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Compression tests on heat-curing dental resins

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Introduction

Complete dentures' repairs are frequent at elderly patients. These dentures are made from different acrylic resins, which have different mechanical properties [1,2,3,].

Material and Methods

18 pairs of complete dentures were manufactured at Faculty of Dentistry Timisoara, using the classical technology. These were realized on the same model type, from different heat-curing dental resins: Superacryl, Triplex, Vertex. A group of 6 pairs (2 from each material) were tested directly on the mechanical testing machine LBG 100T, other 6 had as support the plaster model and other 6 were adapted on models with help of silicone (Lastic Xtra, Kettenbach, Germany). The prostheses were tested at compression, until they broke, by applying forces on their occlusal surfaces.



Fig. 1a: Mechanical testing machine LBG 100T



Fig. 1b: Force applying detail

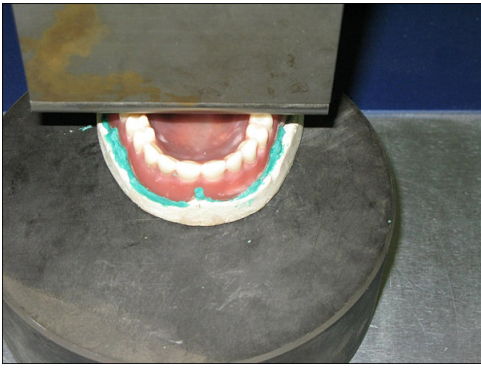


Fig. 1c: Force applying detail

Fig. 1d: Force applying detail

Results

The results emphasized a rapid braking of the prostheses that didn't have any support; slower braking and multiple pieces fracture of plaster model and then that of the prostheses (Fig. 2b). The slowest fracture took place at prostheses adapted on model with help of silicone (Fig. 2a). The braking happened at 2,1 kN, as seen in the graphic below (Fig. 3b- on silicone). Figure 3a (without silicone, directly on model) shows the moment of model braking; by continuing the force application on denture's occlusal surface, we notice a peak of its deterioration at 2,079 kN. Vertex material had the best behaviour, in all three situations.



Fig. 2a: Fractured complete denture

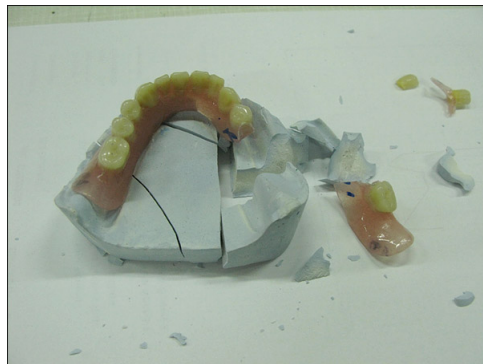


Fig. 2b: Fractured complete denture

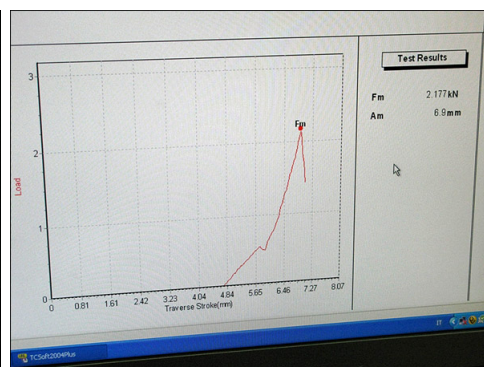
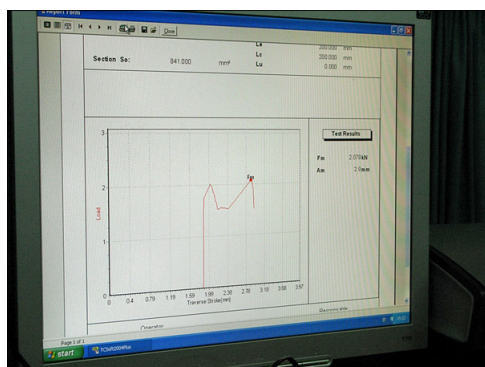


Fig. 3a: Compression load diagrams - denture is situated directly on model

Fig. 3b: Compression load diagrams - denture is adapted on model by silicone

Conclusions

We can conclude that, by imitating the soft tissue with help of silicone, we are closer to the reality from the mouth. The more intimate adaptation to prosthetic field the prostheses have, the more resistant they are (from the mechanical resistance point of view). In case of using silicone, the compression resistance force was higher and, that way, it happened a slower braking in comparison with the case of applying the denture directly on model, as shown in diagrams above. Also, we observed that, denture's mechanical behaviour is connected to resin's properties.

