

Investigation of the Bond Strength of Aesthetic Brackets on Human Enamel - an Innovative Approach

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INTRODUCTION: In orthodontic literature there is very much research published on bonding brackets or other type of attachments since any treatment can fail or be unduly prolonged in spite of good diagnosis and treatment plan if bonding is not done properly. Because of the increase of the mean age of orthodontic patients, a new set of problems have arisen, such as bonding brackets to prosthodontic restorations as ceramic crowns or veneers and using aesthetic brackets instead of metal ones. Orthodontic bonding is done primarily with composite resin but can also be performed using glass ionomer or resin cements. The bond strength of the bracket-tooth interface is improved by conditioning of the buccal (or lingual) tooth surface with acids (H_3PO_4 for enamel and HF for ceramics). In our study we investigated and compared the quality of bonding between ceramic brackets, polymeric brackets and enamel, respectively using a combined method – OCT [^{1,2,3,4}] and confocal microscopy.

The aim of our study was to evaluate the resin layer at the brackets base - tooth interface.

METHODS: We used 100 permanent crack- and caries free permanent teeth that were kept in demineralised water at in the refrigerator until the moment of making the samples. All teeth were cleaned with pumice and rotary brushes. In order to maintain constant quality of the samples brushes were changed after every fifth tooth with new ones. After cleaning the teeth acid etched and brackets were bonded conventionally with composite resin.

The bonding protocol was identical for both types of brackets (ceramic and polymer). We bonded ceramic brackets on 50 teeth (group1) and polymer brackets on the rest of teeth (group2).

The two groups were all investigated using OCT at 1300 nm and confocal microscopy (figure 1).

RESULTS AND DISCUSSION: Following the OCT investigation gaps were found in both sample groups. In group1 (ceramic) we found 6 gaps (12%) and in group2 there were detected only 4 (8%). Group 1 presented slightly larger gaps. We

consider that the defects found might have been produced as a consequence of human error.

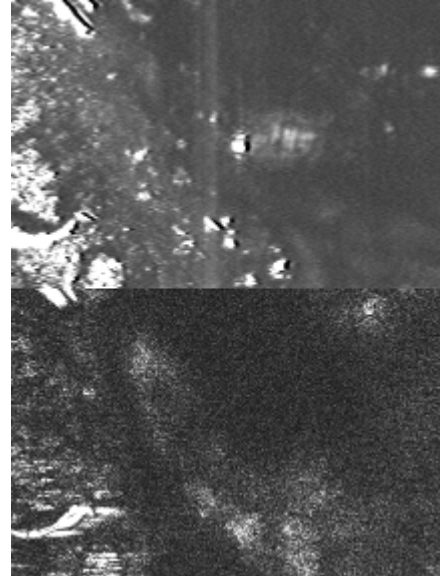


Fig. 1. Defects inside the bonding material investigated with confocal microscopy (upper image and en face OCT scanning (below))

CONCLUSION: Further studies are necessary to determine whether indirect bonding would minimize the error rate.

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