

## **Repair and Replacement Perception of Dental Restorations**

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*Abstract.* Replacement of dental restorations still plays a major role in daily dental practice. However, replacing restorations has the disadvantages of being time consuming; can lead to unnecessary removal of tooth structure. Repair of restorations on the other hand is an alternative choice of treatment, but is not widely done as the criteria of repairing restorations are still controversial and not widely taught in dental schools. The purpose of this study is to evaluate the perception of repair and replacement of dental restorations by graduates and undergraduates at King Abdulaziz University, and what clinical criteria do they follow for either choice, if any. A survey questionnaire of 19 questions was designed and prepared in English. Two hundred questionnaires were given to the faculty, interns, fifth and sixth year dental students at the Faculty of Dentistry, King Abdulaziz University, Jeddah, Saudi Arabia. Most of them have replaced dental restorations. Only 42.7 % have actually repaired restorations as generally they had no clinical experience, and because of their supervisors recommendation. Secondary caries was the main cause of replacing dental restorations), which was significantly higher than other causes. Composite was mainly used in the replacement and repair of dental restorations.

*Keywords:* Restoration replacement, Restoration repair, Restoration failure.

### **Introduction**

Replacement of dental restorations still plays a major role in daily dental practice. However, replacing restorations has the disadvantages of being time consuming; can lead to unnecessary removal of tooth structure and

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could cause major injuries to the pulpal tissues. Repair of restorations on the other hand is an alternative choice of treatment, but is not widely done as the criteria of repairing restorations are still controversial and not widely taught in dental schools.

An important treatment decision that greatly affects the longevity of a failing restoration is whether to remove the restoration completely or to repair only the defective portion. Repair preserves tooth tissues and is more cost effective, likewise more acceptable to the patient than restoration replacement. Furthermore, it may contribute to patients retaining more of their teeth over their lifetime. Another approach is to refurbish, rather than repair a less than ideal restoration. Whereas a repair involves partial replacement of a restoration with the same or different restorative material, refurbishment typically involves the refinishing of a restoration with or without re-contouring. Such improvements in the restoration may render the restoration clinically satisfactory for a further period of clinical service<sup>[1]</sup>.

The purpose of this study is to evaluate the perception of repair and replacement of dental restorations by graduates and undergraduates at King Abdulaziz University (KAU) and what clinical criteria do they follow for either choice, if any.

### **Materials and Methods**

A survey questionnaire of 19 questions was designed and prepared in English. Two hundred questionnaires were given to the faculty, interns, fifth and sixth year dental students at the Faculty of Dentistry, KAU, Jeddah, Saudi Arabia.

The recipients were told to return the questionnaire to the secretary of the department. It took approximately two weeks to collect.

The survey consisted of a cover letter, which explained to the recipients how to fill the questionnaire. It also consisted of several questions that could be answered by yes or no responses (five), by multiple choice answers (thirteen) and one in descriptive format.

The survey inquired about the general information of the recipients, their level of education, their number of years of clinical experience, and whether the recipients were taught the indications for replacing dental restorations; if they have replaced any before, and how many in the past

six to twelve months. Moreover, it queries the cause of replacement and the material of choice that was included.

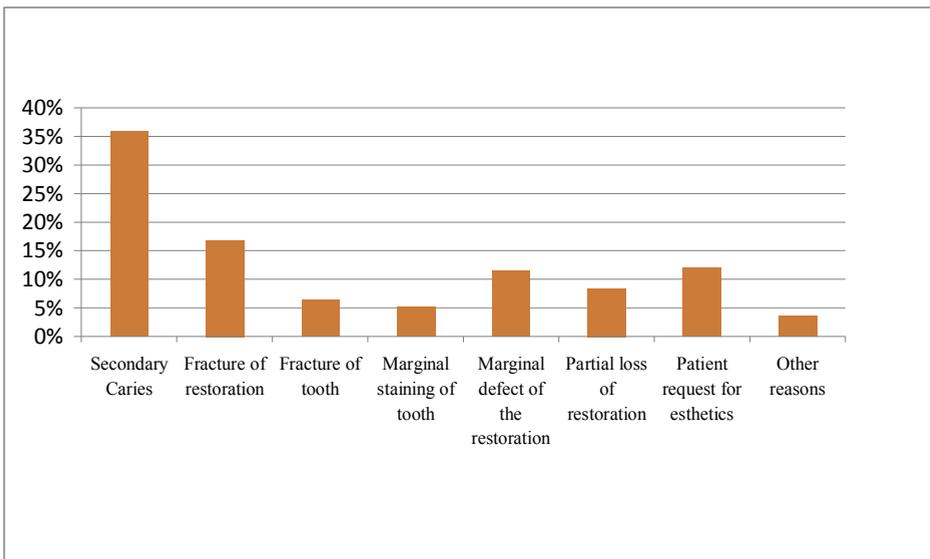
In addition, the survey required information about the longevity of repaired restorations, refurbishing (if they know what it meant) and when it was indicated.

