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Evaluation of the retention and mechanical properties of different orthodontic aligners
(An in vitro study)

A thesis submitted to the council of the College of Dentistry/University of Baghdad in partial fulfillment of the requirements for the degree of master of science in Orthodontics

By
Hussein Shakir Al Noor
B.D.S

Sami K. Al-Joubori
Assist. Prof of orthodontics

B.D.S., M.Sc.

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ABSTRACT

Researches on aligners are limited; therefore, Understanding the properties of the aligner materials can help to produce more accurate results of the aligners and provide more data for orthodontists who are currently using or intending to use this technology.

This study was aimed to investigate mechanical properties (Hardness and Elastic Modulus) of three thermoplastic materials (Leone, Clear aligner, Duran) used in the fabrication of orthodontic aligners and to measure the retention of the aligners made from these materials with and without the presence of attachments.

An impression was taken for the upper arch of a candidate and the treatment plan was done using blue sky plan software. Three thermoplastic materials (Leone, Clear aligner, Duran) were used in this study and 10 samples for each material were used to make aligners. Retention tests were done using tensile test in the Universal testing machine to measure the maximum forces required to remove the aligners from the models. Shore D hardness test was used to measure the hardness of three companies of hard thermoplastic materials.. For elastic modulus, thermoplastic sheets that were less than 1mm in thickness were measured according to the ASTM D 882-02 and those that were 1mm or more were measured according to the ASTM D 638-02a. Ten samples were tested for each of the three materials and the elastic modulus was calculated using tensile test in the Universal testing machine.

Leone 0.8 mm was higher than Clear aligner 0.5 mm in the retention tests of all groups. Leone 0.8 mm was higher than Duran 1mm in two groups (aligner number 1 groups). Hardness tests for the three brands showed no significant differences among them. Leone 0.8mm was less than Duran 1mm and Clear aligner 0.5mm in the elastic modulus.

It can be concluded that Clear aligner 0.5mm is the least retentive aligner. Leone 0.8mm has the highest retention value in both attachments and non-attachments groups regarding aligner number 1. There is no significant difference in hardness among all the three materials used in this study. The elastic modulus of Leone 0.8mm was the least among all the tested sheets.