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RESEARCH ARTICLE

A CLINICAL SURVEY TO ASSESS THE CORRELATION BETWEEN THE NATURE AND TYPE OF FAILURE IN CROWN AND FIXED PARTIAL DENTURES

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ABSTRACT

Objective: The purpose of this study was to evaluate the type of failure and nature of failure in crown and bridge prosthesis and to assess if there is any correlation between type of failure and nature of failure in crown and fixed partial denture.

Materials and Methods: Convenient judgement sampling of patients who reported to the department of prosthodontics with complaint of failures in crown and fixed partial denture were selected for the study from 2013 - 2017. A sample questionnaire was prepared to collect relevant data. The percentage of crown and bridge failure was categorized and tabulated.

Data was entered in excel sheet. SPSS version 17 was used to perform the analysis. Chi. square test was employed to find the association between type of failure in Crown and bridges type and between type of failure & nature of failure. Level of significance was set at 5%.

Results: A clinical survey was conducted to determine the nature and type of failure in crown and fixed partial dentures. The result shows a significant association between type of failure and all crown types. [Chi. Sq. 22.2502 p=0.01] and significant association between type of failure and all bridge types [Chi Sq. 24.8624; P=0.005]. It also shows significant association between nature of failure and type of failure.

Conclusion: Within the limitation of this survey, it was found that when the type of failure and nature of failures were analyzed there is a correlation between type of failure and nature of FPD failure.

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INTRODUCTION

Fixed prosthesis assures greater retention and stability in addition to comfort it is more or less considered as the next best to replace lost tooth or teeth and thereby restore their functions. (Walton, 1986) Knowledge regarding the clinical complications that can occur in fixed prosthodontics enhances the clinician ability to complete a thorough diagnosis, develop the most appropriate treatment plan, communicate realistic expectations to patients and plan the time intervals needed for post treatment care. (Goodacre et al., 2003) Fixed prosthodontic failures are varied and often complex in cause and effect. When a problem occurs, the design and condition of the restoration and associated structures must be considered. This, in turn, will determine whether the problem can be resolved by intraoral or extraoral adjustment or repair, or by restoration replacement. Many repair techniques for crowns and fixed partial dentures have been described in the literature.

(M Ozcan et al 2002, A ehany et al 1981, TH Miller et al 1971, N Beheshti 1979) When a crown or FPD fails, the primary question is whether the problem can be easily resolved, or requires extensive rehabilitation and reconstruction. It is necessary to know the nature and type of failure in fixed prosthesis. A classification system was given by Manapalli (Manappallil J. 2008), which is simple and comprehensive and easily applied and it identifies failures by the degree of severity and considers conventional retreatment possibility. Hence the purpose of this study was to evaluate the type of failure and nature of failure in crown and bridge prosthesis and to assess if there is any correlation between type of failure and nature of failure in crown and fixed partial denture.

MATERIALS AND METHODS

Convenient judgement sampling of patients who reported to the department of prosthodontics with complaint of failures in crown and fixed partial denture were selected for the study from 2013 - 2017. A sample questionnaire was prepared to collect relevant data. The questions pertained to the type of prosthesis. Chief complaint told by the patient in own words, number of units, type of material used in the fabrication of

