Effects of Different Root Coping Materials for Abutment Teeth on Secondary Caries and Periodontal Conditions: A Retrospective Study

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This study evaluated secondary caries and periodontal conditions associated with metal (MCs) and composite resin copings (RCs) of abutment teeth for overdentures. The rates of secondary caries and periodontal problems in 70 root copings (41 MCs, 29 RCs) in 35 patients were retrospectively investigated for a period of 6.9 years. Statistical analysis was performed using chi-square tests and logistic regression (P < .05). No significant differences in secondary caries or periodontal conditions were detected between MCs and RCs. These results suggest that RCs and MCs can be used as root copings of abutment teeth for overdentures. *Int J Prosthodont 2012;25:63–65.*

Root copings for abutment teeth are used to preserve the alveolar ridge and to improve the stability of dentures.¹ Several longitudinal clinical studies^{2,3} have shown that abutment teeth for overdentures are often involved in secondary caries and periodontal problems. However, the influence of different root coping materials on these problems in abutment teeth has not been fully elucidated in vivo. The purpose of this study was therefore to compare secondary caries and periodontal problems between abutment teeth with root copings composed of composite resin and metal.

Materials and Methods

Thirty-five patients (13 men, 22 women; age range: 41 to 86 years; mean age: 65.2 years) with 70 root copings for overdentures were enrolled in this study after obtaining informed consent. Twenty-nine copings were composite resin (RCs; Clearfil DC core, Kuraray) and 41 were metal (MCs; Au-Ag-Pa alloy, GC), all of which had been in place for at least 3 years (mean: 6.9 years). The indications for using RCs and MCs consisted of adequate abutment tooth structure (able to prepare the conventional post-root coping) and a periodontal pocket depth less than 3 mm. Concerning adhesive procedures, dentin adhesive (Clearfil DC bond, Kuraray) was used for RCs. In MCs, the dentin and metal portion were conditioned using dentin adhesive (AD Gel, Kuraray) and primer (Metal Primer, GC) prior to cementation with resin-modified glass-ionomer cement (Vitremer Luting Cement, 3M ESPE).

Data related to the root coping, periodontal condition of the abutment tooth, and plaque accumulation, as well as oral hygiene conditions, were collected in 2010 (Table 1). Information on periodontal conditions at the time of root restoration was also obtained from patient records.

The clinical results from patients with MCs and RCs were mainly compared on the basis of the rates of secondary caries and deepening of the pocket depth (\geq 1 mm). In addition, other relative factors regarding secondary caries and pocket depth were analyzed further (Table 1).

Instructions and hygiene measures were provided for patients regarding oral hygiene, regular toothbrushing, and use of mouthwash (benzethonium chloride) at all recall appointments.

Statistical analysis was performed using SPSS 11.0 (IBM). Chi-square tests (P < .05) were used to determine differences between RCs and MCs related to secondary caries and pocket depth. Logistic regression analysis was used to further identify influential factors. Independent and dependent variables are presented in Tables 2 and 3.

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Table 1	Evaluated Parameters for the Root Coping
Periodont	al Condition, and Plaque Accumulation

Abutment indices		
Coping material (metal = 0, composite resin = 1)		
Coping shape (flat = 0, telescope = 1, dome = 2)	Sex [†]	
Coping height from gingival margin (mm)	Female [‡] Male	
Length from contact area of root coping to denture border (mm)	TVICIC	
Material of contact area in denture tissue surface (metal = 0, composite resin = 1)	Age ^s	
Secondary caries (none = 0 , detected = 1)	Compos	
Distance from gingival margin to the margin of root coping (mm)	Metal	
Periodontal indices	Coping s	
Probing pocket depth (mm)	Dome [‡]	
Width of keratinized mucosa (mm)	Flat	
Width of alveolar ridge at root coping (mm)	lelesco	
Plaque accumulation (test by disclosing solution)	Coping h margin [§]	
Plaque on the margin of root coping (mesial, distal, buccal,	Material of	
two surfaces = 2, three surfaces = 3, four surfaces = 4)	Compos	
Plaque on denture tissue surface of contact area (mesial, distal,	Metal	
buccal, and lingual surfaces: no surface $= 0$,	Plaque or	
one surface = 1, two surfaces = 2, three surfaces = 3, four surfaces = 4)	Plaque or	
Frequency of toothbrushing (times/day)		
	Frequenc	

Results

Secondary Caries

Secondary caries were found in seven teeth (17.0%) with MCs and two (6.9%) with RCs, but the difference was not significant (P = .289) (Fig 1). Logistic regression analysis showed that only plaque accumulation on the denture tissue surface was significantly associated with secondary caries (P = .046) (Table 2). No other significant independent variables were identified.

