Influence of mixing methods and disinfectant on physical properties of alginate impression materials

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OBJECTIVES

The aim of this in vitro study was to quantify the effect of both manual (HM) versus automatic mixing (AM) and of using a disinfectant on various mechanical properties: tensile strength, elastic recovery and detail reproduction of three different alginate impression materials.

MATERIALS AND METHODS

Two of the three alginates that were tested were especially developed for orthodontic purpose: Orthotrace® (Cavex Holland BV, Haarlem, the Netherlands) and Orthofine® (Postbus 92, 3700 AB Zeist, the Netherlands) while the third tested impression material was a conventional alginate CA37FS® (Cavex Holland BV).

Alginates were either mixed by hand or automatically using a Cavex alginate mixer II® (Cavex Holland BV) according to the manufacturer's recommendations.
Mixing was performed at room temperature using tap water. The material was allowed to set in a water bath at 35 °C (± 1 °C), simulating intra oral setting conditions and half of the samples were disinfected before testing.

Fig 1. Sample before testing the tensile strength with Instron® 500.

The disinfectant used was the Cavex ImpreSafe® (Cavex Holland BV) which has a bactericide, virucide and fungicide function. The specimens were exposed for three minutes in a 3% solution and tested according to the ISO 1563: 1990(E) standard specifications for Dental Alginate Impression Materials. Descriptive statistics as well as a two and three-way ANOVA were performed using SAS statistical software package (SAS Institute, Cary, North Carolina, USA).

RESULTS

Evaluation of tensile strength and elastic recovery of different alginate samples, whether either hand mixed versus automatically mixed or disinfected versus not disinfected, resulted in significant differences for all materials. Considering detail reproduction, all three alginates reproduced the 50 µm-line successfully without interruption. However, Orthotrace® and CA37FS® could also reproduce the 20 µm line with the automatically mixing method.

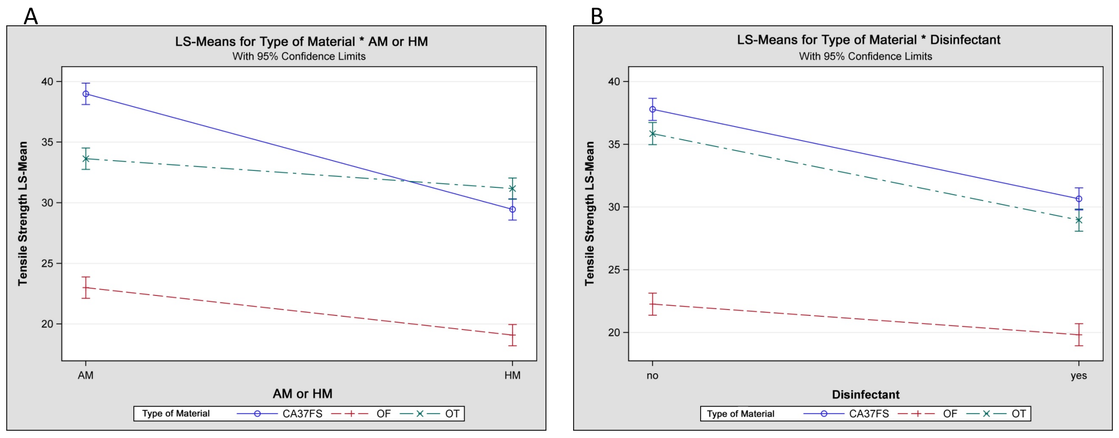

Fig 2. Effect of mixing technique (A) and disinfectant (B) on tensile strength of the three different materials tested.

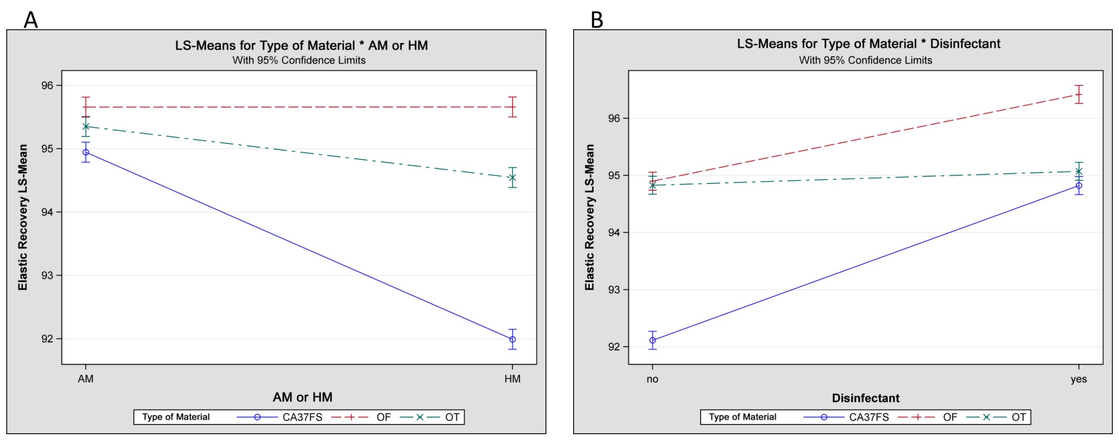

Fig 3. Effect of mixing technique (A) and disinfectant (B) on elastic recovery of the three different materials tested.

CONCLUSIONS

The mixing method can significantly affect the elastic recovery and tensile strength of the alginates tested while the effect of using a disinfectant is less explicit. Concerning tensile strength, CA37FS® showed to be the strongest material, followed by Orthotrace®, while Orthofine® has a very low tensile strength.
All three alginate impression materials complied with the minimum recovery from deformation of 95 %. However, CA37FS® samples that were disinfected and mixed by hand have an elastic recovery lower than the specified minimum.

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