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Frequency and Quality of the Repaired Restorations in Adults from Varna, Bulgaria

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Abstract: ***Traditionally, the accepted treatment strategy for restorations exhibiting signs of deterioration and failure was total replacement. According to the new minimally invasive approach when minimal defects have occurred or the diagnosed defect is localized only in one region of the restoration the repairmen is better choice than the total replacement of the restoration. The aim of the presented study was to evaluate the percentage of repaired restoration in a cohort group of patient, their quality and longevity. One hundred adult patients were examined with the visual-tactile method. Decayed, missed and filled teeth were recorded. Teeth with repaired restorations were recorded separately. Data concerning the longevity of there restoration was gathered. 18.3% of the restorations were with repairs. Thirty –five percent of the reparations were made during the last year and 11,6% was older than nine years. 53.5% of the repaired restorations were on molars, 30.2% on premolars and 16.3% on front teeth. More than half of the reparations had poor marginal adaptation, marginal discoloration and secondary caries. Based on the data obtained from this study we may conclude that reparation of restorations as a treatment method in cases of localized restoration defects is known and applied by dental practitioners.***

Keywords: restoration repair, secondary caries, marginal adaptation, marginal discoloration

1. Introduction

Restoration of teeth is one of the most common procedures in dental practice. It was found that over 60% of all restorative dentistry is replacement or repair of restorations [1, 2]. The defective restoration could present with fracture, marginal detachment, marginal staining, degradation/wear,loss of anatomic form or secondary caries [3]. Concerning dental amalgam restorations the most frequent reasons for replacement recurrent caries and fractures of the filling or the tooth itself [4]. Besides this reasons, composite restoration fail because of poor aesthetics as a consequence of material degradation and discoloration and loss of marginal integrity due to breakdown often causing pain and discomfort [5].

Traditionally, the accepted treatment strategy for restorations exhibiting signs of deterioration and failure was total replacement. This was based on the concept that the best way of treatment of caries and deficiencies in restorations is operative removal. Recently published cross-sectional study from a dental practice based research network showed that still 75% of all posterior restorations were replaced and only 25% were repaired [2]. The replacement of the whole restoration leads to loss of tooth structure and it's weakening, there is a risk of pulp injury, it's time and cost consuming. This consecutive change of the restorations with larger and more complex ones has been called the restorative cycle, spiral or staircase [6].

According to the new minimally invasive approach when minimal defects have occurred or the diagnosed defect is localized only in one region of the restoration the repairmen is better choice than the total replacement of the restoration [7]. Unfortunately dentists usually don't consider this treatment option. A practice-based research study found that only practitioners who assessed caries risk, have graduated recently and practiced in non-fee service settings [3], when the decision concerns restoration of their own, the restoration is on molars and incudes multiple surfaces [2]. Unfortunately in the literature there is no much information about the criteria when restoration should be repaired instead of replaced, and even the new books contain relatively little information on this topic [8, 9]. Maybe this is one of the reasons why in such high percent of the cases dentists change and don't repair defect restorations.

Surveys of the teaching in the dental schools can give informationon the extent to which new techniques and materials will be applied in future. A survey made by Gordon et al (2003)revealed that about 70% of the dental schools in north US and Canada were teaching repair of composite restoratios, but only 8% had formal lectures on the topic; the rest just had it in the clinical lessons [10]. In Germany 50% of the schools had this topic included, while in Scandinavia – 100% [11]. But this teaching was mainly at the clinical level and most of the schools did not have didactic, hands-on or instructional material regarding the repair of restorations [11]. Almost 10 years after the above mentioned survey a new study found out that 88% of the schools have included this topic in their curriculum [12].

The aim of the presented study was to evaluate the percentage of repaired restoration in a cohort group of patient, their quality and longevity.

2. Materials and Methods

One hundred adult patients were examined with the visual-tactile method, using a dental mirror and explorer. No radiographs were taken. Decayed, missed and filled teeth were recorded. Teeth with repaired restorations were recorded separately. Data concerning the longevity of there restoration was gathered. The quality of repaired

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restorations was evaluated according to Rydges' criteria. The original evaluation criteria included color match, cavosurface marginal discoloration, anatomic form, marginal discoloration and secondary caries. Different authors include also surface texture, postoperative sensitivity, proximal contact, fractures etc. The criteria that we have recorded in our study included color match, marginal discoloration, anatomic form, marginal adaptation, secondary caries, postoperative sensitivity, fractures. Instead of the original Ridges' scale with α, β and γ, we have used the signature presented on table 1.

