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Aim of the Study

The objective of this study was to analyse the pressure on the occlusal surface of a prepared molar tooth and its sulcus area during the corrective impression procedure dependent on the type of material and the processing of the preliminary impression.

Materials and Methods

The following materials were tested:

C-Silicones

- Silaplast®/ Silasoft® N¹
- Optosil® P plus/ Xantopren® L²

A-Silicones

- Detaseal® classic/ Detaseal® quick¹
- Dimension® Penta H/ Dimension® Garant L³
- Dimension® Penta H/ Dimension® Garant L exp. II³
- Flexitime® Easy Putty/ Correct Flow®²

¹ Detax, Ettlingen, Germany ² Heraeus Kulzer, Dormagen, Germany ³ Espe, Seefeld, Germany

After setting of the preliminary impression, undercuts were removed in the first series (Fig.1a); in the second series additional spillways were carved (Fig.1b). Corrective impressions were conducted using a force of 100 N. A stop stabilized the end position of the impression tray during the corrective impression. Measurements of pressure (n=7 per method and material) were carried out in a pseudo realistic in-vitro model with calibrated relative pressure sensors (KPY 44R, Siemens AG, Munich, Germany; channel 1 occlusal, channel 2 sulcus area). Pressure values were recorded in both chambers of the measuring device (Fig.2) for a period of 25 seconds utilizing Signalys software (Ziegler-Instruments GmbH, Mönchengladbach, Germany).

Statistics

For statistical analysis the maximum pressure values were evaluated for both channels. MANOVA ($\alpha=0,05$) and unpaired t-tests were conducted using Stat View 5.0 (SAS Institute Inc., Cary, NC, USA).

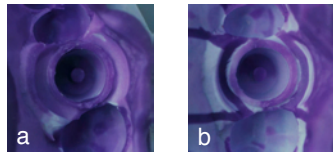


Fig. 1 Corrective impression after different processing of the preliminary impression: (a) undercuts removed (b) undercuts removed and spillways

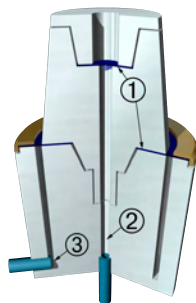


Fig. 2 Abutment

- 1 Teflon®-membrane
- 2 Chamber 1 filled with hydraulic oil (occlusal pressure measurements, Channel 1)
- 3 Chamber 2 filled with hydraulic oil (sulcus pressure measurements, Channel 2)

Results

MANOVA revealed that the maximum pressure values are significantly influenced by the impression material as well as by the method of the preparation of the preliminary impression (undercuts/spillways). Statistical data are displayed in Table 1.

Table 1 Mean maximum pressure values during the corrective impression procedure with various materials (a) only undercuts removed (b) undercuts removed with spillways

	SN	DQ	XL	CF	DGX	DGL
Channel 2 (sulcus)						
pressure [Bar]	1.63 ± .45	1.00 ± .33	.82 ± .15	.64 ± .06	.62 ± .10	.50 ± .21
differences		p = .01	n.s.	p = .009	n.s.	n.s.
Channel 1 (occlusal)						
pressure [Bar]	.98 ± .31	.79 ± .44	.60 ± .16	.58 ± .12	.51 ± .11	.33 ± .02
differences		n.s.	p = .01	n.s.	n.s.	p = .0005
Channel 2 (sulcus)						
pressure [Bar]	.82 ± .11	.73 ± .08	.56 ± .06	.54 ± .07	.51 ± .11	.30 ± .07
differences		n.s.	p = .0008	n.s.	n.s.	p = .0003
Channel 1 (occlusal)						
pressure [Bar]	.40 ± .14	.36 ± .08	.32 ± .09	.30 ± .03	.24 ± .09	.24 ± .06
differences		n.s.	n.s.	n.s.	p = .02	n.s.

- In general, the pressure in channel 2 (sulcus) was significantly higher than in channel 1 (occlusal). Exception: DGL
- For SN, the preparation of spillways reduced the pressure inside the sulcus area significantly (p<.001). The pressure level of SN was still significantly higher than that of CF, XL, DGX and DGL.
- For DQ, DGL and DGX spillways did not lead to a significant reduction of the pressure in the sulcus area.
- In case of spillways, SN, DGL, DQ and CF showed similar data of pressure on the occlusal surface.

Conclusions

For all materials, spillways are capable to reduce the internal pressure during a corrective impression at the top of a tooth as well as in its sulcus area. In this way, initial deformation of the preliminary impression could be minimized before the corrective impression material starts to set. The remaining pressure in the sulcus area provides maximum replica quality of a subgingival finishing line.