ABSTRACT

Setting the Problem: In the available literature, the preparation of the removable denture for the relining procedure is subjective. It is not possible to ensure a uniform thickness of the relining material in all zones, with the risk of unwanted alteration of the previously determined registrations – occlusal plane, occlusal vertical dimension and interocclusal relationship.

Purpose: The basic purpose of this article is to propose a clinically and laboratory tested method for relining complete dentures with a uniform layer of elastic material and preserving of all clinically determined registrations.

Materials and Method: To create a space and ensure a uniform layer of elastic relining material, a vacuum shaped polypropylene space maintainer is fabricated. This clinical approach is illustrated by presenting a selected clinical case with retentive maxillary tuberosities and severe mandibular bone atrophy.

Results and Discussion: The fabrication of a space maintainer for indirect relining of complete dentures with cold-curing silicones ensures a uniform layer of relining material. The space maintainer is positioned in place during all clinical and laboratory steps, preserving in this way the clinically determined registrations – occlusal plane level, occlusal vertical dimension and intermaxillary relations.

Conclusions: The proposed clinical and laboratory method for relining complete dentures with cold-curing silicones is rational and effective. The space-maintainer secures a uniform layer of relining material, even distribution of masticatory pressure to the mucosal-bone biologic base and protects the denture against fracturing.

Keywords: elastic dental materials, silicone relining materials, space maintainers, direct and indirect relining techniques;

INTRODUCTION

Resilient or soft dental resins [1] have been known for more than a century in dentistry [2, 3]. Today, resilient dental materials have a variety of applications: relining partial and complete dentures in highly atrophied or retentive alveolar ridges, removing painful points of compression (e.g. foramen mentale) due to exostosis, closing the valve zone in the area of A-line and as a marginal elastic edge for improving the retention and stabilization of removable dentures [3, 4, 5, 6, 7, 8]. They are also used in overdentures on dental implants [3, 8, 9, 10], in patients with xerostomia, post-surgical passage defects (obturators), in temporary dentures during the healing period after dental implant placement to achieving osteogenesis [9, 10].

There are known several classifications of resilient dental materials. According to their chemical composition, they can be divided into two main types: acrylic-based and silicone-based materials [3, 11, 12, 13]. According to some authors, the production of new resilient materials requires its classification into three groups: acrylic-based, silicone-based and vinyl-based [1]. Other authors have reported on the application of fluorinated and olefin resilient materials [8]. Today, the most commonly used resilient materials are silicone-based [3].

According to the technology, resilient resins are: heat-curing (for laboratory technique only) [8, 12, 14] - Molloplast B (Detax), cold-curing two-component (for both clinical and laboratory technique) [7, 8, 10, 12, 13, 15] - Elite soft relining (Zhermack), Megabase Soft (Dreve), and light-curing (for both clinical and laboratory technique) [16, 17] - (Triial).

When fabricating complete dentures with resilient material lining, the clinical stages are not different from those for the classical complete dentures. Laboratory technology, however, requires a space to be provided for the resilient material. This is necessary for the resilient material to have a uniform thickness, to preserve the occlusal plane level and the clinically pre-determined intermaxillary relation. When using heat-curing resilient materials, a spacer that can be made of different materials is used during the compression of the hard resin. In the literature [8, 14, 18], there are detailed descriptions of this technology, using a wax plate as a spacer. Later, other authors have sug-
gested that the spacer can be made of self-curing or light-curing resin [16], silicone [19, 20], or vacuum-pressed thermofoil [21].

When using cold-curing resilient materials, two technologies have been described - direct (clinical) and indirect (laboratory). The use of a spacer has not been discussed. Providing a space for the resilient material is accomplished by removing 1-2 mm from the mucosal surface of the already finished denture [3, 12, 13] and shortening the edge in the valve zone. In the direct technique, the next steps include the application of an adhesive and placement of the resilient material, which is functionally formed in the area of the valve zone by various functional tests. In the indirect technique with the finished denture, a functional impression with silicone materials is taken and transferred to the laboratory. There, a gypsum working model is cast. The impression material is then removed, and by abrading, as described above, space is provided for the resilient silicone material.

Setting the Problem: In the available literature, the preparation of the removable denture for the relining procedure is subjective. It is not possible to ensure a uniform thickness of the relining material in all zones, with the risk of unwanted alteration of the previously determined registrations – occlusal plane, occlusal vertical dimension and interocclusal relationship.

Purpose: The basic purpose of this article is to propose a clinically and laboratory tested method for relining complete dentures with a uniform layer of elastic material and preserving of all clinically determined registrations.

MATERIAL AND METHOD
To illustrate the methodology, we present a selected clinical case of a patient with retentive maxillary tuberosities and severe mandibular atrophy (Fig. 1).

Fig. 1 a, b - Patient with retentive maxillary tuberosities and severe mandibular atrophy; a) Intraoral view of the upper jaw; b) Intraoral view of the lower jaw

For fabricating the dentures, we used the hard heat-curing resin Meliodent (Heraeus Kulzer), and for lining the dentures—the resilient cold-curing silicone material Elitesoftrelining (Zhermack). The method for providing a uniform layer of the resilient material comprises the following steps:

1. On the working models, cast by using preliminary impressions taken with a customized tray, a spacer was made of 2 mm, thick soft vacuum shaped polypropylene thermofoil. (Fig. 2-6).
2. The spacer was used in all subsequent clinical stages: determination of the intermaxillary relation and testing with the arranged teeth (Fig. 11).

