EXPERIMENTAL RESEARCHES ON FLUORESCENCE OF AESTHETIC DENTAL CORONAR RESTORATIONS

Bohnert M.[*)], Pollak S.[*)], Schmidt W.[*)], Witkowski S.[*)], Neumann C.P.P.[**)], Diana Diaconu[**)], Maria-Antonela Beldiman[**)], Simona Stoleriu[**)], Andrian S.[**)]

[*)] University "Albert-Lüdwigs" Freiburg, GERMANY

[**)] University of Medicine and Pharmacy Gr.T.Popa" Iaşi, ROMANIA

Abstract: Introduction. The aesthetic dental coronary restorations are made-up by composite resins, compomers or non-metallic prostheses. Natural teeth are fluorescent, and so, the biomaterials used today are fluorescent, too. The determination of fluorescence for coronary restorations is useful in dental medicine and forensic medicine. **Material and method**. On a black cast of a maxillary arch there have been applied coronary restorations and fixed prostheses from some biomaterials frequently used today: Compafill A 1, Compafill C 3 (Wilde Dental, Germany), CeramX, Dyract extra, Quixfill (Dentsply DeTrey, Germany), Coltene (Whaledent, Germany), Degufill (Degussa, Germany), Concise (3M, USA), Superpont (Spofa Dental, Czech R.), Vita Akzent "sun kiss" ceramic material (Vita ZF., Germany). The fluorescence of these restorations was revealed in photos by the time of UV-A irradiations, than, the photos were comparatively examined from the point of view of intensity and fluorescence chromatics. Using the photometer appliance (fluorescent-photometer) assisted by a computer, realized by Professor Dr. Michael Bohnert, it was measured and graphic registered, the light-length and the intensity of light emitted on UV-A irradiation, thus, the fluorescence of each restoration from the black cast. **Results**. For each restoration made from such biomaterials, it was observed a particular fluorescence, characteristic. This characteristic was attested also by computerized determination of fluorescence reflected in specific curves. **Discussions.** In dental medicine, especially in dental prosthetics, it is necessary that restorations and fixed dental prostheses to have the same fluorescence as natural teeth. In forensic medicine, the specific fluorescence can offer an extra element to identify the unidentified bodies. **Conclusions**. The coronary dental restorations and fixed prostheses present a different fluorescence, corresponding to the biomaterial used. When there are used non-fluorescent biomaterials, they appear with a clear different chromatic aspect from natural teeth, in UV-radiation light, natural light and artificial light

Key words*:* coronary restorations, fluorescence, aesthetic biomaterials

INTRODUCTION

The aesthetic dental restorations are made-up from chemo-curing and light-curing biomaterials, acrylic resins and composite materials, ceramics or zirconium oxides materials by CAD-CAM technology, covered with „make-up" ceramics elements.

The mineral component of composite and ceramic biomaterials used today for aesthetic dental restorations, is fluorescent. Until the end of the last century, the necessity for fluorescence of aesthetic coronary restorations, aesthetic crowns and bridges, the artificial teeth of removable prostheses, fluorescence that exist at natural teeth, was ignored. Even now, the fluorescence of natural and artificial teeth is represented in iconographies of dental articles, as it appear at irradiation, the lamps which emitted UV radiations, but also, violet- and blue-light, which screens the real chromatic nuance of teeth fluorescence or of the biomaterials.

To determine the real chromatics of fluorescence for dental restorations from different aesthetic biomaterials, we used a special filter applied on the emitting lamp of UV radiations (UV-A) – "black lamp". Using a device to register the intensity and the wave-length of emitted light of the biomaterial after the UV irradiation, so, the fluorescence, represent a modern method to determine – objectively and exactly – the fluorescence of the biomaterial used.

The subjective, visual, assessment of the fluorescence of biomaterials for coronary restorations, is useful to restore the optimal aesthetic aspect in restorative therapy and dental prostheses, and the exactly determination of fluorescence for different biomaterials, became useful in forensic medicine, to identify the unidentified bodies.

MATERIAL AND METHOD

For the experimental research of the fluorescence of aesthetic dental coronary restorations, we used a hard stone cast of maxillary dental arch, where there were prepared different forms, similar with those of substructures used for occlusal restorations, coronary preparations and a vestibular preparation for laminate veneer.

The cast was introduced than in China ink to obtain a black, frosted, surface. On the black cast were applied the aesthetic biomaterials for coronary restorations or dental crowns: Compafill A-1 (hybrid composite, Wilde Dental, Germany), 1.7. occlusal restoration with CeramX (nanoceramic hybrid composite, Dentsply-DeTrey, Germany), 1.6. occlusal restoration with Dyract Extra (compomer, Dentsply-DeTrey, Germany), on 1.4. ceramic dental crown with Vita Akzent „sun kiss" AKZ-3 (Vita Zahn-Fabrik, Germany), on 1.3. substitution inlay-on lay (IOS) from Concise EBS (chemo-curing macro-composite, 3M Co., USA), on 1.2. aesthetic crown from thermo-curing acrylic resin Superpont (Spofa-Dental, Czech Republic), at 1.1. incisal and oral restorations with Miris (micro-composite, Coltene-Whale Dent, Germany), on 2.1. Cantilever dental bridge, with crown and distal extension from Degufill (micro-composite, Degussa, Germany), on 2.4. was applied a vestibular ceramic veneer (laminate) maked-up with Vita Akzent „sun kiss" AKZ-3 (Vita Zahn-Fabrik, Germany), 2.5. occlusal restoration with Quixfill (hybrid composite, Dentsply-DeTrey, Germany), 2.6. occlusal restoration with Clearfill (macro-composite, Kuraray, Japan), and at 2.8., integral occlusal restoration with Compafill C-3 (hybrid composite, Wilde Dental, Germany). The light-curing process was realised with a lamp with the emission of violet-indigo-blue light 400 nm – 470 nm, Optilux (Demetron, Kerr), without distal extension bridge made-up from micro-composite which was realised in the light-curing device in the dental lab: Lumamat 100 (Ivoclar, Liechtenstein)[1]. The black cast with aesthetic dental restorations was placed on a black-tray centred on the UV research table, from Forensic Medicine Institute, „A;bert-Ludwigs" University, Freiburg, Germany.

