ECRONICON OPEN ACCESS

EC DENTAL SCIENCE
Research Article

Effect of Full Ceramic Crown Versus Ceramic Fused to Metal Crown on Periodontal Tissues Health

Mishary Almotairy[1], Fuad Almaghrabi[1], Abdulrahman Alharthy[1], Hisham Alrashaid[1], Hafez Diab[2]* and Yousef Shibatalhamad[3]

[1]*Dental Student Level 12, Riyadh Elm University, Riyadh, Saudi Arabia*

[2]*Professor of Periodontics, Riyadh Elm University, Riyadh, Saudi Arabia*

[3]*Consultant Prosthodontist PSMMC and Associate Clinical Professor, Riyadh Elm University, Riyadh, Saudi Arabia*

***Corresponding Author**: Hafez Diab, Professor of Periodontics, Department of Preventive Dental Science, Riyadh Elm University, Riyadh, Saudi Arabia.

Received: May 12, 2018; **Published:** June 27, 2018

Abstract

Aim of the Study: To investigate and compare the effect of full ceramic crown and ceramic fused to metal crown on periodontal tissues health in a sample of Saudi patients.

Materials and Methods: The gingival index, plaque index, probing depth and clinical attachment level of one hundred teeth (50 covered by full ceramic crown and 50 covered by ceramic fused to metal) were included in the present study. Patients were selected from the outpatient clinics of College of Dentistry, Riyadh Colleges of Dentistry and Pharmacy. One hundred teeth were classified into two groups as follows: Group I: involved 50 teeth covered by full ceramic crown. Group II: involved 50 teeth covered by ceramic fused to metal. The data was analyzed comparing both groups. The descriptive statistics included the mean, range and standard deviation for both groups.

Results: Our results showed that there is statistically significant increase in GI, PI, PPD and CAL scores of ceramic fused to metal crown group II compared to full ceramic crown group I.

Conclusions: Within the limits of this study it can be concluded that ceramic fused to metal crown appear to be associated with periodontal breakdown more than full ceramic crown.

Keywords: *Periodontal Maintenance; Crown Material; Clinical Attachment Loss*

Introduction

The dental full crowns have been considered as major contributing factor in the etiology of periodontal disease [1]. The reactions of the periodontal tissues to prosthetic procedures, and the effect of prosthetic material type on the periodontal tissue damage was done either by providing possibilities for bacterial retention, and/or by a direct irritation effect from the material itself [2].

All dentists should consider using materials that will maintain good periodontal health with optimal fit, reducing possible periodontal damage [3]. When the need exists to employ full-coverage crowns, Precious materials provides one example of a cosmetic restorative crown material available that can help satisfy the goal of excellent health [4].

Porcelain-fused-to-metal (PFM) crowns have been considered the gold standard for the repair of damaged teeth. PFM crowns have good mechanical properties, satisfactory esthetic results, and an acceptable biological quality needed for periodontal health [5]. However, PFM crowns have some limitations that may limit their use. For example, the esthetic of PFM crowns is limited by the metal framework and the layer of opaque porcelain needed for masking the underlying metal grayish shade [6]. Recently the cost of precious metals has risen markedly making PFM relatively unattractive from an economic standpoint [7].

All-ceramic crowns have been used over the last four decades as an alternative for PFM crowns to overcome their esthetic limitations [8]. All-ceramic crowns can be made from different types of ceramic, and not all ceramic types have the same physical and esthetic proprieties [9]. Historically, resin-based crowns were the first metal-free crowns to be used, but they were abandoned because of their low fracture resistance [10]. Newer metal-free crowns are increasingly being used in dental practice; these crowns are made from different ceramic materials such as lithium disilicate, zirconia, leucite-reinforced glass, and glass-infiltrated alumina [11].

Objective of the Study

The objective of the present study is to evaluate the effect of full ceramic crown and ceramic fused to metal crown on periodontal tissues health in a sample of Saudi patients.

Materials and Methods

The gingival index, plaque index, probing depth and clinical attachment level of one hundred teeth (50 covered by full ceramic crown and 50 covered by ceramic fused to metal crown) were included in the present study. Patients were selected from the outpatient clinic of Riyadh Elm University. The study was conducted between January 2017 and June 2017. Patients between 23 years to 55 years of age of both sexes (55 females and 45 males) having prosthesis on vital and non-vital teeth.

