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Aim of the Study

The purpose of this in-vitro study was to evaluate the influence of occlusal loading on the long term stability of phosphate luting cement and adhesive luting material at the marginal gap of ceramic fused to metal crowns (CMC) compared to composite luting at full ceramic crowns (FCC).

Materials and Methods

Twenty extracted human lower premolars were prepared with a chamfer finishing line underneath the dentino-enamel junction. Five CMCs as well as five inceram FCCs were cemented using PhosphaCem, (Vivadent) and another five CMCs and FCCs were luted with Compolute, (Espe).

ferent points before as well as after 15,000 as well as 30,000 loadings (Fig.2). The replica were sectioned, and the depth (d), area (a) and width (w) of a possible gap was analysed with the help of video digitizing using NIH Image 1.62 software (Fig.3).

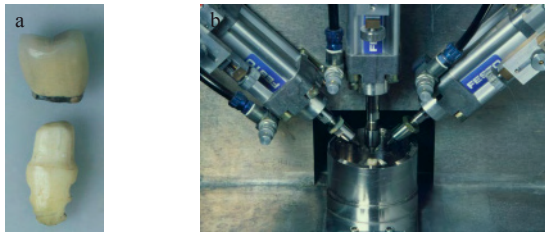


Fig. 1 (a) prepared tooth with its corresponding crown
(b) experimental plant for occlusal loading

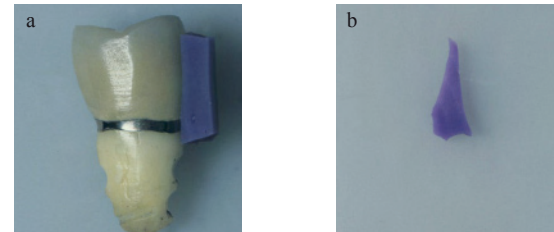


Fig. 2 (a) cemented crown with corresponding replica impression
(b) sectioned part of the replica impression

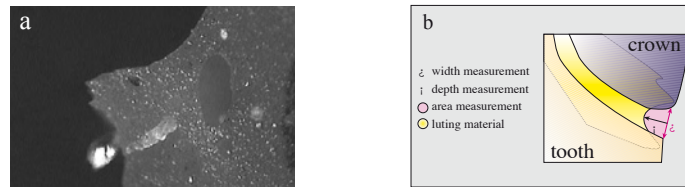


Fig. 3 (a) videodigitized picture of a replica impression
(b) sketch explaining the measurements

All tooth-crown components were stored in physiologic saline (37° C) and 24 h after luting, they were subjected to long term occlusal loading (Fig.1) (15,000 and 30,000 cycles; force rising from 0-50 N within 0.6 s and acting by random axially and ±45° in both vestibular and oral direction). The shape of the luting agent between the crown and the tooth was evaluated by means of a silicon replica at 6 dif-

Statistics
MANOVA ($\alpha=0.05$, Fisher PLSD post hoc test) was conducted using Stat View 5.0 (SAS Institute Inc., Cary, NC, USA) for statistical evaluation of the depth, width and area of the gap.

Results

Statistical evaluation indicated a significant increase of depth as well as area at the marginal gap of FCCs after 30,000 loadings. CMCs cemented with phosphate cement showed significantly wider and deeper marginal gaps as well as an increased loss of luting agent compared to those cemented with adhesive material (Table 1).

	width 0±SD	p-value	width 15000±SD	p-value	width 30000±SD	p-value
CMCcem.	253±96	← 0.4953 →	271±86	← 0.5021 →	290±82	← 0.1801 →
p-value	0.0001		0.0003		0.0001	
CMCadh.	154±24	← 0.7622 →	162±25	← 0.5451 →	174±23	← 0.3659 →
FCCcem.	208±25	← 0.9279 →	209±25	← 0.5626 →	218±24	← 0.5037 →
p-value	0.4910		0.3981		0.2983	
FCCadh.	198±15	← 0.4365 →	197±12	← 0.7031 →	202±16	← 0.7538 →

	depth 0±SD	p-value	depth 15000±SD	p-value	depth 30000±SD	p-value
CMCcem.	68±33	← 0.4827 →	78±33	← 0.0871 →	102±49	← 0.0185 →
p-value	0.0003		0.0041		0.0111	
CMCadh.	39±17	← 0.8012 →	42±16	← 0.2641 →	59±30	← 0.1737 →
FCCcem.	56±8	← 0.0413 →	75±30	← 0.0163 →	100±24	← <0.0001 →
p-value	0.6655		0.0192		0.0357	
FCCadh.	29±3	← 0.0480 →	47±5	← 0.0104 →	63±12	← 0.0007 →

	area 0±SD	p-value	area 15000±SD	p-value	area 30000±SD	p-value
CMCcem.	10733±7448	← 0.2760 →	14177±8611	← 0.2148 →	18109±12565	← 0.0233 →
p-value	<0.0001		<0.0001		0.0009	
CMCadh.	3567±2174	← 0.3887 →	4650±2625	← 0.1572 →	6838±3951	← 0.0236 →
FCCcem.	7617±2129	← 0.0984 →	9985±2795	← 0.0058 →	14085±4907	← <0.0001 →
p-value	0.0300		0.0808		0.0006	
FCCadh.	4124±2129	← 0.1421 →	6302±720	← 0.0359 →	8852±1410	← 0.0008 →

Table 1 Results of area, depth and width measurements depending on loading cycles and luting materials.

Conclusions

In a pseudo-realistic in-vitro investigation the adhesive luting of full ceramic and ceramo-metal crowns showed superior stability at the marginal gap compared to conventional luting with zincphosphate cement.