

DIACRYLYC COMPOSITE RESINS AND AMALGAM RESTORATIONS: LONGEVITY AND REASONS FOR REPLACEMENT

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Abstract: Now more than ever, the dentist has at his/her disposal a wide range of restoration materials. Many times, the success of the treatment depends on the choice of the most suitable materials for the case, as well as on the correct handling of the materials. The replacement of restorations represents the main work, especially for adult patients. The conclusion of this study is that restoration failure is an important problem in dentistry practice, especially in the treatment of adults.

Keywords: materials, RDC, amalgam, proprieties

Rezumat: Acum mai mult ca oricând, medicul stomatolog are la dispoziție o gamă foarte largă de materiale de restaurare, de cele mai multe ori succesul unui tratament stomatologic depinzând de alegerea celui mai potrivit material pentru cazul respectiv, precum și de manipularea lui corectă. Înlocuirea restaurațiilor reprezintă principala sarcină de muncă, mai ales pentru pacienții adulți. Din acest studiu reiese că eșecul restaurațiilor este marea problemă în practica stomatologică, mai ales în tratamentul adulților.

Cuvinte cheie: materiale, RDC, amalgam, proprietăți

INTRODUCTION

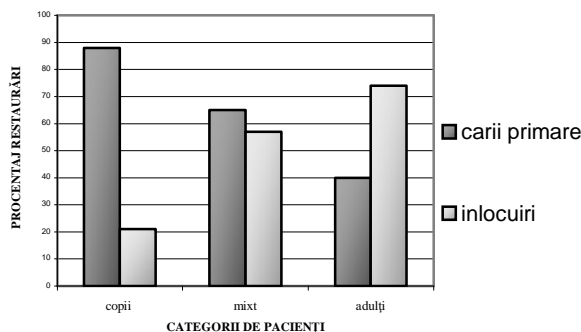
Despite the 30-50% reduction in the incidence of primary caries in most industrialized countries, operational dentistry still stands in the centre of dentistry, no matter if dental care is based on private practice or on a health system for national service.

The replacement of restorations represents the main working task, especially for adult patients. From the first and second figures stands out that every therapy type largely depends on the patients' age and on the type of edentulous area treated. The conclusion of these studies is that restoration failure is a big problem in dentistry practice, especially when it comes to the treatment of adults.

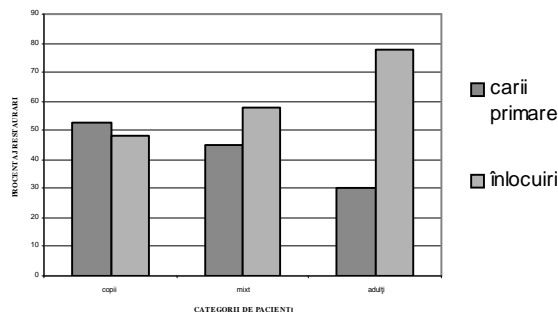
The replacement of old filling stands up to almost 60% of all dentistry treatments carried out.(1) The replacement of an old filling costs at least as much as the one initially applied, and sometimes even more, due to its large dimensions. Taken into consideration this fact, public and private health systems should be interested in reducing the need of restoration replacement. In this context, tracking the main causes that lead to obturation failure, whether these are made of physiognomic

materials type RDC or dental amalgam, is a priority in modern dental treatment.

Picture no. 1. Relationship between the treatment of primary cavity and the replacement of amalgam filling



Picture no. 2. Relationship between the treatment of primary cavity and the replacement of RDC filling



The aim of the conducted study was to assess the frequency of causes that lead to dentistry restorations failure, in order to reach to several important conclusions regarding the opportunity of using restorative materials in different clinical situations, as well as regarding the important elements which must be taken into consideration in the use of technology for implementing various direct restorations.

MATERIAL AND METHOD

In this study we will analyze the information available in the arguments for replacing the amalgam and

RDC restoration and in the longevity of such obturations.(2)

Using the information collected we can draw conclusions regarding the effectiveness of clinical evaluation in this field and the possible improvement of restorative procedures.

The study was conducted over 4 years, taking into account a total of 80 adult patients who required replacement of amalgam or RDC obturation.

The decision to replace these fillings was taken after a careful analysis, according to USPHS criteria. Restorations were replaced only if they were bearing "charlie" value for at least one of the USPHS criteria.

In the end, the obtained data were statistically processed separately for replaced amalgam restorations and separately for the RDC restorations. For RDC restorations data were analyzed separately for the restoration in the front area and separately for the lateral area of the dental arches.

