THE INFLUENCE OF THE DENTAL WHITENING METHODS UPON THE DENTAL HARD TISSUES AND THE CORONARY RESTORATIONS

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Abstract: *The aesthetic aspects constitute a more and more important element of the modern dental medicine. The interest is strongly focused on the frontal area. In this context, a very large emphasis is put on dental bleaching, although this was described about 100 years ago by Harlem. Since then, the dental bleaching techniques have evolved to clinically tested systems, the results being spectacular and very convincing due to their effectiveness and security of use.*

Keywords: *dental bleaching, enamel, dentin, coronary restorations.*

Rezumat: *Aspectele estetice constituie un element din ce în ce mai important al medicinei dentare moderne. Interesul se focalizează puternic asupra zonei frontale, în acest context acordându-se o importanţă tot mai mare albirii dentare, deşi aceasta a fost descrisă deja cu aproximativ 100 de ani în urmă de către Harlem. De atunci, tehnicile de albire dentară au evoluat la nivel de sisteme testate clinic, rezultatele fiind deseori spectaculoase şi convingătoare prin efectivitatea şi siguranţa utilizării.*

Cuvinte cheie: *albire dentară, smalţ, dentină, restauraţii coronare*

INTRODUCTION

Presently, the market for teeth whitening products is rapidly expanding, their broader and broader use determining a very rigorous supervision of the security of use and of the efficiency of the whitening substances, for example by American Dental Association.

There are laborious studies regarding the action mechanism of the whitening systems and especially of their possible secondary effects.

These studies concentrate not only on the dental hard substance but also on the dental restorations, because both constitute the substratum for the whitening process. It would be ideal, for the whitening systems to positively influence the aesthetic aspect without having any damaging effect not only on the dental hard tissues but also on the dental restorations.

A series of studies deal with the security of use and efficiency of the dental whitening systems; these studies are concentrating especially on the micro-structure and also on the surface properties of the enamel, dentin and the coronary restorations.

The dental whitening effects upon the dental hard tissues

The security of use of the whitening systems is debated in numerous articles and thesis, the majority of the studies being done in in-vitro conditions, because in these conditions the preparation of the samples and the actual testing can be controlled without suspicion, they following some standardized research protocols.

Usually, the influence of the whitening materials on the structure of the dental tissues is supervised and researched.

Measuring the micro-hardness provides data upon the modifications that exist in the dental hard tissues, before the mineral deficit is clinically obvious. To determine the micro hardness of the dental tissues and also of the different types of materials used in the dental medicine, the static procedures are mostly used. To realize the measurements, the penetrating body is brought carefully in contact with the sample, after which the pressing force is increased until it reaches the desired value. The penetrating body is gradually pressed in the material of the press, until the elastic force will equilibrate the pressing force. The maximum requirement force is maintained up to 10-30 seconds. To determine the micro hardness, there was invented the penetrating device Knoop in 1939. This is a brick made of diamond with a rhombic section. The angle of the big diagonal section is 172,5* and that of the small diagonal section is 130*. The resulted print is very flat, its deepness is only 1/30 of the big diagonals. The Knoop hardness is calculated following the formula: HK=F/A=1,451F/d2, HK representing the Knoop hardness, F the force expressed in kp, A the projected surface and d the diagonal section expressed in mm. The force is compulsory to be lower than 9,8 N (1 kp). The Knoop hardness is dependent on the examination force, because the diagonal is influenced by the elastic reflux, especially the low one, the big one almost not at all or maybe in a small measure.

At the same time one can obtain details about the elastic behaviour of the material taking into account the modification of length of the small diagonal.

A specific disadvantage of the measuring of the hardness after Knoop is the predisposition of the sample to anisotrops, because only a diagonal is used for determining the hardness. However this question

frequently appears: how exact is the measurement of the micro-hardness done through static procedures, when we talk about bullate mass, like the enamel or the dental ceramics, because under the action of the examining force, the risk of fissures appearing is very high, and for the accurate interpretation of the results it is absolutely necessary the lack of fissures/ fractures at the level of each material.(1)

That is why, one of the methods has become most frequently used, considered as being the most sensible methods and the most exact to determine the modifications at the level of the dental hard tissues. This is the Atomic Force Microscopy (AFM) respectively AFM- Nano indentation.