## Results

The data collected were computerized and analyzed using the Microsoft Excel program 2007 and SPSS v15.

One hundred and fifty-six of two hundred responded to the survey among which 25 were faculty members; 51 were interns; 41 fifth year students; and 40 were sixth year students. The questionnaires returned by the participants included responses to all or most of the questions.

The results compared the responses from the faculty, interns, fifth- and sixth-year dental students. Ninety-three percent of the participants had 1-5 years of clinical experience. 89% percent of all respondents reported that they have been taught the indications for the replacement of dental restorations and 81% actually replaced dental restorations. The cause of replacement of dental restorations mainly was secondary caries (68%), which was significantly higher than the other causes (Fig. 1).



**Fig. 1. Causes for replacing dental restorations.**

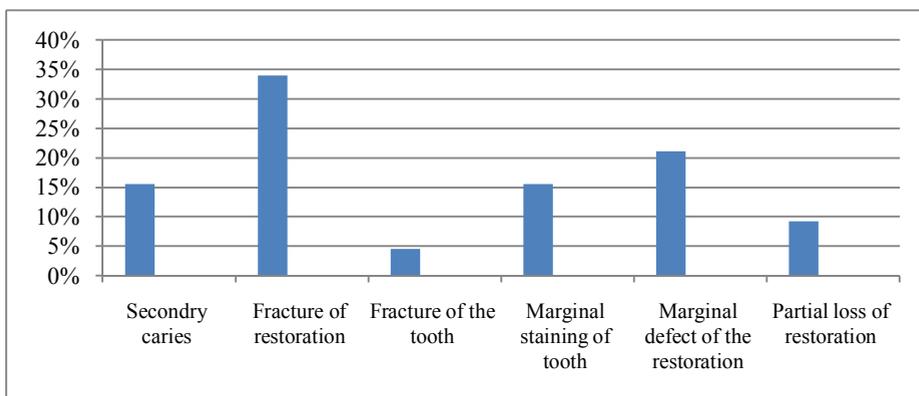
Composite was the main restoration material used by the participants (71.3%) followed by amalgam (15.3%), glass ionomers (8.7%) and indirect restorations were the least used (2.7%).

On the other hand, the results revealed that 70.7% of the participants were taught the indications for the repair of dental restorations. Forty-three percent have actually repaired restorations, whereas 57.3% did not.

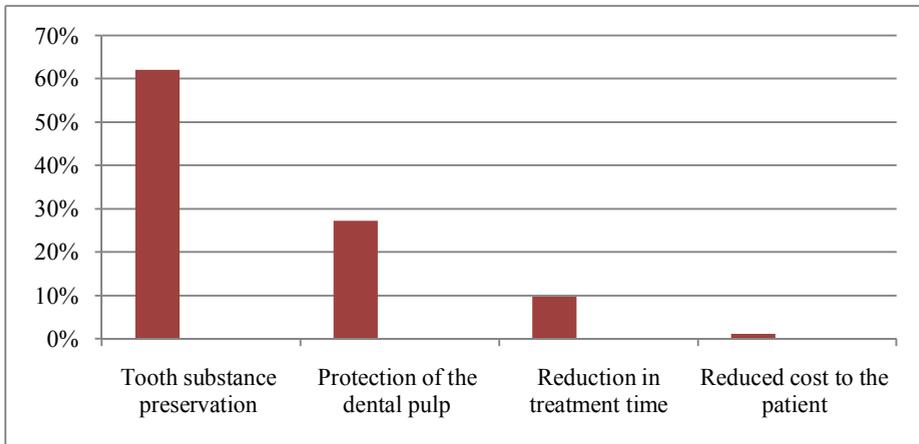
Results showed that the participants did not repair dental restorations as they (30.4%) had no clinical experience; (28.3%) alleged it was their supervisor's recommendation. Followed by the lack of evidence (18.5%), difficulty in decision making (14.1%) and (8.7%) said they had poor clinical experience.