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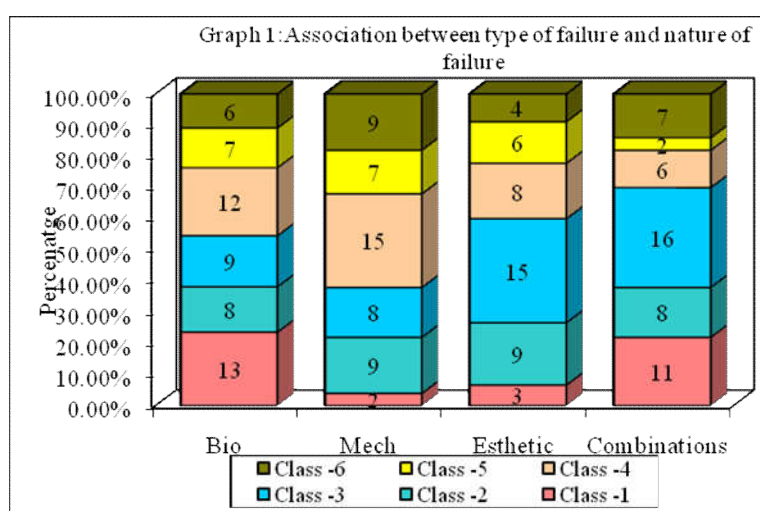
prosthesis, the nature of failure and type of failure was classified. The percentage of crown and bridge failure was categorized and tabulated. Type of failure was classified according to John Manappalli (John Joy Manappallil, 2008). The nature of failure was classified as Biological, Mechanical and Esthetic.

DISCUSSION

Fixed prosthodontics failures can be frustrating and complex in terms of both diagnosis and treatment. Knowledge of the background factors and conditions that causes fixed partial denture and crowns to become unserviceable will help

Classification of crown and fixed partial failure dentures

Grading of failures based on severity	
Class	Description
Class I	Cause of failure is correctable without replacing restoration.
Class II	Cause of failure is correctable without replacing restoration; however supporting tooth structure or foundation requires repair or reconstruction.
Class III	Failure requiring restoration replacement only. Supporting tooth structure and/or foundation acceptable.
Class IV	Failure requiring restoration replacement in addition to repair or reconstruction of supporting tooth structure and/or foundation.
Class V	Severe failure with loss of supporting tooth or inability to reconstruct using original tooth support. Fixed prosthodontic replacement remains possible through use of other or additional support for redesigned restoration.
Class VI	Severe failure with loss of supporting tooth or inability to reconstruct using original tooth support. Conventional fixed prosthodontic replacement is not possible.



Data was entered in excel sheet. SPSS version 17 was used to perform the analysis. Chi. square test was employed to find the association between type of failure in Crown and bridges type and between type of failure & nature of failure. Level of significance was set at 5%.

RESULTS

A clinical survey was conducted to determine the nature and type of failure in crown and fixed partial dentures. Table 1 depicts a significant association between type of failure and all crown types. [Chi. Sq. 22.2502 $p=0.01$] with most common type of failure in class 3 type and it was highest in PFM crowns. Max. class I and class V type. Failure was seen in metal crowns. Max. class 2 and class 4 type failure was seen in ceramic crown. Max. class 6 type failure was seen in PFM crowns.

Table 2 depicts significant association between type of failure and all bridge types [Chi Sq. 24.8624; $P=0.005$] with most common type of failures i.e class 3 type and it was max. in PFM bridges. Class I failure was equally distributed among, Metal bridge and PFM bridge. Class II failure and Class VI failure was common in ceramic bridges. Class IV failure was common in PFM bridges. Class V failure in metal bridges were common. Table 3 depicts no significant association between nature of failure and type of failure. Graph 1 shows there is correlation between type of failure and nature of failure in crown and fixed partial denture.

clinicians in their prosthetic treatment planning. Further more a reliable prognosis might be possible. A thorough assessment of the cause and severity of failure is valuable for patient education and retreatment planning. Hence a classification of FPD failures by Manapallil was given. In our survey this classification was employed to determine the type of failure among the patients and also nature of failure was categorized as biological, mechanical and esthetics. The most common type of failure in crowns were class III type followed by class I. Out of 90 crowns, 23 crowns were class III where the restoration replacement was required. Supporting tooth structure or foundation remained intact and would provide acceptable support for a replacement restorations⁷. 21 crowns were class I type where the cause of failure is correctable without replacing restoration. 20 crowns were class IV, Failure requiring restoration replacement in addition to repair or reconstruction of supporting tooth structure and/or foundation. A study done by Ozcan and Rehany found the failures of crown are correctable through occlusal adjustment or composite resin repair without requiring replacement of the restorations. Type of crowns i.e. metal, ceramic, porcelain fused to metal crowns were categorized (Table 1) where the type of failure and type of crown was compared. It was found to be significant (Table 2). There is an association between type of failure and type of crown, since $P=0.004<0.05$. Out of 110 bridges, 33 fixed partial dentures were class III failures and 22 were class IV. The chi. Square tests for bridge type and type of failure shows that there is no association between type of failure and type of

