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Occlusal Accuracy of Removable Partial Dentures relined with Versyo.com HD®

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Introduction

The indirect relining is afflicted with problems regarding time and dental technique^{7,8} The direct relining^{9,10} might be considered an alternative even if it is not free of problems itself. On one hand the biocompatibility of methylmethacrylates is a reason, which cast the direct implementation in the mouth into doubt¹², on the other hand the binding of the relining material with the existing denture basis often is insufficient.¹³ In particular, soft relining material porosities may occur, which forbid the continuous use of these materials from a microbiological point of view.^{14,15} In this respect the use of light- and dual-curing materials is promising for the direct relining technique.^{16,17} In addition it is well-known that different impression^{17,18} - and casting techniques^{19,20} during the indirect relining process can influence the position of the removable partial dentures and thus have an influence on the occlusion as well. Therefore, the aim of this in vitro study was to investigate changes in occlusion as a consequence of various relining procedures in the dental laboratory including simulated direct relining.

Objectives

Relining of removable partial dentures RPDs is frequently required in clinical routine. It was the aim to investigate changes in occlusion as a consequence of direct and indirect relining of RPDs processed and relined with a lightcuring resin.

Material and Methods

The in vitro study comprised interim dentures in the maxilla, interim dentures and RPDs in the mandible Premium teeth®, Versyo.com® : Heraeus-Kulzer. Each of the three dentures was relined with a lightcuring relining material Versyo.com HD®, Heraeus-Kulzer ten times in the indirect technique, five times in the direct mouth open technique and five times in the direct mouth closed technique. Occlusal contacts of a total of 60 relinings were documented before and after relining. For the descriptive statistical analysis of the occlusal contacts 0= no contact, 1= contact the program Microsoft® Excel 97 SR-1 was used.



Fig.1,2,3: Set up of Premium teeth®, acrylic master model



Fig.4,5,6: Versyo.com Hd® cartridge system, lightcuring resin for RPDs



Fig.7,8,9: Processed dentures before relining



Fig.10,11,12: Indirect, laboratory relining; Direct, mouth open relining; Direct, mouth closed relining from left to right

Results

It can be concluded that indirect relining of RPDs in the dental laboratory with Versyo.com HD® is a reliable procedure for the preservation of occlusion. The direct relining technique revealed specific limitations not related to the material.

Indirect, laboratory relining technique

1 = contact; 0 = no contact

	All Dentures		
	Processed MV	Relined MV	SD
Natural Teeth	1.0	1.0	0.0
Premium	1.0	1.0	0.0

The results for the indirect procedure documented for each denture design an ideal occlusal stability (at least one contact per tooth) after relining.

Direct, mouth open relining technique

1 = contact; 0 = no contact

Interim Denture Maxilla	Interim Denture Mandible			RPD Mandible							
	Processed MV	Relined MV	SD	Processed MV	Relined MV	SD	Processed MV	Relined MV	SD		
Natural Teeth	1.0	0.0	0.0	Natural Teeth	1.0	0.1	0.4	Natural Teeth	1.0	0.2	0.1
Premium	1.0	0.6	0.4	Premium	1.0	0.3	0.1	Premium	1.0	0.5	0.3

The results of the direct, mouth open procedure revealed for interim dentures in the maxilla a loss of all occlusal contacts on natural teeth (0.0) and only reduced contact on the artificial teeth (0.6). Similarities were found for interim dentures and RPDs in the mandible (RPD, natural teeth/artificial teeth: 0.1/0.3; interim dentures mandible, natural teeth/artificial teeth: 0.2/0.5).

