

The influence of margin location and luting material on the amount of undetected cement excess on customized CAD/CAM implant abutments and cement-retained implant crowns. An in-vitro study.

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Abstract

Aim: The aim of the study is to assess the frequency of cement residues after cementation of monolithic zirconia crowns on CAD/CAM custom molar titanium abutments.

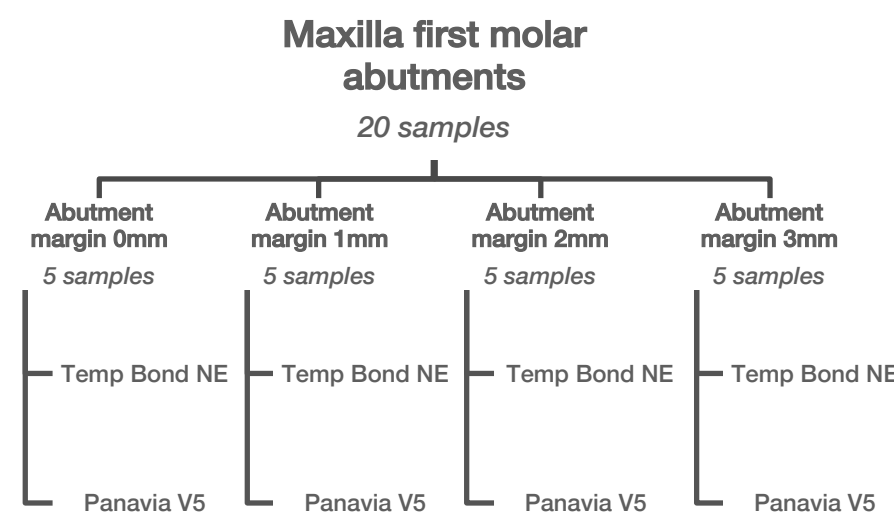
Material & Methods: A master cast with embedded implant analog (SEMADOS, BEGO, Bremen, Germany) and flexible soft tissue silicone mask was used. Twenty CAD/CAM titanium abutments with different positions of the margin – from 0 mm supragingivally to 3 mm below the gingival level – were centrally milled and divided equally into four groups. The same amount of zirconia crowns was luted to the CAD/CAM abutments, excess cement was cleaned and the restorations were removed for evaluation of the undetected cement remnants. The screw access of the abutments and the opening on the occlusal surface of the crowns were covered during in-vitro cementation (Temp Bond NE, Kerr Dental, Germany and Panavia V5, Kuraray, Japan). All quadrants of each specimen were evaluated for calculation of the ratio between the cement remnants area and the total specimen area using Adobe Photoshop.

Statistics: A statistical analysis was carried out using STATISTICA (STATSOFT, Tulsa, USA, version 9.1) and BIAS (Epsilon-Verlag, Frankfurt, version 11.02). Significance was set at $p < 0.05$.

Results: The investigation showed that the amount of cement residues increased as the crown-abutment margin was located more subgingivally. Comparing the 4 groups of margin depths (0 – 3mm), using Kruskal-Wallis-Test, one statistical significant result was found for Panavia V5 ($p=0.0291$) at a margin depth of 3mm (lingual). Comparing the two types of cement (Temp Bond / Panavia V5), using Mann-Whitney U test, no statistical significant result was found.