RESULTS AND DISCUSSIONS

RDC restorations

Replacement criteria were applied on front teeth RDC restoration, as well as on lateral teeth DRC restorations. We have recorded each time the main cause of failure, as well as secondary causes. In the process of results evaluation we have taken into consideration only main failure causes. Criteria for replacing RDC obturations:

1. change in the colour of the filling
2. marginal discolour
3. secondary caries
4. poor marginal adjustment (fissure/ continuity solution)
5. tooth fissure
6. loss of anatomic shape
7. other reasons

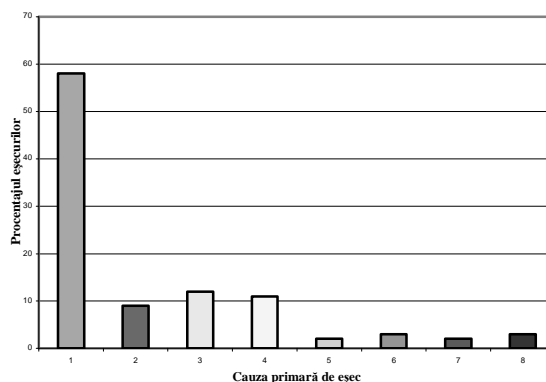
After that, data analysis was divided for restoration with composite materials in the frontal area of the tooth arch. The fillings in the frontal area included almost exclusively class III restorations and a few class V restorations. The distribution of criteria for replacing RDC restorations on permanent front teeth is illustrated in picture 3.

As we can see in the picture, the most frequent failure causes occurred due to: changes in the colour of the filling, secondary caries, poor marginal adjustment, loss of anatomic shape through abrasion.

Taking into consideration the high prevalence of these failure causes, in the following observations we used only the above presented evaluation criteria in order to achieve a fine data analysis. All other causes were enclosed in "other reasons" category. The analysis results firstly show a high prevalence of "other reasons" criteria against the failure causes of amalgam restorations. By including into this criteria poor marginal adjustment, tooth fissure, porous material surface and other reasons, we reach to the conclusion that the real failure cause is not using the proper work technology for the given

material.

Picture no. 3. Prevalence of primary causes for replacing RDC restorations in permanent frontal teeth



This fact proves that the technology used in dental amalgam restorations is not as well acquired by dental practitioners as the technology used for in composite materials restoration. Moreover, seemingly "minor" differences that arise in working technology with the same type of materials, composites, but produced by different firms are often considered unimportant by practitioners. Many practitioners do not always read carefully the producer specifications about the stages and specific time that have to be followed during the use of a certain material; this leads to a series of technique mistakes which in the end will lead to a quick failure of the restoration. A second conclusion resulted from data analysis leads us to the idea that for restorations in the frontal area, the physiognomic criteria is often considered to be the most important.

The third picture shows that reasons like changes in the filling colour or marginal discolour cause more frequently restoration failure in the frontal area than the reason of losing the anatomic shape. Moreover, this last failure criterion is more seldom observed in restorations in this arch area than in the lateral area.

Functional composites with much filling may suffer fissures. If the filling quantity decreases, fine fissures become deeper fractures. Composites with microfilling usually have higher fracture resistance than their stress resistance.(3)

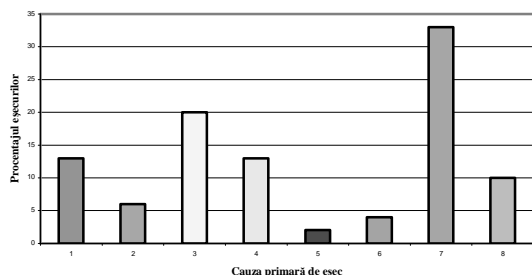
Data analysis continued in the manner presented before for restorations with composite materials in lateral arch area. The fillings in the lateral area have included class I and II restorations, and the obtained results are illustrated in picture no. 4.

Making a comparison between the obtained results and the group of RDC restorations on frontal teeth, criteria regarding the loss of anatomic shape and then secondary caries present a higher prevalence among the failure causes of restorations with composite materials in the lateral area of the arch.

This proves, on one hand, that the physiognomic aspect is considered to be less important in lateral teeth restorations, but on the other hand it emphasizes on the

already known fact that functional demand is more intense in the lateral area.

Picture no. 4. Prevalence of primary causes over the replacement of RDC restorations in permanent lateral teeth



Another analyze aims to reveal the use of which composite group is more successful in posterior teeth. Some clinical surveys report encouraging results after a year or two by using composites with microfilling.(4)

Anyway, most of the products commercialized as an alternative to restoration amalgam for lateral teeth are hybrid composites which offer higher strength and wear resistance than other types of composite materials. Even if the possibilities of smoothing these materials are lower compared to the RDC with microfilling, this is less important for restoration in the lateral area.(5)

As far as secondary caries are concerned, these have proven to be a failure cause almost as important as abrasion.