Table 1: Criteria used for evaluation of repaired restorations

Characteristic	Evaluation criteria
Color match	α - restoration matches the shade and translucency of tooth β – restoration does not match the shade and translucency of tooth, but mismatch is within normal range of tooth shades γ - restoration does not match the shade and translucency of tooth, and the mismatch is outside normal range of tooth shades
Marginal discoloration	α – there is no visual evidence of marginal discoloration β – there is marginal discoloration between tooth and restoration, but does not penetrate in pulpal direction and involves less than 1/3 of the margin γ - there is marginal discoloration between tooth and restoration, but does not penetrate in pulpal direction and involves more than 1/3 of the margin δ - there is marginal discoloration between tooth and restoration penetrating in pulpal direction
Marginal adaptation	α – restoration is closely adapted to the tooth and restoration does not catch β – there is no visible crevice along the border of the restoration but the explorer catches γ – a visible crevice is present along the border of the restoration, the explorer catches no dentin or base are visible δ - a visible crevice is present along the border of the restoration, the explorer catches, dentin or base are visible
Anatomic form	α – restoration is continuous with existing anatomic form β - restoration is discontinuous with existing anatomic form, dentin or base are not seen γ - restoration is discontinuous, anatomic form is damaged but dentin or base are not seen δ – sufficient material is lost so that dentin or base are seen
Postoperative sensitivity	α – no complaints of postoperative sensitivity are present B – presence of postoperative sensitivity
Secondary caries	α – no caries is present β – caries is present

3. Results

A total number of 100 patients were examined. Twenty-eight of the examined patients had repaired restorations. Two hundred thirty-four restorations were diagnosed. The whole number of reparations was 43 (18.3%). Thirty –five percent of the reparations were made during the last year and 11,6% was older than nine years (tab. 2). Fifty-three point five percent of the repaired restorations were on molars, 30.2% on premolars and 16.3% on front teeth. Concerning the studied criteria only 8 (18.6%) of the reparations were only with α scores. In 88.4% of the studied restorations the patients did not complain of postoperative sensitivity and in 74.4% there were no fractures present. More than half of the reparations had poor marginal adaptation, marginal discoloration and secondary caries.

Table 2: Scores achieved for the investigated criteria

Score of the followed criteria	Number of teeth					
	Color match	Marginal discoloration	Anatomic form	Marginal adaptation	Postoperative sensitivity	Secondary caries
α	8	18	13	19	38	21
β	19	15	16	9	-	-
γ	16	8	10	11	-	-
δ	-	2	4	4	4	22

Only in18,6% the color of the reparation was matching to the color of the original restoration (tab. 3). In one case was diagnosed amalgam repaired with amalgam, 6 amalgam restorations were repaired with composite material, glass-ionomer cement was used for the reparation of a composite restoration in two cases and all the rest were composites repaired with composites. All the patients were informed by their dentists for the presence of repaired restorations in their oral cavities.

Table 3: Longevity of the repaired restorations

	Less than 1 year	1- 4 years	5-8 years	9 or more years	Can't remember
Number of Repaired restorations	15	10	11	5	2

4. Discussion

Thanks to the advance in the technology of composite materials and adhesive systems the longevity of composite materials has grown significantly but still it's generally accepted to be no more than ten years. According to minimally invasive concepts if a localized problem – secondary caries, fracture, marginal gap – is present it is not necessary the whole restoration to be replaced. Some studies have revealed that the repair of a restoration could double its longevity [13, 14]. This preserves tooth structures and prolongs the life of the tooth. When comparing life of repaired and replaced restorations in cases with small, localized defects it was found out that it was the same [15]. In our study almost twelve percent of the repaired restorations were older than 9 years, but all of them had some problems, including secondary caries. Thirty-five percent of the repairments were placed during the last year.

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The main problem with those restorations was the insufficient color match with the old restoration. That is most probably due to the color changes that occur with the aging of the restorative materials that is hard to be reproduced with the new composite.Patients did not usually complained of postoperative sensitivity after the repair that we presume is due to the fact that the amount of the removed tissue is less, so the risk of irritation of the pulpo-dentinal complex is reduced on one side and the amount of the newly placed composite is less so the polymerization stress and gap formation are also less. Unfortunately the results concerning the other monitored criteria were quite poor. In this respect it should be pointed out that these results could be attributed to the fact that students in the faculty of dental medicine treated the examined patients so most of them were with low incomes, which is accepted as risk factor for the development of caries [16].

Most of the repaired restorations were on molars. This corresponds to the literature data that most frequently dentists repair molars [17]. Authors accept that this is due to the fact that molars receive more occlusal stress and restoration replacement is generally connected with the removal of additional tooth structure, which leads to decrease of the strength of the remaining tissues that makes dentist hesitate and reconsider their treatment plans.

Only 16% of the observed reparations were of dental amalgam. This could be due to the fact that there is a general tendency when defective amalgam restoration is observed it to be replaced, usually with a composite one [1, 2, 17]. A point that is to be pointed out is the fact that although it is generally accepted that repairments should be done with the same material as the original restoration [14], most of the amalgam reparations (86%) were made with a composite material.

5. Conclusion

Based on the data obtained from this study we may conclude that in the region of Varna, Bulgaria, reparation of restorations as a treatment method in cases of localized restoration defects is known and applied. Unfortunately the outcomes are not good enough, because in a comparatively short time after the repair there are observed lots of problems, including poor marginal adaptation, marginal discoloration and secondary caries.

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