Another method to analyze the mineralized tissues, through which the modifications at the level of the enamel can be made obvious, is the so called FT-infrared-spectroscopies. Hegedus and his collaborators had done a study using this method which showed that, after whitening, irreversible modifications occur at the level of the enamel, even if these are not clinically visible. That is why, they recommend short whitening sessions (up to one hour) and the use of whitening gels with lower concentrations.(2)

In the specialized literature there are studies that show that the whitening substances act passively towards the dental hard tissues, the whitening materials not being capable to decompose the mineral components at this level. There are other studies that oppose these ones, which say that after the whitening process appears a reductions of the content of Ca and P at the level of the enamel.(3,4) On the other hand, Crews and his collaborators came to the conclusion that the content of Ca and P in the structure of the enamel is increasing due to the use of the carbamin peroxide as whitening agent.(5)

Not only the inorganic component of the enamel can be influenced by the whitening process but also the organic one. Hegedus is one of the authors who affirms that the whitening materials determine the appearance of modifications to the organic component at the level of the dental hard tissues.(6)

To study the influence of the whitening materials upon the texture of the dental hard tissues electronic microscopy is frequently used. Presently, the examination with the help of CLSM (confocal laser scanning microscope) is used more and more. Thus one can do a very clear examination of the micro-structure of the dental samples even if wet.(7)

Regarding the influence of the dental whitening upon the texture of the dental tissues, the opinions vary: There are authors that came to the conclusion that, the effects of whitening are negligible,(8,9,10) there existing no difference between the morphology of the whitened teeth and of those not whitened. Some disagree with this opinion, saying that the whitening influences in a certain way the texture, the effect being obvious hard the appearance of small porosities at this level.(11,12)

Beside the effects of the whitening treatment upon the surface texture of the dental hard tissues, it is also taken into consideration its effect upon the texture after sectioning the different levels of these. In these cases the structural modifications could not be observed.(7,13).

The effects of dental whitening upon the coronary restorations:

There are some series of publications that deal with the effect of dental whitening upon the dental restorations, with views regarding the aesthetic effect and also the influence of whitening upon the chemistry and texture of these. As regards the aesthetic aspect the opinions are devised: there are authors who are of the opinion that, the whitening processes do not influence at all the restorations, as far as colour is concerned (14) and there are other authors who came to the conclusion that there takes place a slight colour modification which can be negligible.(15,16)

The compositional dental fillings appear at times lighter in colour due to the process of whitening, this thing being seen only with the help of the digital colour reading procedures. The provisional dental fillings based methacrylate turn coloured in orange contrasting with the peroxides, on the contrary those based on polycaboxilate and bis-acrylate do not colour when in contact with the peroxides, thing which should favour to choose the latter.(7)

Considering the chemistry and the texture of the restorations, the effect is merely dependent on the material used.(17) The ceramic masses and gold are not influenced by peroxides. The composite materials react with the peroxides.

A study done at the University of Freiburg came to the conclusion that, teeth whitening influence the superficial strata of the composite masses. The authors are of the opinion that, the finishing of the dental fillings is not sufficient to restore the physical properties of these materials. Every time the properties of the composite materials are tested, one must keep in mind: the type of material and the type of polymerization, the thread content, the existence of porosities, the temperature of the environment.(18)

The amalgam when in contact with the peroxides reacts oxidatively. One can observe the appearance of taints and modifications at the level of the amalgam dental filling surfaces. Rotstein found the mercury discharge, in the gaseous phase, the discharge factor increasing up to 30. Aside from this, there are no concrete data regarding the duration of the discharge of mercury after it contacts the peroxides. Nonetheless, it is indicated that one should reduce as much as possible the contact between the different types of amalgam and the whitening substances.(19)

The situation is similar when talking about the zinc phosphate cement and the whitening substances, the contact between them must be avoided as the zinc phosphate dissolves when in contact with the peroxides gels.(19)

CONCLUSIONS

The large number of studies that describe the

whitening systems as being secure clinically are contradicted by other studies that show there is a risk in using the whitening systems, especially when they are used inadequately. A major concern is put on the value of pH and the composition of the gels which are used, but also on the use of an active substance' concentration which is too high.

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