Errors in Full Denture Casting Using Acrylic Resins

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Full denture casting currently represents a technological alternative. The casting system we tested usually uses reversible hydrocolloids for investing wax patterns. Besides the system's own advantages, the authors also noticed certain errors consecutive to casting, materialized in lack of substance and the development of porosities on the mucosal facets of the complete denture bases.

Keywords: casting, full dentures, errors

Full denture casting currently represents an alternative to the manufacturing of full dentures, used in parallel with the classical barothermopolymerization of acrylic resins or to various injection techniques[1]. According to DIN EN ISO 1567 standard, autopolymerizable acrylic resins that are suitable for casting belong to type 2, group 2 of acrylic resins (table 1). Their common characteristic is that they are polymerized at temperatures below 65°C, after being poured in a casting flask. This means that they have already been prepared in a texture suitable for casting [2,3]. Each resin developed by various companies has its own casting system.

The aim of the study was to test the casting technology of full dentures, to establish the advantages and disadvantages of this relatively new method, as well as to assess possible errors that may develop.

Experimental part

Various models of total edentation were chosen. Full dentures were manufactured for each model using the casting technique. The casting technique chosen was that of the Vertex Company, the resin used being an autopolymerizable acrylate based on methyl polymethylacrylate. The resin is presented in a powder-liquid bicomponent system, intended for casting.

The method used was the traditional method of all the following technological steps in manufacturing full dentures, including the final pattern step [4] (fig. 1). For

Table 1
CLASSIFICATION OF RESINS ACCORDING TO DIN EN ISO - 1567

Type	Class (method of processing)	Group (manner of presentation)
Type 1	thermopolimerizable resins (>65°C)	Group 1: bicomponents-powder and liquid Group 2: monocomponents
Type 2	autopolimerizable resins (<65°C)	Group 1: bicomponents-powder and liquid Group 2: bicomponents-powder and liquid for casting
Type 3	thermoplastic resins	Monocomponent system-grains in cartridges
Type 4	photopolimerizable resins	Monocomponent system
Type 5	microwave polimerizable resins	Bicompoment system

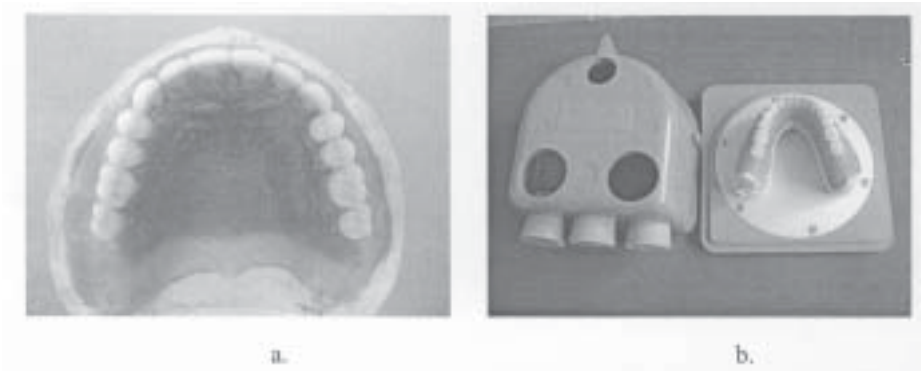

Fig. 1. Final pattern of the dentures, ready for investing: a. maxillary pattern; b. mandibular pattern

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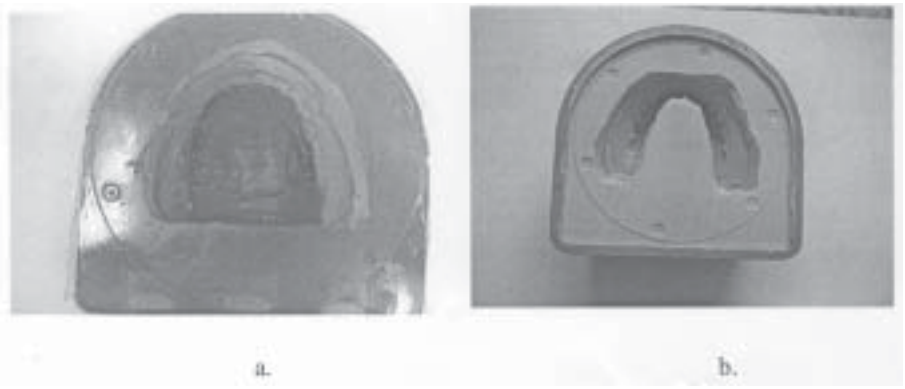

Fig. 2. Investment of the pattern with: a. reversible hydrocolloid; b. silicone

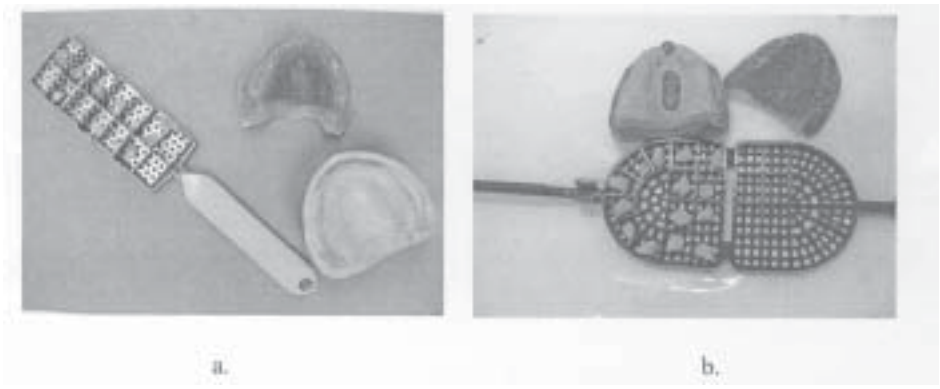

Fig. 3. The pattern: a. the full denture base pattern removed from the pattern;
b. the teeth placed in the Clean-Tray device

