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Research Article

The Collagen Fiber Layer of Tooth Dentine. A Scanning Electron Microscope (SEM) Discovery

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Abstract

The influence of different treatment of the surface of IPS Empress II (e max) with different silane agents so we can cement it with tooth dentine, using several cementation protocols is a fact in aesthetic dentistry nowadays. The evaluation of the cementation success led us to conclusions of a lack of perfection in cementation with the most of the protocols and, the existence of mini-gaps between the cement and the dentine matter of the tooth. These facts revealed in our research the collagen fiber layer of tooth dentine.

Keywords: *Collagen Fiber Layer; Tooth Dentine; Scanning Electron Microscope (SEM)*

Introduction

It's well known that cementing a glass-ceramic system with tooth dentine, probably will reveal mini-gaps (50 - 100 μm) between the glass ceramic surface and the dentine matter of the tooth [1,2] (Figure 1).

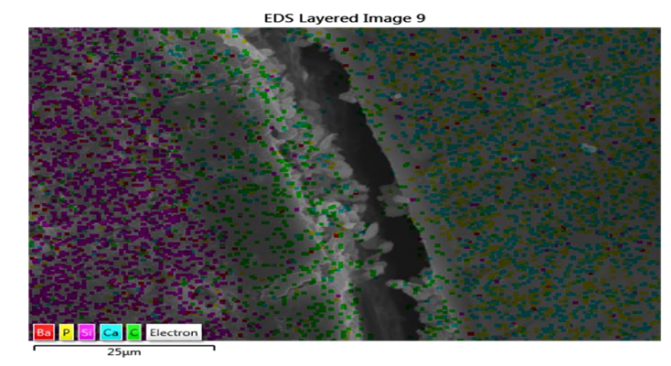

Figure 1

Examining the gap with EDX Analysis, we find out that there is an absolute absence of elements of the gap area. That actually proves the absence of cement at that area, nor any other substance from the cementation process.

Materials and Experimental Procedure

Natural fresh extracted, third molars were prepared for IPS Empress II (e max) veneers. Cores of the glass-ceramic material were used to manufacture ceramic veneers for that cause.

The ceramic surface treatment included acid etching with HF aqueous solution 10% for 30 sec, washed with distilled water and then air-dried. After the etching we proceed with salinization for 20 sec, with one silane agent each time.

The dentine surface was treated with $H_3(PO_4)_2$ aqueous solution 35%, as etching method, for 15 sec and then washed with distilled water and air-dried. After the etching we proceed with dentine primer agent for 15 sec so the dentine gets moisturized. The dentine primer agent is commonly part of the cementation kit we used each time for the cementation of our veneers.

The veneers were permanently cemented, using different silane agents, different resin cements and different dentine primer agents.

The teeth were divided into two pieces, just to observe the interface under Scanning Electron Microscope (SEM) [2] (Figure 2 and 3).

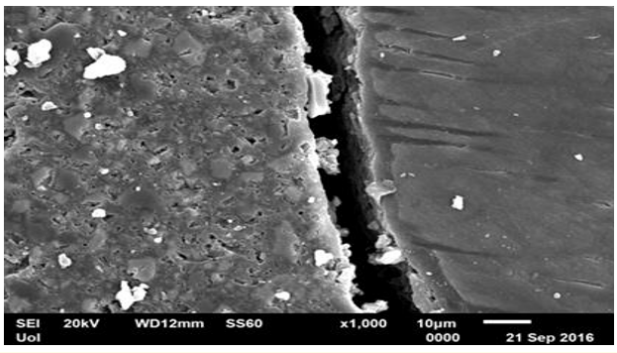

Figure 2

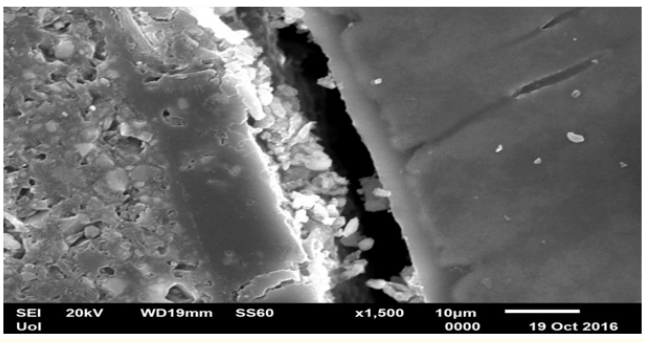

Figure 3

Results and Discussion

After the observation with scanning electron microscope (SEM) it was revealed that at cementation gaps from the dentine side of the interface, using EDX Analysis (Figure 1) the only element existed was "C" and "Ca".

According to the literature, dentine after etching with $H_3(PO_4)_2$ aqueous solution 35%, is actually burned and the only remaining part are the inorganic crystals of "Ca" of dentine tubes, with all the collagen fibers, hidden inside.

The use of dentine primer, has actually the ability to attract the collagen fibers with its hydrofriendly character to the dentine surface, providing with an organic layer the dentine surface, coming through the dentine tubes. That actually explains the existence of "C" on the dentine surface. The existence of "C" on the cement side are actually the broken pieces of the collagen fibers that collapsed through the cementation process and created the mini-gaps.

Examining the scanning electron microscope pictures we observe that the organic layer (Figure 2 and 3) has the same thickness above the inorganic crystal part of dentine. The fact that the third molars were, all of them, vital until the time of extractions and, with no decays existence marks the vitality of the tooth structures so we can talk about a "collagen fiber layer" of tooth dentine (Figure 4 and 5).

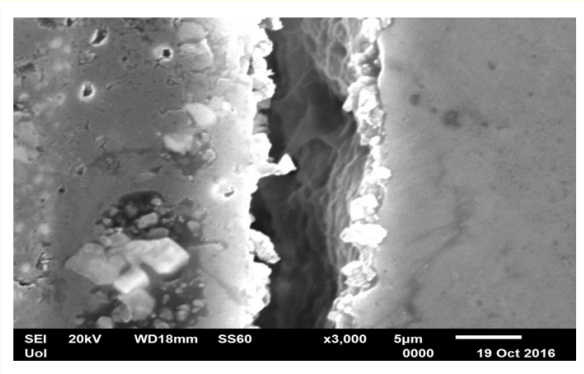

Figure 4

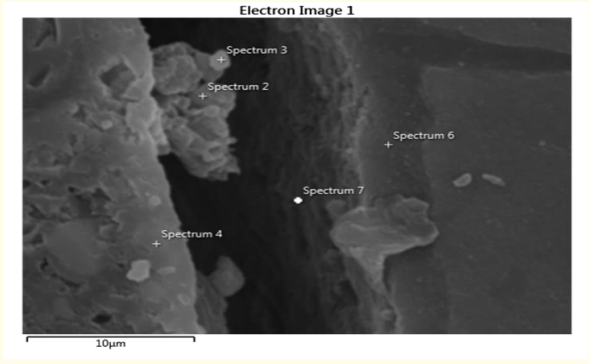

Figure 5

Conclusion

As it is concerned the collagen fiber layer of the tooth dentine, it appears as a homogeneous surface above the dentine tubes. A poetic point of view could refer to it as "the sea surface while a gently breeze of air wave's her". Up to now we knew the existence of collagen fibers through gamma radiation tracking, but now we can have a better look to how it actually appears as a collagen fiber layer all over the prepared dentine.

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