Fracture of the restoration was found to be the main cause of repair by 34% of the participants, whereas fracture of the tooth represented 4.6% (Fig. 2). Tooth substance preservation was the most significant reason for repair (Fig. 3). Seventy-three percent used composite for repairing dental restorations, which is highly significant compared to glass ionomer restorations, and used by only 12.8% while 10.6% used amalgam.

Regarding refurbishing, 46.55% of participants were aware of this term; 38.2% gave a definition, in which 18% gave the correct meaning. Forty-five percent mentioned refurbishing to remove the superficial roughness; followed by 35.7% agreed on implementing it to improve contouring or anatomy; while 10.3% alleged for the over contouring of margins; 6.3% for cervical defects and 2.4% had other reasons.



**Fig. 2. Causes for repairing dental restorations.**



**Fig. 3. Reasons for repairing dental restorations.**

## Discussion

The purpose of this study was to evaluate the perception of repair and replacement of dental restorations by graduates and undergraduates at KAU, and what clinical criteria do they follow for either choice, if any.

The dental undergraduate program carried out by the Faculty of Dentistry at KAU was established fifteen years ago and is considered one of the new programs that could benefit from further studies.

Repair and replacement of dental restorations is being taught as a lecture to the sixth year dental students, although, the students start working on dental with patients in their fourth years. The results compared the responses from the faculty, interns, fifth and sixth year dental students.

The findings of the present study indicate that most of the participants had a 1-5 year clinical experience; fifty-one respondents were dental interns; forty students from fifth year; forty-one sixth year dental students, and whereas the faculty were only twenty-five.

As in many other studies<sup>[2,3]</sup>, secondary caries was the main reason for replacing of dental restorations. Studies have been undertaken with the objective of analyzing the causes of these substitutions and have found secondary caries as the most frequent reason reported. However, other reasons have been identified, such as restoration fractures, marginal

infiltration, and deficient anatomical form and over contouring of the restorations. Mjör and Toffenetti confirm that, although clinical diagnosis of secondary caries is the most common reason to substitute a restoration, scientific basis for this diagnosis is weak<sup>[4]</sup>.

Among other factors, the lifetime of a restoration depends on the criteria used to diagnose failures or, in other words, the need for substitution. Attempts have been made to establish and standardize these criteria with the objective of finding more realistic and accurate criteria to clinically evaluate restorations. However, the quality of restorations is still based on subjective parameters, which are difficult to define and frequently subject to the individual criteria applied by each professional<sup>[2]</sup>.

Although it is considered as an ill defined clinical diagnosis, both in teaching programs and in general practice, the criteria for the diagnosis of secondary caries must be improved and come in line with those for primary caries. Secondary caries are usually localized and delineated lesions and should be differentiated from stained and ditched margins. Small defects of secondary caries, stained and degraded margins may be removed by refurbishing (refinishing or recontouring) procedures. Larger defects may be explored by removing part of the restoration to access the defective margin. By removing part of the restoration to full depth, a firm diagnosis can be made regarding the extent of the lesion, as the defects are often well delineated. Provided the main part of the restoration is satisfactory, the "exploratory" cavity preparation can be filled with an appropriate material<sup>[3]</sup>.

Seventy percent stated they were taught the indications for repair of dental restorations. Only 42.7% have actually repaired restorations, which are significantly low compared to those who have replaced restorations (81%). This could be explained by the inexperience of most of the participants who are mainly new graduates or dental students who (have one to five years clinical experience). Plus, they do not have that much of clinical experience and mainly rely on their instructors experience and advice.

