

Development of Cosmetic Orthodontic Bracket and Bracket Cover

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ABSTRACT

Brackets used for orthodontics are generally made from three kinds of materials, namely stainless steel, plastics and ceramics. In addition, several kinds of orthodontic wire exist, that is, these are made from some materials (Ti-Nb, Ni-Ti, Ti-Mo, etc.) and their sections are of different shape and size. Cost of stainless steel bracket (SB) is relatively low in comparison with plastics bracket (PB) and ceramics bracket (CB). And SB has superior mechanical properties (durability, toughness and strength) too. However, SB has an aesthetic problem due to its reflected light as shown Fig.1.



Fig.1 (i)Stainless Steel Bracket and (ii)Wire on Tooth

On the other hand, the use of finite element method (FEM) in the fields of orthodontics has significantly increased in recent years due to its superior capability to analyze various complicated problems, namely non-linear, optimum problems and so on^[1-3].

The purpose of this study is to develop cosmetic SB (CSB) to reduce its reflected light. However its function and efficiency are still the same as (or more than) general SB. And a reduced reflected light bracket cover (BC) fit on general SB has been developed.

To verify their effects, the following things has been executed.

1. Loads to a tooth from some kinds of orthodontic wire are measured by experiments.
2. A tooth and an alveolar bone are modelled in a CAD software (SolidWorks) from a patient's CT images and a general SB, CSB and BC are created by SolidWorks. These model data are exported to a CG software (Blender) in order to compare the influence of the reflected light.
3. Stresses of a tooth with general SB or CSB and a bone are calculated by using an FEM software (SolidWorks Simulation). In addition, strength of BC covered on general SB is analysed too.

The obtained conclusions are as follows:

1. The load to a tooth from an orthodontic wire is about 2[N].
2. The CSB has superior mechanical properties than general SB.
3. The BC has sufficiently strength and reduces the reflected light.

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