rate is 2% based on the cumulative longevity rate of 84.3% after 8 years. |
| Wong *et al*. (2021) [13] | 1086 | 21.7 | 11-year | | After one year, 16.78% of restorations had failed, after five years, 18.74% had failed, and after 10 years, the annual failure rate for all restorations was 5.73%. |
| Kubo *et al*. (2011) [14] | 97 | 58 mean ages | 11 years | The goal of this study is to delve into the factors that affect the durability of resin composite restorations. | Ten-year longevity of 84.2% was significantly higher than the rest at 71.8%. |
| Pummer *et al*. (2020) [15] | 260 | 6 years | 5 years | The major purpose of this study was to evaluate the long-term success of resin-based composite restorations in primary molars, classified as class II. | Survival rates for distal-occlusal composite restorations were significantly lower than those for mesial-occlusal restorations ($p = 0.003$). |
| Montagner *et al*. (2018) [16] | 130 | 55 mean age | 8 | This retrospective research aimed to examine the AFR, failure causes, and predictors of composite restoration longevity both in the rear and anterior regions of the mouth. | Patient risk variables and tooth location in the arch were associated with an acceptable AFR for restorations put by undergraduate learners after 8 years, with anterior restorations failing more often than posterior restorations. |
| Laegreid *et al*. (2012) [17] | 42 | 25 to 76 years | 1 to 3 years | The purpose of this study was to evaluate the clinical efficacy of large-scale direct composite restorations in molars. | Patients' age, caries risk, restoration length, and the existence of cervical enamel were all considered, however only gender ($p = 0.022$) was shown to significantly affect restoration survival. |
| Kitasako *et al*. (2016) [18] | 32 | 43.9 years | 36 | To compare the clinical efficacy of a highly filled flowable composite to that of a standard paste-type composite for direct posterior restorations, this randomized controlled trial was conducted. | There was no statistically significant difference between strongly filled flowable and conventional restorations across all assessment criteria ($p > 0.05$). |
| Loguercio *et al*. (2019) [19] | 72 | At least 12 and 18 | 36 months | This study aimed to assess the clinical efficacy of the layering strategy to the conventional way when restoring posterior teeth with composite resin. | There was a statistically significant difference between ER and SE in the amount of marginal discoloration present after 36 months in 33 restorations ($p = 0.05$). |
| Scotti *et al*. (2015) [20] | 247 | 46.2 mean age | 35 months | The purpose of this study is to evaluate the durability of direct resin composite restorations on endodontically treated teeth. | Direct restorations with fiber posts were statistically significantly more successful (95.12% success) than those without fiber posts (80% success) due to decreased marginal discoloration, improved marginal integrity, and increased restoration quality. |

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Even though RC was the material of choice for front teeth in the 1990s, amalgam was still utilized for back tooth replacements. In the late 1990s, a dramatic change in material choice started in Scandinavia, following recommendations from several countries to move away from amalgam and toward alternative restorative materials. As a result, more back teeth were given RC treatments. The RC—restorations' survival time was determined by estimating all data. fter eight years, 84% of the participants had survived, which translates to a failure rate of 2% each year. This provides a helpful comparison to previous results showing failure rates in randomized long-term longitudinal trials ranging from 0.5 to 3 percent every year. According to a review by Downer et al., the average lifespan of common restorations is exaggerated in cross-sectional studies. A cross-sectional research focused on restoring previously replaced teeth, and two studies indicated a modest correlation between the survival rates and predicted failure rates. The lifetime estimates were already dubious due to the poor recording response rates of general practitioners in these studies, and the fact that the ages of the restorations were based on just a fraction of the restorations examined (25–79%) [12]. The success or failure of the restorations in this study was determined by evaluations completed by the guiding clinical professors and their students. This represents the actual clinical setting and should be taken into account, even if it is difficult to eliminate observer bias in practice-based research. It should be mentioned that the individuals who implanted the restorations were different from the clinical educators who assessed them. Medical professionals may find this bonus useful in deciding if reintervention is required [21]. Restorative longevity is largely attributable to the operator's skill, which has been postulated and is widely acknowledged. Still, no clinical studies have lent credence to this idea. The ten-year survival rate for resin composite restorations was estimated to be 84.2%, which is greater than the 71.8% projected by the other 23 dentists. The greatest notable variation across operator groups was seen in Class II and Class V restorations, which are notoriously more challenging. When compared to the other set of dentists, our colleagues were able to restore 80% of the restorations that failed [22]. Results from retrospective studies do not match up with the current research on longevity; however, one study did find an increase in survival rates. In contrast to the present study, Blum et al. (2018) found that resin-based composites had an 88% cumulative survival rate after one year [23]. Our findings of 3.1 years of 50% survival for resin-based composites are at odds with the 2.9 years obtained in the study of Zahdan et al. (2018) [24]. Class I and II restorations of posterior primary teeth using resin-modified glass ionomer cement, resin-based composites, and classic glass ionomers were shown to have significantly different lifetimes in another retrospective analysis that evaluated the three materials. Comparatively, 62% of patients treated with resin-based composites survived four years, compared to 46% overall [23-25]. Restorations made by dental students don't last as long as those made by experienced dentists. The fact that the restoration's effectiveness depends on the operator's prior expertise may account for this finding. Undergraduate students' experience (as evaluated by years of study/practice) was shown to have less of an effect on restoration success than operator competence (rather than experience). Nevertheless, if the examiner isn't trained to perform repairs, the operator's restoration skills could not matter. While choosing a replacement, ordinary dentists often use factors that go counter to what science has shown [12, 26, 27]. The results of the current investigation indicate that the repairs had a 4.2% AFR. Patients at high risk of caries had an AFR of 3% with composite restorations, whereas those at minimal risk of cavities had an AFR of 0.88%, according to another research that compared the 12-year durability of significant composite restorations with amalgam restorations. The majority of the composite tooth restorations (60%) had four or five Class II surfaces, whereas a small percentage had only three. The majority of the restorations in this investigation had four or five surfaces, whereas just 8% had only two [28]. The durability of the restoration is directly proportional to the strength of the adhesive connection between the various components. With more than 97% of the restorations still in place after eight years of clinical service, the bonding agent used in this investigation demonstrated an impressive success rate. The study found that the border staining was minor and readily repaired with further finishing and polishing [29, 30].