It is also easier to remove the whole restoration than repairing it, which may require some operator skills. The number of supervisors assigned in each clinical session might not be enough, because of the work load and student demands. Supervisors probably do not have

enough time to explain repair procedures. It could also be due to the different educational backgrounds of the supervisors, and the variety of skills and knowledge. Other studies have shown that the lack of evidence is the main cause for not teaching repair<sup>[5]</sup>.

Apparently, there are no clinical criteria for repair as there is for replacement. In 1973 the California Dental Association (CDA) established a Task Force on Quality Evaluation, based on the premise that quality of dental care should be defined and evaluated by dentists involved in clinical practice. The CDA is specifically designed to establish guidelines for assessing restoration quality except that it's not limited to that only, but also it covers other component of dental care. The rating system provides the rationale for rating clinical quality and professional performance into two main categories: (satisfactory) or (not acceptable) and their subcategories<sup>[3]</sup>. These categories correspond to the judgments any dentist makes when examining any restoration in the mouth of a new patient, in order to develop a diagnosis and treatment plan. The primary decision to be made is whether a restoration is satisfactory or not acceptable, whether it should be retained or replaced. The characteristics most commonly considered is to evaluate the quality of a restoration; surface and color, anatomic form and margin integrity.

Based upon a concept describing the degradation process of amalgam and esthetic restorative materials, Cvar and Ryge in 1971 developed what is known as the U.S Public Health Services (USPHS) criteria. These are based upon three levels of performance: Clinically ideal, which relates to a condition which cannot be surpassed, clinically acceptable, on the other hand, deals with a condition in which all of the characteristics are satisfactory and the restoration is still functional. Clinically unacceptable describes a condition in which one or more of the characteristics dictate that the restoration must be replaced<sup>[3]</sup>.

Most of the participants who have stated that they have repaired dental restorations indicated that fracture of the restoration was the cause for repair. It is the most common condition dealt with in daily dental practice and it is easy to do so and does not require too much skill. Followed by marginal defects and fracture of the tooth it was found to be the least cause for repair.

Composite was the major restoration material used by the participants in the replacement and repair of dental restorations, thus

indirect restorations were the least used. The type of restoration used depends on each case individually. Composite was mainly used because it could be more esthetically appealing than amalgam; easier to use; less time consuming than an indirect restoration; more withstanding and durable than glass ionomer restorations.

Tooth substance preservation was the main reason for repair as replacement could lead to removal of unnecessary tooth structure and could also endanger the dental pulp. Each time a restoration is replaced, more sound-tooth tissue is lost, the preparation is enlarged and both the tooth and the restorations tend to become more susceptible to failure. Therefore, it is highly advantageous to increase the life expectancy of a restoration, thereby, delaying the possible loss of the tooth that it restores<sup>[1]</sup>. While reduced costs to the patient were the least reason chosen by the participants, since treatment in the dental faculty is for free. This issue would be more important in the private practice sector.

The main difficulty in replacing composite restorations is differentiating sound tooth structure from restorative material at the interface between the restoration and the tooth. The excellent color-matching and light-transmitting properties of present-day composite materials pose a challenge for dentists trying to identify the cavity margins at the time of replacement<sup>[5]</sup>. That is why many operators choose and encourage the use of a darker or a slightly different shade in posterior regions.

Although no consensus exists within the dentistry profession as to the best repair protocol, the results of several laboratory studies conducted in the late 1970s and 1980s demonstrate that acceptable composite repairs can be achieved. Most of the participants considered the repair of direct composite restorations to be a definitive measure, whereas 23.6% did not answer the question. These results are consistent with findings from other studies carried out in North America and Europe<sup>[5-7]</sup>.

When asked about refurbishing, which means refinishing of the restoration less than half of the participants said they knew what it was, where 38.2% gave a definition only 18% gave the correct meaning. Some said that it meant the replacement of missing teeth; others said it meant applying an additional layer of composite to the restoration. That could be due to lack of knowledge, and as mentioned earlier, the repair

of dental restorations is taught to six year dental students, while the students start working on dental patients in their fourth year.