Direct, mouth closed relining technique

1 = contact; 0 = no contact

Interim Denture Maxilla	Interim Denture Mandible			RPD Mandible							
	Processed MV	Relined MV	SD	Processed MV	Relined MV	SD	Processed MV	Relined MV	SD		
Natural Teeth	1.0	0.8	0.1	Natural Teeth	1.0	0.9	0.1	Natural Teeth	1.0	0.9	0.2
Premium	1.0	1.0	0.0	Premium	1.0	1.0	0.0	Premium	1.0	1.0	0.0

The direct, mouth closed relining revealed good occlusal stability (all types of dentures, natural teeth: 1.0). For artificial teeth the following mean values were calculated: 0.8 (interim denture maxilla), 0.9 (interim denture and RPD mandible). However, the visual inspection documented slightly malpositioned clasp retainers.

Conclusions

The present analysis revealed that for the indirect relining technique, which included an impression and the relining procedure in the dental laboratory, the occlusion obtained after the impression could be retained during the laboratory process. However, this study did not focus on the precision of different impression techniques or impression materials which do influence the result ^{17,18} With respect to the laboratory process, the use of Versyo.com HD represents a reliable and reproducible procedure in the applied processing technology when using casts mounted in the articulator. Thus the processing accuracy of this technique is to be equated with relining techniques using methylmethacrylates which have been in clinical use for decades. The results of an earlier pilot study documented, that the gap between the denture base to be relined and the cast was often too narrow in spite of the moderate cut back of the denture bases. An application of the regular Versyo.com on the denture base was not possible without small localized blow holes, even by using a cartouche or cannula. The more viscous consistency of Versyo.com HD as used in this study allowed an application to the denture bases and casts without deliquescing of the material applied. The relining material adapted to stone/mucosa not until the denture was brought into position. If the material was applied as evenly as possible to the base, the surface of the polymerized reline was usually homogeneous and nonporous. The experience also showed that it was necessary to check the occlusion as well as the position of the clasp retainers prior to the polymerization when using the relining technology with mounted casts and repositioning of the relined dentures. If the desired position was obtained, the polymerization was initiated at single spots using a dental curing light. The cast and the denture could then be withdrawn from the articulator and polymerized completely in a polymerization unit Uni XS . It must be noted that it is necessary to build a split cast as the conventionally mounted casts do not fit into the requested polymerization unit. For the same reason it is not possible to perform a reline with the usual technique using a stone mold. This technique would not provide for enough accessibility for light.

The preparation of a counter mold from the light-curing material Versyo.putty, as suggested by the manufacturer in order to fix the denture, is easy to accomplish, especially with the relining of smaller denture bases. This procedure was additionally tested in individual cases with regard to its feasibility in the dental laboratory, but was not part of the standard examination of this study. The results of the simulation of the direct relining reflect the findings often observed during the clinical procedure: the mouth open technique, which is recommended in the literature for the relining of distal extension base situations ³, guarantees the subjectively correct position of the retention elements in the first instance. The sole application of pressure on the clasp retainers often is not sufficient to overcome the resistance of the relining material beneath the denture due to its viscosity. This is the reason why a rotation around the rests of the denture is possible which may lead to premature occlusal contacts in the distal molar area.

For the mouth closed relining technique, this problem is prevented by the force on the occlusal surfaces of the artificial teeth. But it is a precondition that, with the RPD in the correct position, the artificial teeth exhibit sufficient occlusal stability. If this position is no longer assured, e.g. because of the abrasion/attrition of the artificial teeth¹, this method will certainly cause inaccuracies. In this in vitro simulation inaccuracies always occurred when the artificial teeth in the posterior area were restricted to one quadrant. Consequently, the rotation around the hinge-axis resulted in a leverage effect on the clasp retainers on the contra-lateral side. Therefore, it might be useful in selected cases to accomplish the relining impression under mastication pressure even for free-end situations ⁸; as it is described for the altered cast method ^{2, 4, 18}. For RPDs revealing sufficient occlusal stability the results of this in vitro study suggest the combination of both techniques. After having brought the removable partial denture in a nearly optimal position with regard to the occlusion when dealing with the mouth closed technique, the dentist has to check and adjust manually the position of the clasp retainers when using the mouth open technique. Any occlusal inaccuracies occurring after polymerization, must be corrected by remounting ²⁰. Furthermore, the conclusion is obvious, that the design and location of the retention elements have an influence on the correct position of the denture when relining. A stable interaction between retainer and abutment tooth enables not only an equal distribution of forces during masticating ⁶, but also a clear positioning of the denture when relining. This may be the reason why it has been suggested to apply cast retainers even for interim partial dentures ⁵