Table 1. Depicts association between type of failure and crown types

Type of failure	Crown types						
	Metal	%	Ceramic	%	PFM	%	Total
Class -1	14	40.00	1	4.00	6	20.00	21
Class -2	2	5.71	8	32.00	3	10.00	13
Class -3	9	25.71	6	24.00	8	26.67	23
Class -4	2	5.71	3	12.00	2	6.67	7
Class -5	4	11.43	1	4.00	1	3.33	6
Class -6	4	11.43	6	24.00	10	33.33	20
Total	35	100.00	25	100.00	30	100.00	90
Between three crown types, Chi-square=22.2505, p=0.0138*							
Between Metal and Ceramic crown type, Chi-square= 16.6632 P = 0.0051*							
Between Metal and PFM crown type, Chi-square= 7.493 P = 0.1872							
Between Ceramic and PFM crown type, Chi-square= 6.9323 P = 0.2262							

*p<0.05

Table 2. Depicts association between type of failure and bridge types

Type of failure	Bridge type						
	Metal	%	Ceramic	%	PFM	%	Total
Class -1	3	10.00	0	0.00	5	10.00	8
Class -2	5	16.67	12	40.00	3	6.00	20
Class -3	7	23.33	5	16.67	21	42.00	33
Class -4	6	20.00	4	13.33	12	24.00	22
Class -5	5	16.67	2	6.67	4	8.00	11
Class -6	4	13.33	7	23.33	5	10.00	16
Total	30	100.00	30	100.00	50	100.00	110
Between three crown types, Chi-square=24.8622, p=0.0056*							
Between Metal and Ceramic crown type, Chi-square= 8.7210 P = 0.1213							

*p<0.05

Table 3. Association between type of failure and nature of failure

Type of failure	Nature of failure								
	Bio	%	Mech	%	Esthetic	%	Combinations	%	Total
Class -1	13	23.64	2	4.00	3	6.67	11	22.00	29
Class -2	8	14.55	9	18.00	9	20.00	8	16.00	34
Class -3	9	16.36	8	16.00	15	33.33	16	32.00	48
Class -4	12	21.82	15	30.00	8	17.78	6	12.00	41
Class -5	7	12.73	7	14.00	6	13.33	2	4.00	22
Class -6	6	10.91	9	18.00	4	8.89	7	14.00	26
Total	55	100.0	50	100.0	45	100.0	50	100.0	200
Chi-square=25.8912, p=0.1695									

bridge, since $P=0.487>0.05$. In our study nature of failure was categorized as biologic, esthetic and mechanic. When the type of failure and nature of failure was compared, it was found that there is an association between type of failure and nature of failure since $P=0.025<0.05$. Out of 200 failures, 48class III type of fixed partial denture failure had mechanical failure which shows that mechanical failures could be because of faulty designs misplaced finish lines rough or sharp surfaces and under cuts on bonding surfaces causes crown to be dislodged, there by replacing restorations we can plan the retreatment. This shows that there is correlation between the type and nature of failure. Because if there is class III type of failure, the nature of failure will be purely either mechanical or esthetic. When nature of failure is biological, then the type of failure will be class II or class IV. When there is combination of nature of failure like mechanical, biomechanical, biological and esthetic. Then the type of failure will be class IV and class V. In our study, classification given by John Manappallil found to be very useful in retreatment planning.

Conclusion

Within the limitation of this survey, it was found that when the type of failure and nature of failures were analyzed there is a correlation between type of failure and nature of FPD failure.

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