The repair of fissure sealants is an established technique, but the concept of repair of composite restorations is not recognized<sup>[3]</sup>. Existing literature, notably established textbooks, include little, if any information on relevant criteria and procedures for repair of dental restorations. Recent textbooks on operative dentistry and certain journals do, however, suggest the repair of defective composite restorations as a legitimate alternative to the replacement of defective restorations<sup>[5]</sup>.

Surveys of the teaching of materials and techniques are considered to provide valuable insight into the extent to which new materials and techniques may be applied in the future. In addition, such surveys serve as an important purpose to those responsible for ensuring that dental curricula are contemporary<sup>[3]</sup>.

Several studies that have been carried out in European (German, British, Irish and Scandinavian) dental schools and North American dental schools<sup>[2,3]</sup> have reported that the majority of the schools in the countries surveyed may be found to teach the repair of direct composite restorations (DCRs). However, marked variations were observed in respect of this teaching and the expected longevity of repaired DCRs. Where the repair was not taught, views differed as to the intentions, if any to include this teaching in the curriculum. It is concluded that the teaching of DCRs may be found to be widespread.

Another study carried out in Scandinavian dental schools<sup>[7]</sup>, reported that all undergraduate students are taught and gain clinical experience in the repair of composite restorations. Although, the findings reveal agreement in the teaching of reasons and operative procedures for the repair of composite restorations, variations were found in relation to the teaching of indications for, and expected longevities of such repairs.

### ***Recommendations***

Clear criteria and guidelines for replacement and repair of dental restorations should be developed and followed in the dental school.

Graduate and undergraduate students should be encouraged to repair or refurbish dental restorations when warranted to reduce the high percentage of restorations' replacement.

Final results of this study will be shared with the students to place more emphasis on conservative approaches in their clinical work.

### Conclusion

Most of the participants have been taught the indications for replacement and repair of dental restorations. While most of them have replaced dental restorations, only 42.7% have actually repaired restorations as mostly they had no clinical experience, moreover due to their supervisors' recommendation. Composite was mainly used in the replacement and repair of dental restorations.

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## استبدال وإصلاح حشوات الأسنان

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المستخلص. ما زال استبدال وإعادة حشوات الأسنان يلعب دوراً رئيسياً في الممارسة اليومية لطب الأسنان. لكن استبدال الحشوات له مساوؤه، فهو يستغرق وقتاً طويلاً، ويمكن أن يؤدي إلى إزالة غير ضرورية لأنسجة الأسنان الصحيحة. إصلاح الحشوات من جهة أخرى هو خيار بديل لاستبدال الحشوات، ولكنه لا يمارس على نطاق واسع. الهدف من هذه الدراسة هو تقييم تصور إصلاح واستبدال حشوات الأسنان من قبل الخريجين والجامعيين في جامعة الملك عبدالعزيز. المواد والطرق: تم عمل مسح استقصائي من ١٩ سؤالاً، وأعد وصمم باللغة الإنجليزية. مائتا استبيان قدمت إلى هيئة التدريس، والمتدربين، وطلاب السنة الخامسة والسادسة في كلية طب الأسنان في جامعة الملك عبدالعزيز في جدة، المملكة العربية السعودية. معظم المشاركين قد أعطوا محاضرة عن مؤشرات استبدال وإصلاح حشوات الأسنان. في حين أن معظمهم قد استبدل حشوات الأسنان، فقط ٧,٤٢٪ فعلاً، قد قاموا بإصلاح الحشوات لأن معظمهم ليس لديهم تجربة وخبرة سريرية، أو بسبب توصية المشرفين عليهم بالاستبدال وليس الإصلاح. سبب استبدال حشوات الأسنان أساساً هو التسوس الثانوي، ٦٨٪، والذي كان أعلى بكثير من غيره من الأسباب. مادة الكومبوسيت كانت أكثر المواد استخداماً في استبدال وإصلاح حشوات الأسنان. ينبغي تطوير معايير واضحة ومبادئ توجيهية لاستبدال وإصلاح حشوات الأسنان ليتم اتباعها في الكلية.