RESULTS

The emitting UV radiations tubes of the UV research table are equipped with a

standard filter, and the dental restorations appeared all with a blue fluorescence. By using the so-called "hand lamp" with UV radiation over which we applied a special filter, it can be observed the different nuances of different fluorescence of aesthetic biomaterials for coronary restorations[2].

There is a white-light blue fluorescence for occlusal restorations with Compafill on 1.8., 2.8., a deep blue for 1.7., 1.1., in case of CeramX and Miris restorations, and with an intermediary nuance for the bridge with distal extension from Degufill, a yellow-light green fluorescence for the artificial preparation with Concise EBS, a pink fluorescence for the ceramic crown and the laminate veneer with Vita Akzent „sun kiss", and the absence of fluorescence of aesthetic crown made-up from acrylic resin Superpont applied on 1.2..

The determination of fluorescence for different restorative biomaterials with the device called "fluorescence-photometer" assisted by a computer, designed by Prof Dr. Michael Bohnert, was made for next biomaterials: CeramX, Compafill A-1, Compafill C-3 (Wilde Dental, Germany), Degufill (Degussa)[3]. The others restorations had a too small surface for the traductor device, as it was realised in that period of time (2006).

The results obtained with this device are reflected in curves with maximal values corresponding to the wave lengths of the light emitted under the action of UV radiations, and so, to the fluorescence.[4]. These wave lengths coincide with light-blue nuances, visual registered (fig.1).

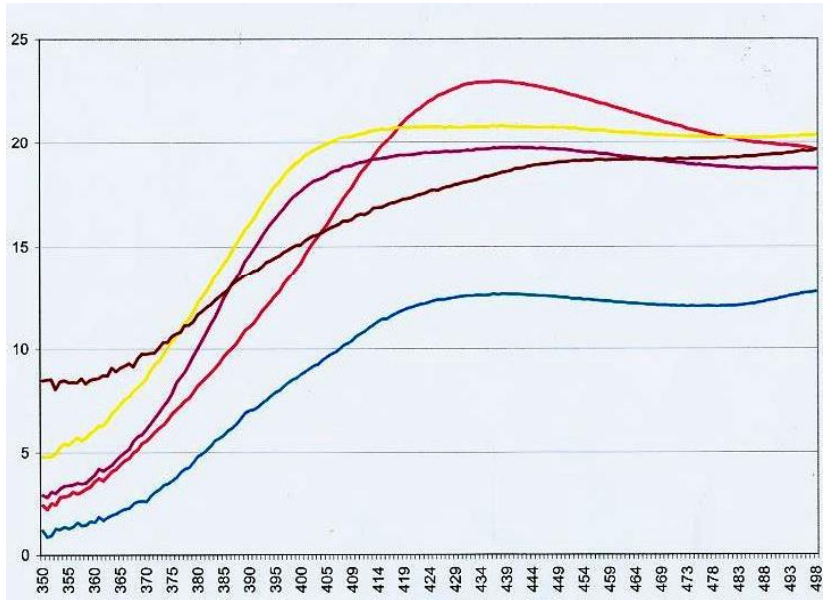

Fig.1. The registration of fluorescence resulted after UV irradiation with the photometer assisted by computer for some aesthetic coronary restorative biomaterials (CeramX, Compafill A1, Compafill C3, Degufill)

DISCUSSIONS

From the point of view of contribution at restabilising the aesthetic function, the aspect of natural tooth, the pink fluorescence presented by "make-up" ceramics Vita Akzent „sun kiss" represent

the most valuable contribution in this area, because this pink fluorescence is added to white nuances corresponding to vestibular surface of prosthetic restorations, and having that effect for it were made others experimental research, to give the aspect of „vital tooth", natural tooth for restored or prosthetic replaced teeth.

The yellow-light green fluorescence visual registered, for the artificial preparation from composite resin Concise EBS, also contribute to the effect of naturalness of dental restorations.

This revolutionary material, almost half a century ago, was designed for posterior restorations, and had remarkable results from aesthetic point of view, this fact was verified also with the visual registered fluorescence of the artificial tooth realised with this material, fluorescence which is almost the same with this of natural tooth.

The light-blue fluorescence observed at others materials is summering-up with other nuances of white, white-light yellow, white-grey, after which are chosen the biomaterials corresponding to key-colours, and contribute to aesthetic function, in condition of natural light illumination and artificial light with UV-A radiations.[5]

CONCLUSIONS

In conditions of restabilising the aesthetic function of restored dental arches by conservative or prosthetic therapy, begin to represent an exigency of aesthetic dentistry, the fluorescence of materials for dental coronary restorations, which contribute to the disappearance of the differences from natural and restored teeth, is a concern for researchers and practitioners. The forensic medicine doctors have a new method to use, introduced by our research group, method which is an international premiere.

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