The criteria of inclusion include tooth was covered from 6 months to 3 years ago. The exclusion criteria include smoking, pregnancy, history of systemic diseases and those who had periodontal surgery.

One hundred teeth were classified into two groups as follows:

- **Group I:** Involved 50 teeth covered by full ceramic crown.
- **Group II:** Involved 50 teeth covered by ceramic fused to metal crown

The following parameters will be evaluated for every tooth

1- Gingival Index (GI) described by Löe and Silness 1963 [12].
2- Plaque Index (PI) described by Silness and Löe 1964 [13].
3- Probing pocket depth (PPD) according to Ramfjord, 1967 [14].
4- Clinical attachment loss (CAL) according to Ramfjord, 1967 [14].

The PPD and CAL measurements were carried out at six sites for every tooth (mesiobuccal, midbuccal, distobuccal, mesiolingual, midlingual and distolingual) using UNC manual probe. The mean score in millimeter for individual tooth was calculated by summing the scores of each site and dividing by the total number of sites. Two periodontists examine all sites and the overall Kappa score of 0.97 was achieved for intra-examiner variability and 0.92 for inter-examiner variability.

The recorded data were compiled and entered in a computer using Statistical Package for Social Sciences (SPSS) version 20.0 software (Chicago, IL, USA). One way ANOVA and Chi-square tests were used for comparisons. A p-value of less than 0.05 was considered as statistically significant. The data was analyzed comparing both groups. The descriptive statistics included the mean, range and standard deviation for both groups.

Name						
Age						
Tooth no.						
Type of crown						
GI						
PI						
PPD	Buccal			Oral		
	MB	MID B	DB	MO	MID O	DO
CAL	Buccal			Oral		
	MB	MID B	DB	MO	MID O	DO

The clinical sheet form for the present study

Results

The study evaluated the GI, PI, PPD and CAL among 50 teeth covered by full ceramic crown (group I) and 50 teeth covered by porcelain fused to metal crown (group II). The age range in both groups was between 18 - 60 years with average age 46.5 years. Since there was uneven distribution of gender, data was not analyzed according to the gender.

Table 1 describes the minimum, maximum and mean scores along with the standard deviation for GI, PI, PPD and CAL. The mean of the GI score in the group II (1.72) was higher than that of the group I (1.14). The mean GI score of group II (1.72) was even higher than the mean (1.44) of the overall combined groups. Similarly, the PI mean score of the group II (1.82) was higher than that of the group I (1.18) as well as the mean PI score of the overall group (1.67). ALSO, the mean of the PD score in the group II (2.95) was higher than that of the group I (2.50). The mean PD score of (2.95) in the group II was even higher than the mean (2.755) of the overall combined groups. Similarly, the CAL mean score of the group II (1.93) was higher than that of the group I (1.35) as well as the mean PI score of the overall group (1.705).

		GI	PI	PPD	CAL
Group I Full ceramic crown	N	50	50	50	50
	Minimum	0.89	1.27	1.69	0
	Maximum	2.13	2.40	3.33	2.47
	Mean	1.14	1.18	2.50	1.35
	Std. Deviation	0.32243	0.26248	0.36570	0.27530
Group II Porcelain fused to metal crown	N	50	50	50	50
	Minimum	1.11	1.52	1.98	0
	Maximum	2.75	2.95	4.35	3.85
	Mean	1.72	1.82	2.95	1.93
	Std. Deviation	0.28371	0.18527	0.32682	0.27480
Total	N	100	100	100	100
	Minimum	0.89	1.27	1.69	0
	Maximum	2.75	2.95	4.35	3.85
	Mean	1.44	1.67	2.755	1.705
	Std. Deviation	0.30307	0.188875	031626	0.26505

Table 1*: Shows the average (mean) scores of gingival index GI, plaque index PI, Probing pocket depth PPD and Clinical attachment loss CAL of both groups.*

Our results showed that there is statistically significant decrease in GI, PI, PPD and CAL scores of group I compared to group II (Table 2 and Figure 1).