Even if a class I restoration on molars or premolars is successful for 5-6 years, it is very possible for the marginal closure to be compromised and sequentially, secondary caries may appear. The main failure forms in the case of such restorations remain the marginal fissure or abrasion of the occlusal surface, which limits the application of composites in the distal area or at least requires restoration remake in short time intervals in order to ensure tooth occlusal function.(6)

Materials containing barium glass filling or other fillings which contain heavy metal atoms are the most promising in terms of early detection of secondary caries because of their radiopacity. The repeated stress it's very likely to lead in time to material fatigue and to an early loss of material cohesion. Moreover, the repeated stress may cause the loss of connections with dental hard tissue, leading first, to the appearance of fissures and then to marginal secondary caries.

"Other reasons" criteria is almost as well represented in lateral teeth restoration as in frontal teeth restoration, the reason being the same. To these we could add the incorrect choice of treatment solution in some clinical cases.

Amalgam restorations

The criteria initially settled for evaluating the necessity of replacing amalgam restorations are generally different from those chosen for composite resin restorations.

The criteria are:

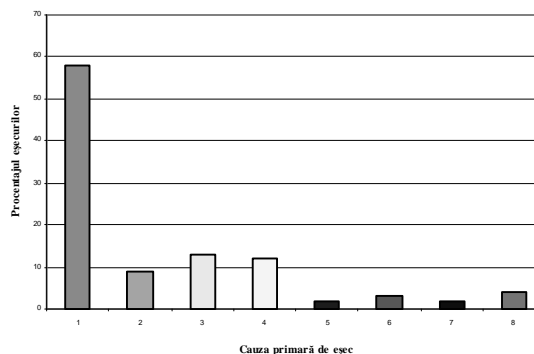
1. secondary caries
2. marginal degradation
3. isthmus fracture
4. tooth fracture
5. porous surface
6. loss of anatomic shape
7. poor marginal adjustment
8. other reasons

The alternatives presented above were centralized taking into consideration the primary failure causes, like in the case of RDC restorations. The centralization results are presented in picture no. 5.

The diagram shows that, by far, secondary caries have been the most frequent reason for the replacement of amalgam restorations. Marginal degradation, isthmus or tooth fracture, have each had a share between 10-20% as reasons for restoration replacement. All the other reasons have rarely been amalgam restoration failure grounds and the "other reasons" criteria covered only 3.2 %.

In conclusion we could say that the selection of replacement criteria was satisfactory, covering the diagnostic criteria used in clinical practice. We would like to emphasize on the fact that at the "other reasons" criteria frames the restoration replacement required by endodontic treatments.

Picture no. 5. Prevalence of primary failure causes in amalgam restorations



Very low frequency of "loss of anatomic shape" criteria led us once again to the conclusion that dental amalgam is very often the best treatment solution for restorations in the lateral arch area; its superior mechanical strength being by far higher than the resistance of most composite materials used in coronary restorations.

During further data analyzing we have recorded if there were many combined reasons for restoration replacement or just one reason. The results have shown that only about 50% of all the analyzed cases required replacement due to several combined reasons.

The relatively high frequency (12-13%) of "isthmus or tooth fracture" criteria is generally due to errors in the preparation of the dental support for dental amalgam restorations.

CONCLUSIONS

- The studies concerning restoration longevity are subjective and rely on the opinion of each individual practitioner about what is acceptable or unacceptable. The diagnosis of secondary caries is a classic example. Clinically, this diagnosis tends to include all cases in which the probe “hangs” and where the location is inaccessible to direct inspection. Therefore it is difficult or impossible to distinguish between true secondary caries and marginal fissure at the tooth-restoration interface.
- The number of criteria used in clinical diagnosis of restoration failure is limited and usually only one major cause is recorded as the reason for the failure. But there are many marked differences between practitioners as far as the diagnosis of failure is concerned, the assessment being mostly subjective.
- The durability of a restoration depends not only on the qualities of that material, but also on the conjunction of several factors: teeth, restoration type, patient's age, used material, operator.
- The information obtained in this study demonstrates that application of the DRC in an area with functional stress drastically reduces the durability of RDC restorations.(7)
- Taking into consideration that the durability of restorations depends on a correct diagnosis, it's necessary to have a systematic evaluation of diagnosis procedures and this should be the greatest part of the study program in operative dentistry at all levels.
- Therefore we must emphasize on the importance of definitions, criteria, standardization and calibration of clinical studies for students in latest years of study and especially for practicing doctors.

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