Literature

- Diaz-Arnold AM, Vargas MA, Shaul KL, Laffoon JE, Qian F: Flexural and fatigue strengths of denture base resin. J Prosthet Dent. 2008 Jul; 100(1):47-51.
- D.L., Dixon, K.G. Ekstrand, L.C. Bredding, (1991). The transverse strengths of three denture base resins. J. Prosthet. Dent., 66: 510-513.
- G. Uzun, N. Hersek. (2002 Jul): Comparison of the fracture resistance of six denture base acrylic resins. J Biomater. Appl.; 17(1):19-29.

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This Poster was submitted by DMD PhD stud. Otilia Bolos.

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COMPRESSION TESTS ON HEAT-CURING DENTAL RESINS

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INTRODUCTION: Complete dentures' repairs are frequent at elderly patients. These dentures are made from different acrylic resins, which have different mechanical properties.

METHODS: 18 pairs of complete dentures were manufactured at Faculty of Dentistry Timisoara, using the classical technology. These were realized on the same model type, from different heat-curing dental resins: Superacryl, Triplex, Vertex. A group of 6 pairs (2 from each material) were tested directly on the mechanical testing machine LBG 100T, other 6 had as support the plaster model and other 6 were adapted on models with help of silicone (Lastic Xtra, Kettenbach, Germany). The prostheses were tested at compression, until they broke, by applying forces on their occlusal surfaces.

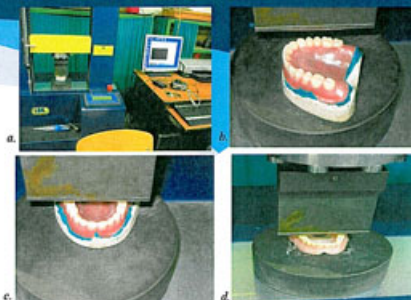


Fig.1. a. Mechanical testing machine LBG 100T; b, c, d. Force applying detail

RESULTS: The results emphasized a rapid braking of the prostheses that didn't have any support; slower braking and multiple pieces fracture of plaster model and then that of the prostheses (Fig. 2b). The slowest fracture took place at prostheses adapted on model with help of silicone (Fig. 2a). The braking happened at 2,1 kN, as seen in the graphic below (Fig. 3b- on silicone). Figure 3a (without silicone, directly on model) shows the moment of model braking; by continuing the force application on denture's occlusal surface, we notice a peak of its deterioration at 2,079 kN. Vertex material had the best behaviour, in all three situations.

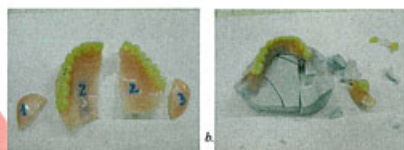


Fig.2. a, b. Fractured complete denture

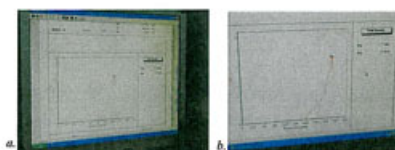


Fig. 3. Compression load diagrams: a. denture is situated directly on model; b. denture is adapted on model by silicone.

DISCUSSION & CONCLUSIONS: We can conclude that, by imitating the soft tissue with help of silicone, we are closer to the reality from the mouth. The more intimate adaptation to prosthetic field the prostheses have, the more resistant they are (from the mechanical resistance point of view). In case of using silicone, the compression resistance force was higher and, that way, it happened a slower braking in comparison with the case of applying the denture directly on model, as shown in diagrams above. Also, we observed that, denture's mechanical behaviour is connected to resin's properties.

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REFERENCES: Diaz-Arnold AM, Vargas MA, Shauil KL, Laffoon JE, Qian F. Flexural and fatigue strengths of denture base resin. *J Prosthet Dent.* 2008 Jul; 100(1):47-51. D.L., Dixon, K.G. Ekstrand, L.C. Bredding, (1991). The transverse strengths of three denture base resins. *J Prosthet Dent.* 66: 510-513. G. Urzun, N. Heseck. (2002 Jul): Comparison of the fracture resistance of six denture base acrylic resins. *J Biomater. Appl.*; 17(1):19-29.