Methods and Materials

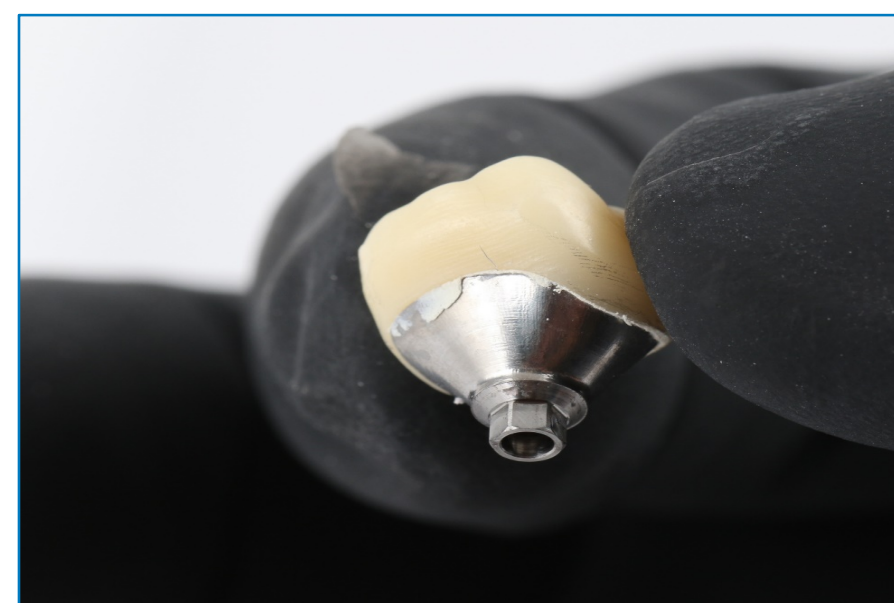
Sample distribution of abutment designs



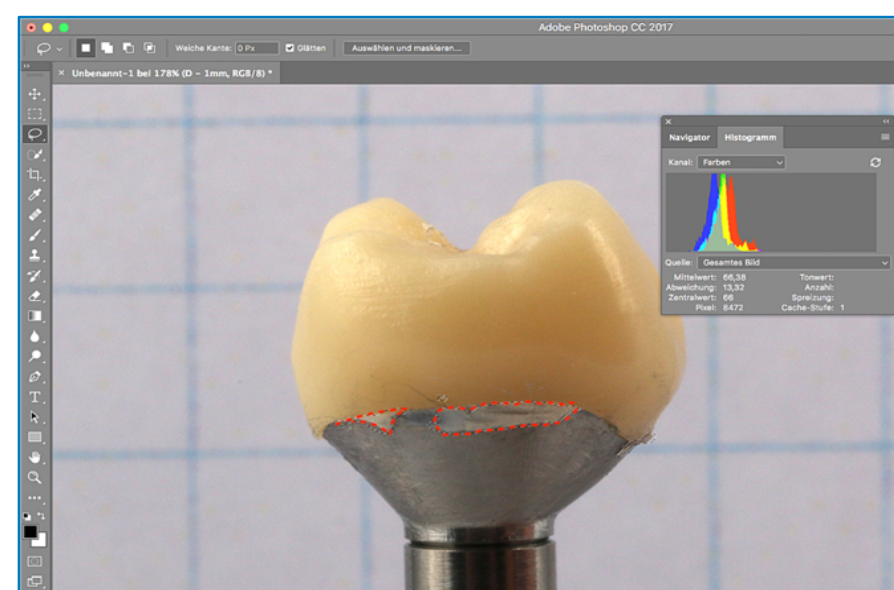
Sample abutments with corresp. zirconia crowns



Cement remnants directly after retrieving the crown-abutment complex



Evaluation of cement covered areas using Adobe Photoshop



Results

Lingual residues (%)						
Margin depth	N	Mean	Median	Minimum	Maximum	SD
0	5	0.71	0.28	0.13	1.77	0.74
1	5	0.44	0.00	0.00	1.42	0.64
2	5	0.53	0.46	0.13	1.12	0.38
3	5	1.74	1.68	1.15	2.59	0.54

Table 1. Lingual cement residues: Panavia V5 (%) – I

Kruskal-Wallis-Test: $H(3, N=20) = 9.015686$ $p = 0.0291$			
Margin depth	N	Rank total	Mean rank
0	5	50.00000	10.00000
1	5	32.00000	6.40000
2	5	43.00000	8.60000
3	5	85.00000	17.00000

Table 2. Lingual cement residues: Panavia V5 (%) – II

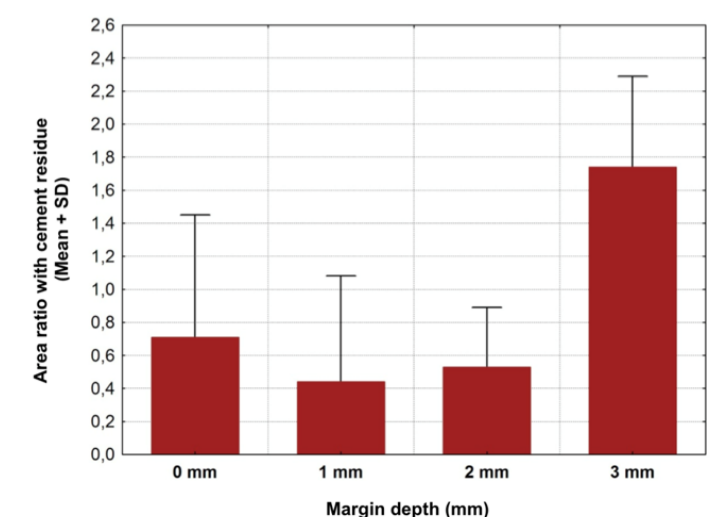


Fig. 1. Lingual cement residues: Panavia V5 (Mean + SD)

Conclusion

The amount of residual cement after cleaning increased as the restoration margins were located more subgingivally. The type of luting cement has no influence on the number of remnants left behind. The use of customized CAD/CAM abutments does not guarantee avoidance of subgingival cement residues after crown cementation. It is essential to exercise the utmost care when cementing crowns to CAD/CAM implant abutments. Therefore, further clinical research is needed to confirm or contradict the obtained results.

References

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Background and Aim

Background: As cement remnants of fixed implant-supported restorations have been associated with clinical and radiographic signs of peri-implantitis, there is a call for search of reducing the probability of leaving subgingival cement. One of the novelties is the application of computer-aided design and computer-aided manufacturing (CAD/CAM) to produce custom implant abutments from different materials. High flexibility in designing the subgingival part of computer-aided design and computer-aided manufacturing (CAD/CAM) abutments and the positioning of the shoulder finish line may eliminate the problem of undetected cement residues. However, so far there only little data available to support this hypothesis. The influence of the type of the selected cement remains unclear in this context.

Aim: To test whether or not one position of the abutment margin and type of cement is superior to the other in terms of remaining cement following cementation of reconstructions on customized molar abutments. Overall Aim of this in vitro study was to investigate the amount of cement remnants around molar restorations on CAD/CAM abutments. In addition, the influence of different luting materials on the amount of cement remnants after cleaning have been investigated.