A reduced number of restorations with fractures or failures at interaction sites or in the restoration margins demonstrated that the most common material used in the bulk fill approach had outstanding mechanical qualities after 36 months of clinical testing. These alterations were not clinically noteworthy since the absolute risk of fracture was approximately 5.4% to 7.2% [31].

Even though the tooth was salvageable in every case, 2.44% of restorations in this study exhibited coronal fractures. The results show that fiber posts may reduce the occurrence of coronal fractures and, when fractures do occur, can promote a restorable pattern. Consistent with these results, CAMPOS et al. (2012) demonstrated in vitro that post-placement was significantly associated with better fracture patterns. Direct restorations without posts caused most fractures to be irreparable, but restorations with connected fiber posts increased the prevalence of recoverable fractures in endodontically treated premolars with MOD cavities, according to another in vitro study [8].

## CONCLUSION

It was determined that composites may be effectively put for posterior cavities with an overall failure rate ranging from 2% to 6%. This is a tolerable range. When it comes to lifespan, the two most important aspects are the operator's level of expertise and the use of fiber posts.

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## REFERENCES

1. 1. An update on posterior composite restoration: variables impacting shape and function (Bohaty BS, Ye Q, Misra A, Sene F, Spencer P.). Clinical Periodontal Research (2013): 33–42. Two, Raj V, Macedo GV, Ritter AV, and Swift Jr. EJ made it. Durability of composite restorations placed on the back of the mouth. The author cites a 2007 article in the Journal of Esthetics and Restorative Dentistry(19(1):3-5).. The authors are Demarco FF, Corrêa MB, Cenci MS, Moraes RR, and Opdam NJ. Posterior composite repair longevity: it's about more than just the materials. The article is published in Dent Mater and has a page number of 87–101. 4. Opdam NJ, Demarco FF, Cenci MS, Collares K, Correa MB, Van de Sande FH, and others. Reevaluating patient risk variables for restoration survival: a comprehensive literature review. Dentistry operations, 2016;41(S7):S7-26. 5. The authors of the study include Demarco FF, Collares K, Coelho-de-Souza FH, Correa MB, Cenci MS, Moraes RR, and others. 10. A thorough study on the long-term survival and causes for failure of anterior composite restorations. (Dental Mater. 2015;31(10):1214-24). 6. The authors of the article are Velloso SR, Lemos CA, de Moraes SL, Vasconcelos BC, Pellizzer EP, and Melo Monteiro GQ from Egito. Restoring posterior teeth with bulk-fill vs traditional resin composite: a meta-analysis and systematic assessment of clinical outcomes. Journal of Clinical Oral Investigations 2019;23:221-33. Radford DR, Gallagher JE, and Wannonyi KL. 7. How a primary care service's decision to include dental team training affected patients' ability to get and make use of dental treatment. Article published in 2013 in the journal Public Health, volume 127, issue 11, pages 1028–1033. Gonzalez CC, Campos EA, and Michel MD. Posts made of personalized fiber glass. Fatigue and fracture resistance. I am Journal of Dental Research. 2012;25(1). 9. The authors are Palotie, Eronen, Vehkalahti, and Vehkalahti MM. Two- and three-surface restorations in the back teeth of patients aged 25 to 30 who visited the Public Dental Service were observed for 13 years to see how long they lasted. Article published in the Journal of Dental Research in 2017; volume 62, pages 13–7. 10. Laske M, Opdam NJ, Bronkhorst EM, Braspenning JC, Huysmans MC. The durability of fixed dental restorations in the Netherlands. Study arising from a practice-based research network providing descriptive data. Journal of Dental Research. 2016;46:12-7. This is the eleventh work by Naghipur, Pesun, Nowakowski, and Kim. Two-surface amalgam and composite resin premolar restorations put by dental students had a twelve-year survival rate. In 2016 the Journal of Prosthet Dent published an article with the DOI: 116(3):336-9. 12, Pallesen U, van Dijken JW, Halken J, Hallonsten AL, and Höigaard R. Proposed 8-year follow-up of permanent teeth with posterior resin composite restorations in the Public Dental Health Service: their longevity. In the Journal of Dental Research, 2013;41(4):297-306. 