

SURVEY OF COMPOSITE RESTORATIONS IN KOREA

서울대학교 치과대학 치과보존학교실

엄정문 · 이종혁

Abstract

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Chung-Moon um, Jong-Hyeok Lee

Dept. of Conservative Dentistry, College of Dentistry, Seoul National University

A survey has been made of the reasons for the replacement of 318 resin restorations in selected dental practices in Korea. Secondary caries and discolorations were the main reason for replacement of composite restorations, followed by discoloration, fracture of restoration, loss of anatomic form and pain sensitivity. The estimated 50% survival time for the surveyed restorations was 3.3 years.

I. Introduction

The treatment of dental caries has traditionally involved the removal of diseased tissue and the replacement of these by restorative materials. Despite the improvement of oral hygiene and the control of carious lesions by non-operative treatment, placement, replacement, and re-replacement of restorations still constitute the major worked load in

general practice. It was found that about 60% of restorative practice in the United Kingdom may be found to comprise the replacement of existing restoration¹⁾. A major object of restorative dentistry has been the discovery of a long lasting esthetic anterior restorative material. During the past 30 years, several improvements have been made in the bis-GMA composite resin system, and newer resins have been made. Many changes have been

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made in particles involving size, shape, and composition.

Tooth-colored resin materials are being used with increasing frequency in restorative dental treatment. The development of restorative treatment techniques and the improved quality of materials should increase the longevity of restorations and justified the requests for esthetic restorations.

In general, composite resin is chosen as esthetic restorations because of its easy manipulation, adhesion to enamel and dentin, superior finishing, and high esthetic quality. Moreover, the improvement of material properties enables composite restoration to be used in stress bearing area in the posterior region²⁾.

Longevity of restorations is a good measure for the success of restorative dentistry: long-lasting restorations proves good quality. The life expectancy of restoration depends on a number of various factors: patients' attitude towards oral hygiene, the ability of the operators, the correct use of selected materials, the operator's ethics and the thorough analysis of the reasons for the failure of restorations. Most of the criteria for replacement of restorations are subjective, and marked variations in

diagnoses could be found between clinicians³⁻⁸⁾.

The most common reasons for the failure composite restorations are secondary caries, fracture of teeth or restorative materials, poor margins, esthetic problems such as body or margin discoloration and loss of restoration contour. From a clinical point of view, the outer lesion of secondary caries appears to be the most important and its diagnosis provides a good basis for treatment planning⁹⁾.

This study focused on the operative treatment performed in general dental practice in Korea with emphasis on replacements, types of restorations, and the analysis of failures of composite restorations.

II. Materials and Methods

Clinicians who worked in the Department of Conservative Dentistry, Seoul National University Hospital(SNUH) were asked to record all composite restorations to be replaced.

The age of the failed restoration was noted if this information was available from the patients record. The reasons for replacement of composite restorations are recorded as shown in Table 1. Types of composite restorations were recorded ac-

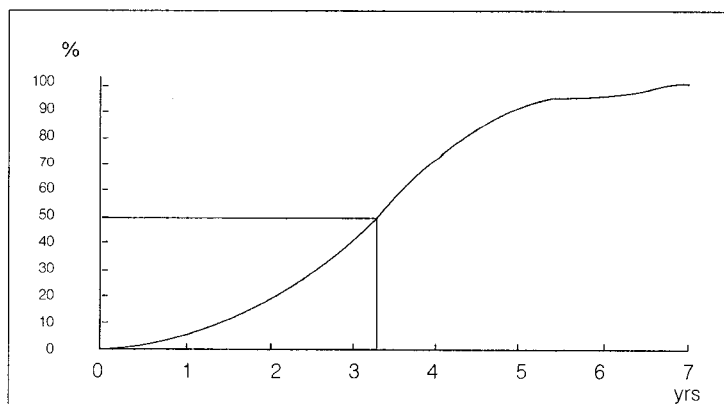


Fig. 1 Accumulated percentage distribution of the age of failed composite restorations

Table 5. Median longevity of failed composite restorations in permanent teeth in different countries expressed in years

Country	Sweden	Denmark ^a	Denmark ^b	Italy	Korea	Korea [*]
Years	6	6	6	3	2	3

(* Present survey)

IV. Discussion

According to this survey, secondary caries account for 25% of the reasons for the failure of composite restorations, whereas Mjör and Toffenetti¹⁰ reported 44% and Mjör and Um¹¹ 29%. These variations can be attributed to the differences in survey subjects, methods, regions, and the subjective criteria of the clinicians involved.

