The Evaluation of the BioBleach Trays

Efficiency and manufacturing process

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Tooth bleaching and other cosmetic treatments (performed at home or in the dental office) are very common nowadays. The use of thermoplastic materials for the manufacturing of whitening trays should have good biomechanical properties in order to assure a good treatment outcome with a good esthetic result. The most common tray manufacturing material is an acrylic poly-resin thin foil that can be vacuum-formed in order to fit any clinical situation. The material must be inert in order to prevent harmful free radicals release form the interaction with different bleaching substances. Thermoformed trays were manufactured in our dental office and immersed in a mixed oral suspension (that also contained artificial saliva) in order to test the behavior of the material in the intraoral environment.

Key words: bleaching trays, thermoplastic materials, vacuum-formed foils

Various bleaching modalities are now offered to patients, either monitored by the dental office or self-directed, for which relative efficiency is unknown [1].

The thermoplastic materials used for bleaching tray fabrication should have particular characteristics including transparency, lower hardness, better elasticity and resilience, and resistance to aging. However, manufactured bleaching trays could have inherent limitations such as dimensional instability, low strength and poor wear resistance. These issues could be associated with materials characteristics and/or with the manufacturing processes. Another factor that should be taken into account is the thickness of the bleaching tray foil and the whitening agent that is used [2, 3]. The chemical properties of the material have a great importance due to the possibility of toxic free radicals release when the tray makes contact with the bleaching agent [4- 6].

The most common materials used for the manufacturing of the bleaching trays are PETG (Duran foils), PC/TPU foils (Dura soft), Copy plast (PE foils), etc. The most used thickness is the 0.5 mm foil due to a higher elasticity and transparency.

The present study aims at the characterisation of the manufactured bleaching teeth tray. The manufacturing process could introduce unexpected limitations in the resulting trays.

Firstly, mechanical properties of different materials commonly used in dental practice for fabrication of bleaching trays has been assessed through a set of tensile tests carried out under different conditions [7]. The tests have the purpose of analysing the effect that the forming process, and subsequently the normal use of the trays, may have on properties of the material. For this reason, the samples were subjected to an aging treatment in a particular solution that reproduces the biochemical behaviour of human saliva. Special considerations must be given to the gingival reaction of the thermoplastic materials due to the chemical composition in a prolonged use of the tray [8].

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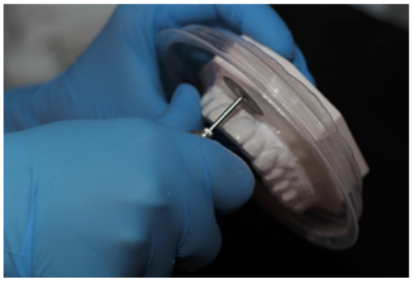
Experimental part

Materials and methods

Two bleaching trays were manufactured in our dental office (fig. 1, 2). The BioBleach soft foils were used to manufacture the bleaching trays. Before the vacuum-forming process of the thermoplastic foils, intraoral impressions were taken. After the manufacturing of the models, trimming was done in order to assure a good adaptation of the foil in relation to the gingival margin. The trays were then manufactured through-out a thermal vacuum-forming process using the Ministar device (fig. 2, 3, 4). Also, reservoirs were added to the bleaching trays for a more efficient treatment. In order to establish the quality and efficiency of the thermoplastic material, an aging treatment solution (that contained artificial saliva) was prepared, similar to the intraoral environment. The trays were submerged in the aging solution and were left there for ten hours. The purpose was to see if the trays presented micro-cracks, biofilm deposits, delaminated areas, etc.

Fig. 1. The stone model of the selected case

Fig. 2. The manufacturing of the trays: the Ministar vacuum-forming device



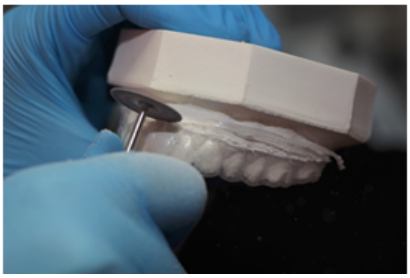


Fig. 3. The cutting and the finishing phase of the tray

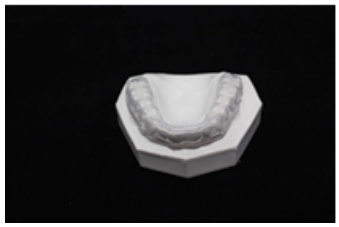


Fig. 4. The final result: the upper bleaching tray applied on the stone model

Results and discussions

The vacuum-forming process has a small effect on thickness reduction of the foil but the clinical implications to this small amount is insignificant. The aging treatment with the oral suspension had some effect on the bleaching trays (microscopic changes), such as biofilm deposits and a slightly delamination of the tray surface, but since these trays are only used a couple of times by the patient, compared to other thermoplastic foils that are used for dental alignment, for a much longer period of time, the clinical implications are minimal.

Dealing with tetracycline stains, fluorosis, uneven tooth colour through-out the dental arch or other aesthetic implications, are only a few reasons for tooth bleaching. A good result is conditioned by a high quality of the thermoplastic bleaching trays, a good bleaching agent and other auxiliary techniques that can enhance the aesthetic effect (liners, sandblasting, etc.) [9-11].

Conclusions

The tensile tests and the chemical behaviour of the foils, as well as the vacuum-forming process seem to have good outcomes regarding the clinical implications of the bleaching trays. Therefore, a good treatment outcome is expected.

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