



## **SECONDARY AESTHETIC DENTAL DYSFUNCTION TREATMENT**

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**Abstract:** Several methods and materials are used in modern restorative dentistry for anterior dental lesions treatment. The desired aesthetic outcome can be obtained only with the correct treatment method correlated to case particularities. Sometimes, subjective and unrealistic approaches lead immediately or in time to undesirable dental restorations. The aim of the present paper is to evaluate the statistic distribution of aesthetic anterior dysfunctions detected on 425 patients from both genders that had restorative treatment during a period of 10 years. For each patient, there has been conducted an initial clinical examination and a photographic documentation was made. Also, each patient was asked to submit a questionnaire regarding his dental history. The results of the study represented the foundation for the discussions regarding the causes that led to aesthetic dysfunctions. The conclusions indicated that all errors that conducted to an initial failure of treatment are only connected with the medical decisions made by the dentist.

### **INTRODUCTION**

The aesthetics in dentistry is nowadays defined by the teeth's normal aspect and regular distribution on the jaws, and by their harmonic relation with our facial figures and skin nuance. Several pathologies may affect our aesthetic appearance, but the dysfunctions in the dental area have one of the biggest social impact.(1)

Dental caries on anterior teeth is one of the most popular pathology affecting both genders in a variable proportion depending on diet and type of dental hygiene.

That is why the treatment of aesthetic dysfunctions caused by dental caries becomes necessary, not only for the correction of an unpleasant smile, but for the middle and long term consequences that may occur in the absence of medical assistance.

The dental caries treatment is supposed to be as conservative as possible and has to restore tooth appearance and shape.

There are still clinical challenges regarding the anterior restorations, aesthetics, durability, resistance in time and wear rate, and, most of all, the type of protocol should be applied in case of deep caries that are threatening tooth vitality.

The composite resin materials with various conformation and application techniques, each one with numerous steps that can generate errors, are electively used in restoring the primary dental loss, produced by dental caries.(2,3)

Satisfactory results can be obtained only if the protocol for each procedure is completed in a correct manner.

The most common aesthetic problems are those consecutive to a failed caries treatment.

The individual hygienic pattern, the alimentary habits

and the variable parafunctions may contribute to anterior restorations failure, aggravating the already existent aesthetic dysfunction.

So, this type of secondary aesthetic dysfunctions is disturbing for the patient and for the dentist, because they are generally creating a communication gap.

Luckily, the adherent and aesthetic materials can be used not only for primary treatment, but for correcting or replacing the anterior restorations with physiognomy issues.

### **AIM**

The management of secondary aesthetic dysfunctions implies a retreatment that corrects all the deficiencies for which the initial treatment was considered a failure.

The aim of this study was to identify the causes and evaluate their statistic distribution as elements that generated this type of pathology in a group of patients during a period of time.

### **MATERIALS AND METHODS**

425 patients from both genders who had restorative treatment during a period of 10 years presented 450 anterior defective restorations detected and diagnosed at initial presentation.

For all the patients, the aspect of the anterior defective restorations was recorded on a digital image of the clinical case, that were later used as an element of comparison, after the completion of the retreatment.

This initial image was included in each patient's treatment sheet, along with the initial motives of presentation for the dental treatment.

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The examination protocol used in all clinical cases was explained to the patients, in order to obtain their full collaboration and to gather all the necessary information for a correct diagnosis.(1)

Examination protocol had for all treated teeth the following basic steps:

- All removable appliances were taken off.
- The patient cleaned the teeth using a toothbrush and dental floss (in order to eliminate all the alimentary debris).
- A professional cleansing was accomplished with abrasive toothpaste and mechanically activated brushes (at low speed) in order to eliminate all extrinsic discoloration that may interfere in the diagnostic process.
- Initial colour selection.
- A moisture control method compatible with the case particularities was used.
- The examined teeth/restoration was dried for at least 5 seconds before the visual inspection.
- Visual examinations were conducted under a good artificial illumination, using a dental mirror.
- For tactile investigations, two explorers were used - a blunt one and a standard sharp one (tip of 0,5mm) in order to differentiate cavitated surface defects.(2)
- For restorations with proximal component, bite-wing radiographic investigations were made. (4)

Each restoration/each clinical case was evaluated using the following criteria (individual clinical characteristics were also considered):

- Aesthetic aspect (shape, colour).
- Integrity/ retained/ partially retained / missing restorative material.
- Configuration / discoloration of the marginal adaptation;
- Proximal/cervical configuration (where it is necessary).
- Restoration wear.
- Secondary caries signs (recurrent/marginal caries).(1,4)

The restorations were visually and tactiley evaluated by moving the blunt and the sharp probes over the surfaces and margins. The blunt probe served in discovering level differences on restorations surfaces or between the restoration and enamel.

