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Improving Wax Spacer Integrity and Removal in Custom Tray Fabrication Using Aluminium Foil

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Abstract

In the fabrication of complete dentures, a precisely made custom tray is essential for obtaining accurate impressions and for ensuring the correct application of pressure and relief on completely edentulous arches. The use of auto-polymerizing polymethyl methacrylate (PMMA) resin has simplified the process of custom tray fabrication. Light-activated polymerizing resin in combination with baseplate wax as a spacer remains a commonly used approach. However, the exothermic polymerization of PMMA can soften or melt the wax spacer, leading to dimensional distortion, tray contamination, and inconsistencies in spacer thickness, thereby compromising the tray's intended function. This article presents a simple and effective technique that uses aluminium foil to maintain the intended wax spacer thickness and facilitate its easy removal during custom tray fabrication with auto- and light-activated resin materials.

Keywords: Auto-polymerizing PMMA resin, Custom tray, Aluminium foil, Wax spacer.

INTRODUCTION

The use of a spacer during custom tray fabrication is essential for achieving accurate definitive impressions in completely edentulous patients [1]. A spacer provides controlled relief, ensures uniform thickness of impression material, and helps regulate tissue displacement during impression making. According to selective pressure theory, different areas of the denture-bearing tissues require varying degrees of pressure based on their displaceability [2].

Despite advances in computer-aided design and manufacturing (CAD/CAM) and intraoral scanning technologies, conventional impression techniques using custom trays remain the most commonly employed method for complete denture fabrication [3]. Accurate impressions using these techniques depend heavily on the design and integrity of the spacer incorporated during tray fabrication [4].

Auto-polymerizing polymethyl methacrylate (PMMA) and light-activated resin materials are widely used for custom tray fabrication, with baseplate wax serving as the most common spacer material [5-7]. However, the exothermic polymerization of PMMA can generate temperatures ranging from 70°C to 90°C, which exceeds the melting point of baseplate wax (approximately 45°C). This may result in wax spacer distortion, loss of uniform thickness, tray contamination, and difficulty during spacer removal.

Various spacer-protection techniques have been proposed to overcome this limitation, including the use of cellulose acetate sheets, vacuum-formed thermoplastic spacers, and alternative spacer materials. While effective, these methods may involve additional cost, equipment, or limited availability.

The purpose of this article is to describe a simple technical modification in which a thin sheet of aluminium foil is placed over the wax spacer during custom tray fabrication. This modification aims to preserve wax

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spacer integrity during polymerization and facilitate easier spacer removal, without altering conventional tray fabrication procedures.

TECHNIQUE

1. Preliminary cast preparation: Make a preliminary cast of the edentulous arch and outline the tray extension, spacer area, and tissue stops (Figure 1).
2. Spacer adaptation: Adapt baseplate wax of the desired thickness onto the cast, cutting out the wax over the tissue stops (Figure 2).
3. Foil placement: Adapt a thin sheet of aluminium foil (0.001 inch, e.g., Falcon Heavy Duty Aluminium Foil) over the wax spacer, leaving a 1 mm margin short all around. This ensures adequate adhesion between the wax and PMMA resin. Apply a separating medium over the cast, excluding the foil-covered wax area (Figure 3).
4. Tray fabrication: Fabricate the custom tray using either auto-polymerizing PMMA (by sprinkle-on or dough adaptation methods) or light-activated resin (Figure 4).
5. Finishing and spacer removal: Trim, smooth, and polish the tray borders. The wax spacer and aluminium foil are then removed together before making the final impression (Figure 5,6).



Figure 1: Outline markings on the preliminary cast indicating tray extension, spacer area, and tissue stop locations



Figure 2: Adaptation of baseplate wax spacer to the desired thickness, with tissue stop areas left uncovered



Figure 3: Placement of a thin aluminium foil sheet over the wax spacer, positioned approximately 1 mm short of the spacer margins



Figure 4: Fabrication of the custom tray using auto-polymerizing or light-activated resin material over the foil-covered wax spacer



Figure 5: Removal of the aluminium foil and wax spacer from the completed custom tray



Figure 6: Intaglio surface of the custom tray after complete removal of the wax spacer and aluminium foil

DISCUSSION

Auto-polymerizing PMMA resin undergoes an exothermic reaction during polymerization, with temperature rise influenced by resin thickness and processing technique [4]. When baseplate wax is used directly as a spacer, exposure to this heat may cause partial melting or deformation, leading to inconsistent spacer thickness and difficulty during removal after tray fabrication.

The technical modification described in this article involves placing a thin aluminium foil sheet over the wax spacer before tray processing. Aluminium foil, with a melting point of approximately 660°C, acts as a physical and thermal barrier between the resin and the wax. This barrier helps minimize heat transfer to the wax spacer, thereby maintaining its intended thickness and allowing the wax and foil to be removed together easily after polymerization.

Previous techniques have attempted to address spacer distortion using alternative materials [8]. Tripathi et al. described the use of a cellulose acetate sheet to reduce heat transfer during PMMA polymerization [9]. Nanda A et al. proposed replacing wax with a vacuum-formed polyvinyl sheet, which provides dimensional stability and ease of removal [10].

Compared with these methods, the aluminium foil modification offers advantages of low cost, easy availability, simplicity, and compatibility with both auto-polymerizing and light-activated tray materials. However, this technique is descriptive in nature and was not supported by quantitative temperature measurements, dimensional analysis, or experimental comparison with other spacer-protection methods. The absence of such data represents a limitation, and further controlled studies are required to objectively evaluate its effectiveness.

CONCLUSION

When baseplate wax is used alone as a spacer, it may soften or deform during polymerization of custom tray materials, compromising spacer integrity and complicating removal. The technical modification described in this article is placing a thin aluminium foil sheet over the wax spacer which helps preserve spacer thickness and allows for easy and clean removal after tray fabrication. This simple, inexpensive, and easily adaptable modification may improve the efficiency and predictability of conventional custom tray fabrication procedures.

Conflicts of Interest

The author reports no conflicts of interest.

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