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Poster Faksimile:

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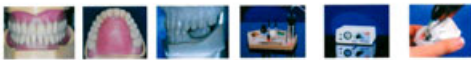
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Objectives

Relining of removable partial dentures (RPDs) is frequently required in clinical routine. It was the aim to investigate changes in occlusion as a consequence of direct and indirect relining of RPDs processed and relined with a lightcuring resin.

Methods



Set up of Premium teeth®, acrylic master model

Versyo.com HD® cartridge system, lightcuring resin for RPDs

The in vitro study comprised interim dentures in the maxilla, interim dentures and RPDs in the mandible (Premium teeth®, Versyo.com®; Heraeus-Kulzer). Each of the three dentures was relined with a lightcuring relining material (Versyo.com HD®, Heraeus-Kulzer) ten times in the indirect technique, five times in the direct mouth open technique and five times in the direct mouth closed technique. Occlusal contacts of a total of 60 relinings were documented before and after relining. For the descriptive statistical analysis of the occlusal contacts (0= no contact, 1= contact) the program Microsoft® Excel 97 SR-1 was used.



Processed dentures before relining

Indirect, laboratory relining, Direct, mouth open relining, Direct, mouth closed relining (from left to right)

Results

Indirect, laboratory relining technique

1 = contact; 0= no contact

	Processed		Relined	
	MV	SD	MV	SD
Natural Teeth	1.0	0.0	1.0	0.0
Premium	1.0	0.0	1.0	0.0

The results for the indirect procedure documented for each denture design an ideal occlusal stability (at least one contact per tooth) after relining.

Direct, mouth open relining technique

1 = contact; 0= no contact

Interim Denture Maxilla				Interim Denture Mandible				RPD Mandible						
	Processed		Relined			Processed		Relined			Processed		Relined	
	MV	SD	MV	SD		MV	SD	MV	SD		MV	SD	MV	SD
Natural Teeth	1.0	0.0	0.0	0.0	Natural Teeth	1.0	0.1	0.4	0.4	Natural Teeth	1.0	0.2	0.1	0.1
Premium	1.0	0.6	0.4	0.4	Premium	1.0	0.3	0.1	0.1	Premium	1.0	0.3	0.3	0.3

The results of the direct, mouth open procedure revealed for interim dentures in the maxilla a loss of all occlusal contacts on natural teeth (0.0) and only reduced contact on the artificial teeth (0.6). Similarities were found for interim dentures and RPDs in the mandible (RPD, natural teeth/artificial teeth: 0.1/0.3; interim dentures mandible, natural teeth/artificial teeth: 0.2/0.5).

Direct, mouth closed relining technique

1 = contact; 0= no contact

Interim Denture Maxilla				Interim Denture Mandible				RPD Mandible						
	Processed		Relined			Processed		Relined			Processed		Relined	
	MV	SD	MV	SD		MV	SD	MV	SD		MV	SD	MV	SD
Natural Teeth	1.0	0.8	0.1	0.1	Natural Teeth	1.0	0.9	0.1	0.1	Natural Teeth	1.0	0.9	0.2	0.2
Premium	1.0	1.0	0.8	0.8	Premium	1.0	1.0	0.0	0.0	Premium	1.0	1.0	0.0	0.0

The direct, mouth closed relining revealed good occlusal stability (all types of dentures, natural teeth: 1.0). For artificial teeth the following mean values were calculated: 0.8 (interim denture maxilla), 0.9 (interim denture and RPD mandible). However, the visual inspection documented slightly malpositioned clasp retainers.

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