The sharp probe was used to identify gaps on the restorations surface or between the restoration and enamel. This method was used for detecting the presence of the marginal secondary caries.

For identifying the recurrent caries, a visual method and bitewing radiographs were used.(1,4)

The protocol of retreatment had for all treated teeth the following basic steps, starting with the surgical stage of excavation:

1. The defective anterior restoration was removed using a round carbide bur at conventional speed.
2. The excavation was made step by step from middle to the outer limits till the complete elimination of restorative material;
3. The status of the inner cavity was noted.
4. If dentinal protection was present, the material was removed with a round carbide bur at conventional speed, revealing the juxtapulpal walls of the cavity.
5. For each patient, the moisture control method used a latex dental dam and a saliva ejector placed under the dental dam in the opposite part of the mouth.
6. During the anterior restorations removal, in order to reduce the heat produced by friction it was used a good irrigation and a conventional high speed evacuation device was placed near the tooth to eliminate the water excess.
7. The isolation with dental dam and a saliva ejector (placed under the dental dam in the opposite part of the mouth) was reapplied and completed considering the clinical situation

(retraction cord).(5)

The second part of the retreatment was represented by a new dental cavity preparation, in which necrotic tissues removal and supplementary dental preparation were performed.

The necrotic tissues removal targeted the infected dentin and it was made with a round carbide bur at conventional speed.

This step was considered completed when the remaining layer of affected dentin (even with a modified colour) on the juxtapulpal walls presented certain hardness at a tactile control, using a standard probe. When the dental destruction was important, there were created retention ridges in the dentin and pins were inserted in order to improve the restorations' retention.(6)

On the enamel, there were two complementary interventions. At first, all the enamel that was demineralized, stained or with limited mechanical strength, was removed with a cylindrical carbide bur at medium speed.

Finally, each enamel cavo-surface margin for each cavity was bevelled at least 2 mm with a cylindrical abrasive rotary instrument at high speed. The bevel varied as extension and depth accordingly to the case particularities.

The final part of the retreatment was represented by the restorative stage, with a general protocol for all treated teeth that had the following steps:

- Cavity cleansing with saline solutions or water, without pressure and drying in the same manner.
- Disinfection of the cavity walls with a solution of 2% chlorhexidine (selected because of its compatibility with adhesive systems type IV and V used with composite resins).
- Colour selection was made in standardized conditions for all cases, using a universal colour key on wet teeth and at day light.
- Tooth's moisture control.(5)
- Proximal conformation for class III and IV cavities modified for adherent materials was made with partial or circular matrix (when necessary) and cervical conformation for class V cavities was made with partial or cervical matrix.(4)
- Indirect pulp capping for deep cavities and dentinal protection for medium cavities. For indirect pulp capping was used calcium hydroxide as neodentinogenetic and antiseptic layer (for affected dentin) and a layer of resin modified glass ionomer cements (RMGIC) without conditioner as a mechanically protective base.(7-16)

In cavities of medium depth, the layer of resin modified glass ionomer cements (RMGIC) without conditioner (as a mechanically protective base) was directly placed on the juxtapulpal walls.

In both type of cavities, the good marginal sealing provided by the layer of modified glass ionomer had a role in blocking residual bacteria and stopping ulterior caries evolution.

The light curing of the base layer was made using a LED device with time and power settings adjusted to the type of RMGIC material selected for each clinical case.

- Composite resin application. The application of the composite followed the general steps for this category of materials: total etch (for enamel and dentin) with phosphoric acid, bonding/priming (as specified in the information sheet from the producer) and resin placement.