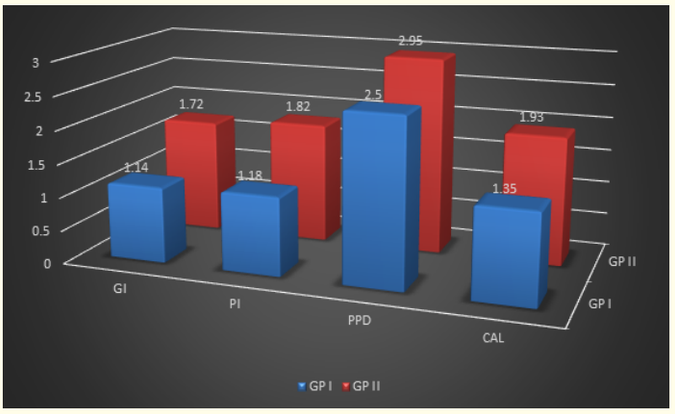

Figure 1: *Shows graphical comparison of mean GI, PI, PPD and CAL in group I and group II.*

	Group I	Group II	P
GI	1.14 ± 0.32243	1.72 ± 0.28371	< 0.05
PI	1.18 ± 0. 0.26248	1.82 ± 0.18527	< 0.05
PPD	2.50 ± 0.36570	2.95 ± 0. 0.32682	< 0.05
CAL	1.35 ± 0.27530	1.93 ± 0.27480	< 0.05

Table 2: *Shows the mean ± SD of mean GI, PI, PPD and CAL in group I compared group II.*

Table 3 shows one way ANOVA of mean GI, mean PI, mean PPD and the mean CAL in both group. In all the variables there was a statistically significant difference, $p < 0.05$ between the full ceramic crown group versus porcelain fused to metal group.

One Way ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
GI	Between groups	5.873	1	6.243	8.554	0.008*
	Within groups	53.945	98	0.615		
	Total	59.791	99			
PI	Between groups	6.688	1	5.532	15.324	0.001*
	Within groups	44.311	98	0.576		
	Total	50.999	99			
PPD	Between groups	7.345	1	7.345	5.216	0.011*
	Within groups	47.294	98	2.468		
	Total	54.639	99			
CAL	Between groups	6.386	1	6.386	6.284	0.014*
	Within groups	51.340	98	1.364		
	Total	57.726	99			

Table 3: *Shows one way ANOVA of GI, PI, PPD and CAL with respect to group I and group II.*

** Significant at p < 0.05.*

Discussion

In this retrospective clinical study that was designed to evaluated the GI, PI, PPD and CAL among 50 teeth covered by full ceramic crown (group I) and 50 teeth covered by ceramic fused to metal crown (group II). The results showed that there is statistically significant decrease in GI, PI, PPD and CAL scores of group I compared to group II. These results indicated that ceramic fused to metal crown have more negative effect on periodontium compared to full ceramic crown.

This is in agreement with Al-Wahadni., et al. [5] who reported that all ceramic restorations attract less plaque accumulation compared to ceramic fused to metal crown. Gemalmaz and Ergin [6] in a clinical trial reported similar finding. Weishaupt., et al. [7] reported that ceramic crowns may accumulate less plaque as compared to metal ceramic crowns. They attributed certain stabilizing effect of this particular material for a favorable gingival response.

Reitemeier., et al. [2] reported that type of material alloy has no effect on the level of plaque accumulation and gingival health was similar around any material alloy. Also, Christensen [22] in a comparison of zirconium to metal fused to porcelain crowns also made similar conclusions. Richter [15] and Abidi., et al. [1] also noted similar findings. It has to be mentioned that with disregard to framework material, (zirconia, metal, or glass ceramic) the porcelain remains relatively the same in regards to composition and surface texture [16-18].

This study incorporated relatively simple, inexpensive and easy to use indices GI, PI, PPD and CAL. Other studies have been used different indices in their publications [19-21].

Restoring a tooth with compromised periodontal health with an appropriate full-crown, using modern materials that are shown to reduce the risk of additional plaque retention or a negative inflammatory response, should now be considered the treatment of choice for maintaining prolonged dental health [22-24]. If periodontal health is to be considered the future of success for dental care, it is imperative to use restorative procedures and materials which can help maintain a healthy periodontium.

Conclusion

Within the limitation of this study it concluded that porcelain fused to metal crown appear to be associated with periodontal breakdown more than full ceramic crown.