Fig. 11 a, b. Clinical stage – sample with ordered teeth

3. After then, holes in the spacers were made in the area of canine teeth and the first molars (Fig. 12-15).

Fig. 12-15. Holes in the spacers

4. The prototypes of the dentures were placed in a cuvette, together with the spacers. (Fig. 16-18).

Fig. 16-18. Prototypes of the dentures before casing-in
5. After completion of the polymerization, the finished dentures were cleaned, and the spacers were removed. (Fig. 19-24)

**Fig. 19-20.** The finished dentures; **Fig. 20.** after polymerization, the spacers still not being removed

6. Due to the holes in the spacers on the mucosal surfaces of the dentures, stoppers were formed that assisted the last clinical-stage – the taking of functional impressions (Fig. 23-24).

7. After adjusting of the finished dentures by the anatomical-semi-functional method [22], these were used as customized trays, and functional impressions with the silicone material Elite regular (Zhermack) were taken with the mouth closed and by applying the relevant functional tests [22].

8. When examining the finished impressions, the piercing stoppers could be seen. (Fig. 25-28)

**Fig. 21-22.** Finished dentures – removing the spacers

**Fig. 23-24.** The finished dentures after removing the spacers – view of the resin stoppers

**Fig. 25-28.** The functional impressions
9. The next steps included casting of functional impressions, preparing of hard gypsum models and mounting the models and dentures on a specifically opened binding clip for relining. (Fig. 29-30)

**Fig. 29-30.** Casting of hard gypsum models and mounting on an opened binding clip for relining

10. The impression material was removed. (Fig. 31-33)

**Fig. 31-33.** The models mounted on a binding clip for relining; the even thickness of the removed impression material is a guarantee for the even thickness of the resilient material

11. The dentures were treated as the edge in the valve zone was shortened by about 1-2 mm and a 2 mm wide and 1 mm deep groove was formed on it (Fig. 34-35) the stoppers were abraded, and the resilient silicone material was placed in the released space. Prior to placing the material on the dentures, an adhesive was applied according to the manufacturer’s instructions.

**Fig. 34-35.** Treatment of the edge in the valve zone

12. The resilient silicone material was polymerized for 10 minutes at 40-45°C in a pressurized polymerization apparatus and then processed according to the manufacturer’s instructions.

**Fig. 36-38.** The finished dentures
RESULTS AND DISCUSSION

The use of a spacer in this indirect method for lining with cold-curing silicone material provides a uniform layer of the resilient material. Its use in all clinical and laboratory stages makes it possible to preserve the clinically pre-determined parameters - the occlusal plane level and the intermaxillary relation.

Fig. 39-41. Use of the spacer at the clinical stage – sample with ordered teeth

Fig. 42. The finished dentures

The technique for lining with a cold-curing silicone material described so far in the scientific literature does not allow for the accurate preservation of these parameters. The removal of 1-2 mm from the inner denture surface prior to applying the resilient material, as described in the literature [3, 12, 13], is done in a rather subjective manner, without providing a uniform level in all areas.

This creates a real risk for creating an uneven silicone layer and a change in the occlusal plane level, usually in the caudal direction. This also leads to a change in the intermaxillary relation and reduction in the distance between the tooth rows at physiological rest.

CONCLUSIONS

1. The use of a spacer in all clinical and laboratory stages provides a predictable outcome.
2. The use of a spacer provides a uniform layer of resilient material, thus enabling the even distribution of masticatory pressure and preventing from denture fracture.
3. The use of a spacer in all clinical stages makes it possible to preserve the clinically pre-determined parameters – the occlusal plane level and the intermaxillary relation.

Acknowledgements:

We would like to express our gratitude to Mr Bozhidar Tenev, dental technician at the Dental Laboratory of the Faculty of Dental Medicine, Medical University – Sofia, for his assistance in clarifying the technology and its implementation and to Mr Tsvetan Borikin also dental technician at the Dental Laboratory of the Faculty of Dental Medicine, Medical University – Sofia, for making the dentures.

REFERENCES:

3. Otto D. Klinische und experimentelle Untersuchungen weichbleibender und harter Unterfütterungskunststoffe. [dissertation] [Medizinische Fakultät der Friedrich-Schiller-Universität, Jena] August 2004. [in German] [Internet]


9. Christensen GJ. The Increased Use of Small-Diameter Implants. JADA. 2009 Jun;140(6):709-712. [Crossref]


18. White KC, Beckley E, Connelly ME. Trial base adapted with sealed temporary soft liner. J Prosthodont. 1990 Nov;64(5):618-21. [PubMed] [Crossref]


20. Kutay O. A silicone rubber spacer used to determine the optimum thickness for hard and resilient materials in complete dentures. J Prosthet Dent. 1993 Mar;69(3):329-32. [PubMed] [Crossref]


Received: 17/05/2019; Published online: 15/11/2019

Address for correspondence
Dr Mariana Yankova, PhD
Department of Prosthetic Dental Medicine, Faculty of Dental Medicine, Medical University, Sofia,
1, St. G. Sofiiski blvd., Sofia, Bulgaria
E-mail: m.jankova@abv.bg; marianayankova13@gmail.com