Periodontal Problems

Deepening pocket depths were found in 13 teeth (31.7%) with MCs and 5 teeth (17.2%) with RCs, but the difference was not significant (P = .267) (Fig 1). Logistic regression analysis showed that plaque accumulation on the abutment tooth was significantly associated with pocket depth (P = .034) (Table 3). No other independent variables were identified.

Table 2 Logistic Regression Analysis for Secondary Caries

Independent variables	Odds ratio	95% CI	р
Sev [†]			
Female [‡] Male	1.00 0.02	0.00-3.09	.13
Age [§]	0.90	0.81-1.00	.05
Coping material [†]			
Composite resin [‡] Metal	1.00 4.14	0.18-96.69	.38
Coping shape [†]			
Dome [‡] Flat Telescope	1.00 5.52 11.87	0.08–385.30 0.04–3,263.01	.43 .39
Coping height from gingival margin§	0.84	0.37-1.91	.67
Material of contact area in denture ti	ssue sur	face [†]	
Composite resin [‡] Metal	1.00 2.60	0.12-56.41	.54
Plaque on margin of root coping§	0.47	0.19-1.14	.09
Plaque on denture tissue surface of contact area [§]	2.70	1.02-7.18	.05*
Frequency of toothbrushing§	0.72	0.15-3.48	.69
Width of keratinized mucosa§	1.48	0.82-2.68	.20
Distance from gingival margin to margin of root coping [§]	0.60	0.10-3.55	.58
Length from contact area of root coping to denture border [§]	1.37	0.95-1.97	.09
Width of alveolar ridge at root coping [§]	0.88	0.44-1.73	.70

CI = confidence interval.

*Plaque accumulation on the denture tissue surface was the only factor significantly related to the occurrence of secondary caries,

P < .05.

[†]Categoric variable. [‡]Reference category.

§Continuous variable.

Discussion

The rates of secondary caries and deepening pocket depths were lower in RCs (6.9% and 17.2%, respectively) than MCs (17.0% and 31.7%, respectively), but the differences were not significant. This trend could be explained by the improved marginal adaptation and adhesion associated with the stronger bonding capability of recent composite resin materials, even under moist clinical conditions. Moreover, periodontal maintenance and personal hygiene measures have also been reported to influence the success rates of abutment teeth.³

The rates of secondary caries (17%) and increasing pocket depths (31.7%) for MCs in the present study were comparable to those found in the study by

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Independent variables	Odds ratio	95% CI	P			
Sex [†]						
Female [‡] Male	1.00 3.52	0.31-40.43	.31			
Age [§]	1.05	0.94-1.18	.40			
Coping material [†]						
Composite resin [‡] Metal	1.00 41.06	0.83-2,023.28	.06			
Coping shape [†]						
Dome [‡] Flat Telescope	1.00 1.87 2.01	0.07-51.90 0.15-27.24	.71 .60			
Coping height from gingival margin [§]	0.96	0.58-1.58	.86			
Material of contact area in denture tissue surface [†]						
Composite resin [‡] Metal	1.00 0.68	0.05-10.07	.78			
Plaque on margin of root coping§	3.78	1.10-12.92	.03*			
Plaque on denture tissue surface of contact area ${}^{\$}$	1.33	0.68-2.61	.41			
Frequency of toothbrushing§	4.69	0.55-40.08	.16			
Width of keratinized mucosa§	0.76	0.48-1.20	.24			
Distance from gingival margin to margin of root coping [§]	0.41	0.11-1.55	.19			
Length from contact area of root coping to denture border $^{\$}$	1.17	0.87-1.59	.31			
Width of alveolar ridge at root coping [§]	0.71	0.41-1.24	.23			

Table 3Logistic Regression Analysis of DeepeningPocket Depth

CI = confidence interval.

*Plaque accumulation on abutment teeth was the only factor significantly related to deepening of pocket depth, P < .05.

Significantly related to deepening of pocket depth, T < .05.

[†]Categoric variable. [‡]Reference category.

§Continuous variable.

Ettinger et al⁴ on MCs (13% and 41.4%, respectively), despite periodontal maintenance and professional care being applied in both studies. Logistic regression analysis indicated that plaque accumulation on the tissue surface of the denture against the abutment tooth as well as on the abutment tooth were significant factors in secondary caries and deepening pocket depth prevalence, respectively, suggesting that patients should pay more attention to daily cleaning of these areas in addition to periodontal maintenance and professional care. Fluoride-releasing materials, such as glass-ionomer cement, could also be incorporated into coping materials and compomers to further decrease secondary caries and pocket depths.⁵



Fig 1 Rates of secondary caries and deepening pocket depths in patients with MCs and RCs. No significant differences in the rates of secondary caries (P = .289) or deepening pocket depths (P = .267) were found between MCs and RCs.

Conclusion

Within the limitations of this study with a short observation period, the results suggest that composite resin as well as metal can be used as root coping materials for overdenture abutments. However, further long-term studies are necessary to validate the clincal outcomes.

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