Bibliography

1. Abidi YA., *et al*. "An Evaluation of Association between Crown Margins and Materials with the Periodontal Health". *Journal of the Pakistan Dental Association* 20.3 (2011): 148-153.

2. Reitemeier B., *et al*. "Effect of posterior crown margin placement on gingival health". *Journal of Prosthetic Dentistry* 87.2 (2002): 167-172.

3. Kosyfaki P., *et al*. "Relationship between crowns and the periodontium: a literature update". *Quintessence International* 41.2 (2010): 109-126.

4. De Backer H., *et al*. "Survival of complete crowns and periodontal health: 18-year retrospective study". *International Journal of Prosthodontics* 20.2 (2007): 151-158.

5. Al-Wahadni AM., *et al*. "Periodontal response to all-ceramic crowns (IPS Empress) in general practice". *International Journal of Dental Hygiene* 4.1 (2006): 41-46.

6. Gemalmaz D and Ergin S. "Clinical evaluation of all ceramic crowns". *Journal of Prosthetic Dentistry* 87.2 (2002): 189-196.

7. Weishaupt P., *et al*. "Clinical and inflammatory effects of galvano-ceramic and metal-ceramic crowns on periodontal tissues". *Journal of Oral Rehabilitation* 34.12 (2007): 941-947.

8. Ainamo J and Bay I. "Problems and proposals for recording gingivitis and plaque". *International Dental Journal* 25.4 (1975): 229-235.

9. Silness J. "Periodontal conditions in patients treated with dental bridges.3. The relationship between the location of the crown margin and the periodontal condition". *Journal of Periodontal Research* 5.3 (1970): 225-229.

10. Löe H. "Reactions of marginal periodontal tissues to restorative procedures". *International Dental Journal* 18.4 (1968): 759-778.

11. Amsterdam M. "Periodontal prosthesis: Twenty-five years in retrospect". *Alpha Omegan* 67.3 (1974): 8-52.

12. Loe H and Silness J. "Periodontal disease in pregnancy. I. Prevalence and severity". *Acta Odontologica Scandinavica* 21 (1963): 533-551.

13. Silness J and Loe H. "Periodontal disease in pregnancy. II. Correlation between oral hygiene and periodontal condition". *Acta Odontologica Scandinavica* 22 (1964): 121-135.

14. Ramfjord SP. "The periodontal disease index (PDI)". *Journal of Periodontology* 38.6 (1967): 602-610.

15. Richter WA and Ueno H. "Relationship of crown margin placement to gingival inflammation". *Journal of Prosthetic Dentistry* 30.2 (1973): 156-161.

16. Koth DL. "Full crown restorations and gingival inflammation in a controlled population". *Journal of Prosthetic Dentistry* 48.6 (1982): 681-685.

17. Jones JC. "The success rate of anterior crowns". *British Dental Journal* 132.10 (1972): 399-403.

18. Kancyper SG and Koka S. "The influence of intracrevicular crown margins on gingival health: preliminary finding". *Journal of Prosthetic Dentistry* 85.5 (2001): 461-465.

19. Ehrlich J and Hochman N. "Alterations on crown contour effect on gingival health in man". *Journal of Prosthetic Dentistry* 44.5 (1980): 523-525.

20. Orkin DA., *et al*. "The relationship of the position of crown margins to gingival health". *Journal of Prosthetic Dentistry* 57.4 (1987): 421-424.

21. Felton DA., *et al*. "Effect of in vivo crown margin discrepancies on periodontal health". *Journal of Prosthetic Dentistry* 65.3 (1991): 357-364.

22. Christensen GJ. "Porcelain-fused-to-metal versus zirconia based ceramic restorations". *Journal of the American Dental Association* 140.8 (2009): 1036-1039.

23. Gunay H., *et al*. "Placement of the preparation line and periodontal health--a prospective 2-year clinical study". *International Journal of Periodontics and Restorative Dentistry* 20.2 (2000): 171-181.

24. Parma-Benfenati S., *et al*. "The effect of restorative margins on the postsurgical development and nature of the periodontium. Part II: Anatomical considerations". *International Journal of Periodontics and Restorative Dentistry* 6.1 (1986): 64-75.

Volume 17 Issue 7 July 2018