Discoloration accounted for 24% of the failure of composite restorations. This ratio is slightly higher than that reported by Mjör¹², Qvist et al.¹³ and Mjör and Toffenetti¹⁰. Discoloration is a subjective criterion and technique dependent¹⁴. The higher percentage of discoloration is probably due to a demand for improved esthetics, especially the increased interest in esthetics by women.

Compared to other studies, this research shows higher percentage of restorative materials' fracture as one of the reasons for the failure. This result can be due to the increased use of composite restorations for different type of restorations, since the improved quality of materials allows the placement of large restorations. Most of the changes that occurred in the restorations happened within an early time period(3 years), and the major occurrences were with color both as a shift in color per se as well as stain. For the most part, the color shift in the body of the material was small.

What was more apparent was the surface stain, which was probably due to the larger filler particles and the resultant roughness. It was found that the stain at the margins occurred predominantly during the first 3 years and that there was only an 11% increase during the next years¹⁵. True failures,

which were directly related to the restorative materials, accounted for 30.4% of the composite restorations. For the composites there were significant associations found between the failures and surface roughness, marginal fracture, and color mismatch. Surface staining and marginal staining were not associated significantly with any of the three different failure modes. Many restorations assessed as being unsatisfactory continued to function for a further 2.5 to 3.5 years on average before being replaced, often for unrelated reasons¹⁶. Newer material are more brittle than those used previously. It is very difficult to set up precise criteria for re-restorations because opinions of the researchers, despite standardization of subjects, can affect their clinical judgement. Statistically significant differences were found among the dentists as to the reasons for posterior restoration replacement, replacement materials used, and increase in size of the replacement restorations. Differences were attributed to individual practice philosophies, demonstrating that clinical information was not the sole determining factor as to type.

Reports on pain/sensitivity following the use of composite restorations have been published¹⁷⁻¹⁹. These differ from each surveys. Differences in materials and techniques may explain this difference.

There are many studies on the longevity of composite restorations²⁰⁻³⁰. Many variables in design, criteria, types of restorations, the age of patients, types of dentition, and national differences are reflected in the results of each study. Bentley and Drake²⁰(1986) noticed that 55.9% of composite restorations survived after 10 years and

ording to Blacks classifications.

III. Results

The survey forms were returned from 12 clinicians in the Department of Conservative Dentistry,

Table 1. Reasons for replacement of composite restorations(n=318) expressed as percentages

Reason	Percentage(%)
Secondary caries	25
Discoloration	25
-Margin	-17
-Body	-8
Loss of anatomic form	11
Fracture of restoration	21
-Bulk	-12
-Margin	-9
Pain/Sensitivity	11
Other reasons	8

Seoul National University Hospital(SNUH). The reasons for replacement of 318 restorations were recorded. Secondary caries, discoloration and fractures were the most common reasons for failure, followed by loss of anatomic form and pain/sensitivity(Table 1).

The median age of composite restorations was 3.3 years(Fig. 1). The age of failed restorations did not seem to be dependent on the reasons for failure. The types of composite restorations replaced are given in Table 2. Few Class I and Class II restorations had been placed.

Table 2. The percentage distribution of composite restorations according to type

Class	%
I	9
II	4
III	29
IV	7
V	51

Table 3. Reasons for replacement of composite restorations in permanent teeth of adults in different countries expressed as percentages

Country	Sweden	Denmark ^a	Denmark ^b	Italy	Korea	Korea [*]
Failure						
Secondary caries	20	38	32	44	29	25
Discoloration	19	14	20	21	13	24
Loss of anatomic form	40	20	15	8	16	14
Fracture of restoration	-	3	8	14	16	17
Others	21	27	25	14	27	18

(* Present survey)

Table 4. Failure due to discoloration of composite restorations in adults in different clinical cross sectional surveys expressed as percentages

Country	Sweden	Denmark ^a	Denmark ^b	Italy	Korea	Korea [*]
Discoloration						
Body	12	10	13	12	9	17
Margin	7	4	7	9	4	7