Fig. 4. Repositioning of the teeth in the investment impressions: a. made of reversible hydrocolloids, b. made of silicone

the investment, the finite pattern is attached to the base of the flask with a special silicone. The liquefied hydrocolloid is thus cast in the already prepared flask.

Turning the pattern into the finite denture is carried according to the specifications of the full denture casting system. The finite pattern is invested in a special flask, using either a reversible hydrocolloid or a silicone material (fig. 2). The indication of the system used is investing with a reversible hydrocolloid, but we also invested with silicones, to compare the results obtained.

Once the impression materials have set, the flask is unwrapped, the model is removed together with the denture base pattern.

The teeth are introduced in the Clean-Tray device, removing the wax remains (fig. 3).

Following investment, a pouring canal and two draining canals are made in the resulting pattern, using the special rods provided by the system. Subsequently, the teeth are repositioned in the investment impressions (fig. 4).

The acrylic resin is then prepared and poured through the specially created canal until the canal is completely filled. Afterwards, the acrylic resin is polymerized by immersing the flask for 30 min into a special polymerization pot which contains water at a temperature of 50+/-5°C, 2.5 bars. The polymerized denture is subsequently removed from the investment. The necessary adjustments are minimal, mainly in the interdental spaces (fig. 5).

Fig. 5. The denture removed from
the elastic investment

Fig. 6. Deficiencies in using reversible hydrocolloids for wax pattern investment; a. bubbles that develop in the mass of the reversible hydrocolloid in the flask; b. pressing the flask leads the development of holes in the mass of the hydrocolloid; c. melting of denture base wax.

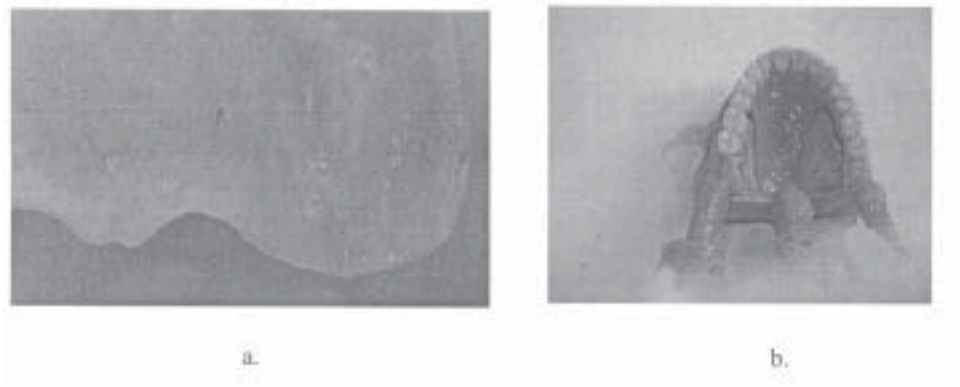

Fig. 7. a. detailed view of the porosity on the mucosal face of the denture; b. lack of substance

Results and discussion

Deficiencies have developed mainly in dentures that were produced using impressions made of reversible hydrocolloids. When the reversible hydrocolloid was poured into the flask, air bubbles developed at the surface of the canals. Although the flask had been closed with clasps, when the flask was pressed, the bubbles became even more apparent. After the hydrocolloid cooled down and was removed from the investment, the base pattern wax had melted in the very place where the flask had been pressed (at the insertion of the hydrocolloid solution). The causes of these deficiencies lie in the improper setting of the hydrocolloid, in the absence of vibration, which causes bubbles to develop and the denture base pattern wax to melt (fig. 6).

The dentures obtained by casting had a high level of porosity on the mucosal surfaces (fig. 7), which develops when the acrylic resin is being poured. This porosity is caused by the incorporation of air bubbles when the acrylic resin is poured in the mold. Dentures may also be incomplete (fig. 7), due to the fast setting of the resin which requires great skill when pouring it in the mold.

Conclusions

When using a new technology, one should consider all the aspects incurred, namely both the advantages and the disadvantages offered by the system. The producer's indications must be followed "ad literam".

The casting system has the following advantages: the reversible hydrocolloid can be reused; reduced polymerization time; wide colour range of the material (10 colours), minimal adjustments required.

Disadvantages of the full denture casting system are: costly technology due to the necessity to acquire the casting system; in the case of retentive fields, problems may occur during the unwrapping stage; possible errors may occur during tooth positioning.

We consider that the alternative of using a silicone material rather than a reversible hydrocolloid for investing the final pattern is better because, when a hydrocolloid is used, bubbles can develop in mass of the material. Pressing the flask to eliminate these bubbles leads to the melting of denture base wax.

The study revealed possible errors subsequent to full denture casting, i. e., flaws that develop on the mucosal surfaces, which may be a consequence of a flaw in preparing acrylic resins, and mainly in improper pouring.

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