The resin placement was made with incisal index technique and layering technique for class IV cavities, and layering technique for class III and V cavities.

The morphologic modelling was made for each type of cavity by adding small portions of composite resin and

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closing, step by step, the cavity.

The light curing of each composite layer was made using a LED device with time and power settings adjusted to the type of material and shade selected for each clinical case.

- The morphologic adjustment corrected the morphology for restored surfaces by mechanically removing the composite surplus. The composite removal was made with cutting and abrasive rotary instruments, with various forms adapted to the case's necessities.

The functional adjustment (occlusion adaptation) corrected in the same manner the restored surfaces that were involved in class II occlusion contacts and verified the diagnostic positions and movements of the jaws.

- The finishing stage was made to obtain surfaces without imperfections and the polishing was made to obtain a high polish on restored surfaces using various abrasive systems. The retreatment was completed with the application of a light cured nano-filled protective coat which effectively seals the surfaces creating a smooth and glossy surface.

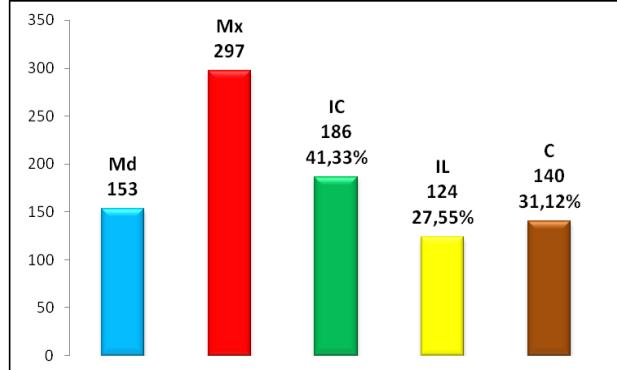
- The final status for each patient was documented with a digital image of the clinical case with the correct aesthetic restoration(s).

### RESULTS

The distribution by gender indicated that 203 females and 212 males, with ages from 25 to 55 years, presented 450 anterior defective restorations that generated secondary aesthetic dysfunctions.

All patients were treated in a private practice dental office in Bucharest by two experienced dentists during 10 years. The distribution of anterior composite restorations that needed retreatment by arch and teeth is presented in figure no. 1.

**Figure no. 1. Distribution by arch and type of teeth**



Considering the type of class of anterior defective restorations, modified class III Black were identified on 225 teeth (50%) and modified class IV Black (with various degree of damage of the incisal margin) were detected on 144 teeth (32%).

Modified class V restorations were identified on 81 teeth (18%) only on buccal surface of the teeth, all cases in which were identified defective restorations on oral surfaces were not taken in evidence for the present study.

The 225 modified class III Black restorations affected the distal surfaces in 120 cases and the mesial surface was affected in 115 cases.

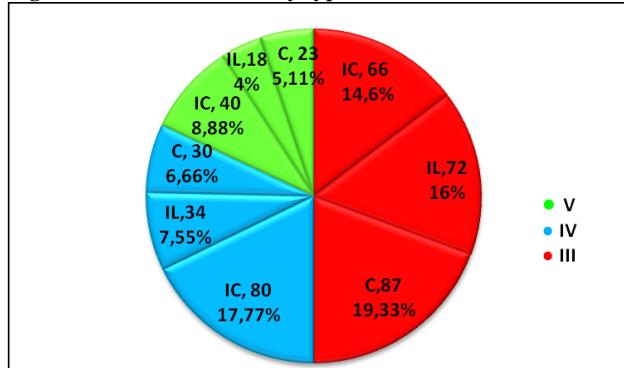
The 144 modified class IV Black restorations affected the distal surfaces in 98 cases and the mesial surface was affected in 46 cases.

The distribution of anterior defective restorations that needed retreatment on type of teeth and type of class is presented in figure no. 2.

The distribution by the depth of the cavities after initial restorations and necrotic tissues removal, indicated that

from the total of 450, 378 (82%) of them were deep and only 72(18%) had a medium depth.

**Figure no. 2. Distribution by type of class and teeth**



The medium depth cavities were located as follows:

- 51 in male patients and 21 in female patients;
- 37 class V, 25 class III and 10 class IV.