13. Wanyonyi K, Sparrius M, Louca C, Wong C, Blum IR. An eleven-year follow-up clinical investigation on the longevity of posterior composite restorations in an outpatient primary care dental clinic. Dental Journal. 2021; 106: 103586. Authors: 14. Kubo, Kawasaki, and Hayashi. Determinants of how long resin composite repairs last. Dentistry Journal, 2011;30(3):374–383. 15. Hiller KA, Schmalz G, Buchalla W, Nikolić M, Cieplik F, and Pumper A. Composite and composite restorations put in the back of children's mouths using various anesthetics: a retrospective 5-year research on their durability. Current Opinion in Clinical Oral Investigations. 2020;24:141-50. AF Montagner, FH Sande, C. Müller, MS Cenci, and AH Susin. The 8-year results of anterior/posterior composites: survival, failure causes, and clinical properties. This article is from the Braz Dent Journal, volume 29, pages 547–554. 18. Laegreid T, Johansson AK, Gjerdet NR. Using composites to restore many teeth: a three-year clinical study. The full text of the article may be found in the 2012 issue of Acta Odontol Scand (70(4):344-52).Y. Kitasako, A. Sadr, M. Burrow, and J. Tagami: 18. A flowable composite that is highly filled was evaluated clinically for direct posterior restorations for 36 months. "Aust Dent J" 2016;61(3):366-73. 19. The publication by Loguercio AD, Rezende M, Gutierrez MF, Costa TF, Armas-Vega A, and Reis A. Randomized study of resin composite restorations filled with bulk at the posterior location and followed for 36 months. Dentistry (2019, 85: 93-102). This is the twenty-first paper by Scotti, Eruli, Comba, Paolino, Alovisi, Pasqualini, and colleagues. A retrospective clinical investigation on the longevity of class 2 direct restorations in teeth that have had their roots filled. Journal of the American Dental Association, 2015, 43(5), 499-505. FF Demarco, K. Collares, MB Correa, MS Cenci, RR Moraes, and NJ Opdam were named in the study. How long will my composite repairs last? Why aren't they succeeding? Sullivan KM, Lynch CD, Blum IR, Brunton PA, Wilson NH; Braz Oral Res. 2017;31. 22. Is the existing curriculum for teaching posterior resin composites at dental schools in the United Kingdom and Ireland in line with what is expected in clinical practice? Özcan M. and Blum IR. (2018) Br Dent J. 224(12): 967–972. Dental restoration: potential and constraints. 24-Zahdan BA, Szabo A, Gonzalez CD, Okunseri EM, Okunseri CE. Curr Oral Health Rep. 2018;5(4):264-9. Stainless steel crown and multi-surface composite restoration survival rates used by

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dental students in a pediatric clinic. This sentence is a citation for an article published in the Journal of Clinical Pediatric Dentistry in 2018. The authors of the article are Pinto GD, Oliveira LJ, Romano AR, Schardosim LR, Bonow ML, Pacce M, and others. Findings from a pediatric dentistry practice about the longevity of back restorations in baby teeth. Journal of Dental Research. 2014;42(10):1248–54. 26. Van de Sande FH, Opdam NJ, Da Cenci MS, Rosa Rodolpho PA, Correa MB, and Demarco FF. Impact of patient-specific risk variables on the chance of posterior composites' survival. According to a study published in 2013 in the Journal of Dental Research, the authors include Baldissera RA, Corrêa MB, Schuch HS, Collares K, Nascimento GG, Jardim PS, and others. Can one set of restorative composites be used for both front and back teeth? Journal of Dental Research, 2013;41(11):1027–35. 8. With contributions from Opdam NJ, Bronkhorst EM, Loomans BA, and Huysmans MC. Composite restorations outlive amalgam ones after 12 years. Journal of Dental Research, 2010;89(10):1063-7. 29. Watts, DC, El-Safty, S., and Silikas, N. Resin composites used in dental restorations that are intended for use as bulk fill might creep. Scientific Reports in Dental Materials, 2012, 28, 928–935. 30. With contributions from Peumans, De Munck, Van Landuyt, and Van Meerbeek. Two-step self-etch adhesive in non-carious cervical lesions: a thirteen-year randomized controlled clinical study. The article is published in Dent Mater and has the following keywords: 31. 15. Ilie N. and Bucuta S. The micro-mechanical characteristics and light transmission of bulk fill composites in comparison to traditional resin-based composites. The published version of this article is "Clinical Oral Investigation" (volume 18, pages 1989–2000) from 2014.