(* Present survey)

Paterson²¹⁾(1984) reported that the average longevity of composite restorations 4-5 years. According to this survey, the longevity of composite restorations was about 3.3 years in Korea. This result is much shorter than 8 years in Sweden¹²⁾(Mjör, 1981) and 6 years in Denmark^{13,23)}(Qvist et al. 1986, 1990), and 6 years in Sweden²⁾(Mjör, 1997), but similar to 3.3 years of Italy¹⁰⁾(Toffenetti et al, 1992) and longer than 2 years reported by Mjör and UM¹¹⁾(1993) in Korea. Compared to Qvist et al.'s study^{13,23)}, this research presents much higher ratio of class V cavities than class III.

The results from this study can be attributed to poor knowledge about proper tooth brushing despite the increase of concerns for oral hygiene. Composite restorations have various problems because of characteristics of the material itself: contraction during polymerization, expansion caused by the absorption of moisture, fracture by lower strength than metallic restorations, marginal leakage, and discoloration. Besides, diverse factors such as the condition of polishing, patients' diet patterns, and the state of oral responsible for 47%, dentists for 30%, and materials used for 23% of restoration failures⁷⁾. The survival of restorations placed in patients aged 60 or more was less favorable than for younger patients²⁰⁾. During early aging the composited generally became darker, more chromatic, and more opaque²⁷⁾. Conventional auto-cured composite resin restorations placed with acid-etching of the enamel, and with bonding resin have shown improvements in their marginal adaptation and discoloration when compared to restorations placed without enamel etching in several two-year studies(Bozell & Charbeneau²⁸⁾, 1979; Oram & Lyders²⁹⁾, 1981). However, the use of enamel acid-etching alone did not eliminate longer-term marginal discrepancies(Christensen & Christensen³⁰⁾, 1982; van Dijken, Hörstedt & Meurman³¹⁾, 1985; van Dijken³²⁾, 1986; Crumpler & others³³⁾, 1988), marginal discoloration(van Dijken³²⁾, 1986; Crumpler & others³³⁾, 1988), caries and the loss of restoration retention,

even with the later repeated use of low-viscosity intermediate bonding resins(van Dijken³²⁾, 1986). Powers et al.²⁷⁾(1980) and Ameye et al.³⁷⁾(1981) claimed that microfilled composite demonstrates better color stability than macrofilled composite. Satou et al.³⁸⁾(1989) reported that light cured composite resin has higher resistance to discoloration than chemically cured composite resin.

Willems et al.³⁹⁾(1993) studies on posterior composite resin revealed that superior quality of ultra-fine compact filled composite resin. Moreover, Kim and Um⁴⁰⁾(1996) noticed differences between commonly used shade guide of composite resin kit and the color of composite resin after polymerization.

Therefore, light cured microfilled composite resin should be used for esthetic restorations in anterior teeth after careful recognition of the actual shade following polymerization. The new restoratives will be developed in response to early detection of caries, resulting in smaller lesions, and smaller restored surfaces exposed to the oral cavity. There will be less marginal length, less vulnerability to wear, and less microleakage. The materials of the 21st century will be less technique sensitive in the hands of the clinician and therefore will result in fewer clinical failures. The clinical behavior of these 21st-century materials should provide longer wearing, nonleaking, esthetic restorations that are easily manipulated and placed by clinicians at an economical cost to dental patients⁴¹⁾.

Since this cross sectional survey evaluates the longevity of composite resin in selected practices, it is difficult to assess how representative the present results are for general practices in Korea. For more accurate results, longitudinal study with regular follow-up examination and objective standardized criteria should be established.

V. Conclusion

The increased use of composite restorations requires proper plans for treatment, the accurate

preparation of cavities, the choice of the right treatment, the accurate preparation of cavities, the choice of the right materials for the clinical conditions, correct manipulation, the patients' augmented concerns for oral hygiene and the ability to maintain dental health, and continuous care and follow-up of restorations. The longevity of composite restorations is measured to 3.3 years as a result of surveying patients who had come to the Department of Conservative Dentistry, Seoul National University Hospital. Secondary caries was the most common reason for the failure of restorations.

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