The deep cavities were located:

- 182 in female patients and 171 in male patients;
- 200 class III, 134 class IV and 44 class V.

The main causes that made necessary the retreatment summarized on clinical analysis (made during the treatment) and based on patients' initial demands are presented in direct connection with the type of class in table no. 1.

**Table no. 1. Retreatment causes**

Class/Primary Cause	III	IV	V
1. Secondary caries 40% (180)	118	40	22
2. Restorations integrity 20% (90)	44	36	10
3. Colour 16% (72)	29	25	18
4. Shape (Incisal/proximal/cervical configuration) 8% (36)	12	10	14
5. Restoration wear 8% (36)	10	19	7
6. Gingival bleeding 8% (36)	12	14	10

### DISCUSSIONS

The results of this study indicated that the most important cause that determined an anterior aesthetic dysfunction were the secondary caries, as a direct consequence of initial treatment failure.

For the recurrent detected caries, the improper treatment of the affected dentine remaining after the surgical stage and the absence or the incomplete or incorrect dentinal protection are, most likely, the main causes. The marginal secondary decays were determined by an improper contour form, by the unnecessary conservation of demineralized enamel and by a less rigorous moisture control and adhesive technique used during the restorative stage.

An identified deficiency was also the absence of open sandwich technique in all the cases with evolution under the gingival margin, leading to an incorrect marginal adaptation at the cervical level.

Deficiencies in restorations integrity represented the second main group of causes that determined secondary aesthetic dysfunctions by chipping, fracture or restorations displacement.

These situations were primarily influenced by the dimensions of the restorations and the deficiencies in second class occlusion contacts adaptation that needed corrections before the retreatment.

Because the adherent restorative technique is not based on hard condensation like the amalgam restorations, when an incorrect conformation is performed, the resulting marginal

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contour is defective and the ulterior marginal sealing has a low quality as well.

The colour deficiencies detected in such a great proportion on examined patients can be deceiving just because aesthetic materials are used. This situation is quite understandable since adherent treatment has numerous steps and each one may potentially generate an error, each case having its own individual particularities.

For the cervical restorations, the aesthetic dysfunction caused by the colour difference between the final restoration and surrounding dental tissues was generated from the step of the colour choosing or during the restorative stage when a bulk technique was used instead of a laminate technique.

For proximal and incisal and proximal restorations the colour was not selected accordingly to the teeth's region to be restored and there were no or insufficient bevelling on buccal surfaces that could allow a slow optical passage. So, the colouristic transition between the restoration and the dental tissue would not have been so obvious.

The restorations' shapes also created aesthetic problems, the incorrect modelling without miming the buccal, incisal, cervical or proximal tooth's morphology generating restorations with no anatomic components.

The absence of the typical, natural curvature in incisal-cervical area or in the mesio-distal one by amplifying or diminishing it, generated under-contoured restorations to the cavities margins.

The restorations wear mainly observed at incisal region presented a particular aspect regarding some unusual alimentary habits that patients declared they had. In a preventive manner, some extra dietary advices were given in the idea of limiting restorations deterioration.

The gingival bleeding caused by the deficient anterior restoration, interested all the teeth with sub-gingival components treated adherently. This problem was either a consequence of an incorrect contact area that allowed the inter-dental papillae to be traumatized during mastication, either the lack of marginal adaptation at cervical margin for the restorations.

### CONCLUSIONS

The lowest number of defective adherent restorations that generated secondary dysfunctions was associated to class V cavities.

The large number of class III defective restorations equal with the sum of class IV and V restorations can be explained only by the dentists' limited ability to adapt to a difficult treatment protocol that sometimes has to take place in a very confined working space.

Restorative dentistry based on minimal invasive methods plays an important role in the treatment of anterior aesthetic secondary dysfunctions by the self-limiting characteristics of the preparations obtained during the retreatment that allow small restorations.

The aesthetic dysfunctions are often the result of several coexisting causes that lead to incorrect anterior restorations and the retreatment's outcome is, sometimes, considerably influenced by the gravity of the initial situation.

The right method of retreatment for aesthetic dysfunctions is always influenced by the clinical form of defective anterior restoration and by the local particularities (degree of visibility during normal activities), but, it is, still, the dentist's subjective decision.

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