

■ *Original Article*

Success of three quarter crown in posterior teeth

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Abstract

Introduction: This study was designed to observe the success of three quarter crown over conventional full veneer crown in the posterior teeth (premolars and molars) where there has been considerable destruction of tooth structure but with the buccal surface remaining intact. **Method:** A total number of 30 patients were studied. Among which 15 patients were treated with three quarter crown and rest of the 15 patients were treated with conventional full veneer crown. The specific parameters of the study were the preservation of natural tooth tissue, prevalence of secondary caries, conservation of periodontal health, esthetic, comfort and oral hygiene maintenance. After 6 Month of follow up period patient were recalled to evaluate the above mentioned parameters. **Results:** Among all the observations this study revealed the similar result in both group of patients. Periodontal disease and maintenance of oral hygiene was significantly associated in patient with three quarter crown, slight alteration of oral hygiene in the patient treated with full veneer crown was present. Conservation of the natural tooth structure especially buccal wall with negligible alteration in patient's aesthetics (20%) as well as functional activities (20%) was significant for those patients with three quarter crown. **Conclusion:** Overall findings established that three quarter crown is equally effective for the restoration of the tooth and can be used as an alternative to conventional full veneer crown in the posterior teeth where there has been considerable destruction of tooth structure but with the buccal surface remaining intact.

Keywords: Three quarter crown, conventional full veneer crown, secondary caries, periodontal disease, oral hygiene, esthetic

Introduction

Teeth do not possess the regenerative ability that is found in most other tissues. Therefore, once enamel or dentin is lost as a result of caries or trauma, restorative materials must be used to re-establish form and function. Thus teeth require restoration for which preparation must be done on the basis of fundamental principles from which basic criteria can be developed to help predict the success of prosthodontic treatment¹. Missing teeth and the lost structures that result from various factors can be

replaced with fixed prosthesis that will improve the patient comfort and masticatory ability, maintain the health integrity of the dental arches. It is also possible, by the use of the fixed restoration, to render supportive and long range corrective measures for the treatment of problems related to the temporomandibular joint and its neuromuscular components. On the other hand with improper treatment of the occlusion, it is possible to create disharmony and damage the stomatognathic system². Some of the circumstances where cast metal or ceramic restoration be used instead of amalgam or composite resin restoration, and the selection of the material and design of restoration is based on several factors like destruction of tooth structure, esthetic

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needs of the patient, financial consideration, oral hygiene maintenance and retention. If the amount of destruction previously suffered by the tooth to be restored is such that the remaining tooth structure must gain strength and protection from the restoration, cast metal or ceramic restoration is indicated over amalgam or composite resin².

If the tooth to be restored with a cemented restoration in a highly visible area, or if the patient is highly critical, the cosmetic effect of the restoration must be considered. Whereas the plaque control program, or an oral hygiene maintenance will increase the chance for success of the restoration. The conservative restoration that requires less destruction of tooth structures than that does by the full veneers is the partial veneer crown. The use is based on the premise that an intact surface of the structure should not be covered by a crown³. Tooth with a full veneer crown is about 2.5 times as likely to have a pulpal problem as one with a partial veneer crown⁴. Since it does not cover the entire surface, it tends to be less retentive than a complete crown and is less resistant to displacement. However, they provide the advantage of casting with less enamel removal than a crown, when carefully performed they can produce an exceptionally long lasting restoration¹.

Several types of partial veneer exist for posterior teeth that are three quarter crown, modified three quarter crown and seven eighths crown. The three quarter crown covers three fourths of the coronal surface of the tooth, leaving one surface intact. The facial surface commonly remains untouched. One of the principle indications for the three quarter veneer crowns type of restoration is in those instances where there has been considerable destruction of tooth structure but with the buccal surface of the tooth to be remaining intact. In these instances the veneer principle will impart maximum strength to the remaining tooth structure. As a secondary consideration, the three quarter veneer crown design permits obtaining adequate retention and resistance form for the restoration¹.

The three quarter veneer crown design can be used to good advantage where recountouring of the tooth crown is necessary for the purpose of re-establishing the loss of contact with adjacent teeth and reshaping proximal embrasures. Three quarter crown is an alternative to the full veneer crown, particularly suitable for those teeth with sufficient bulk which

can accommodate the necessary retentive features. Due to the clear access to the supragingival margin, selected finishing procedure can be achieved and oral hygiene is also well maintained. Seating of the restoration is relatively good due to the escape of luting agent are easier during cementation. Minimum display of metal enhances the esthetics of the patients and fulfils the cosmetic expectations⁵.

Material and Methods

This was a prospective type of comparative study, conducted in the department of prosthodontics, Bangabandhu Sheikh Mujib Medical University, Dhaka. Patients attending for the treatment of restoration that are sound mesially but have extensive carious involvement and previously restored or broken restoration at distal surface. Purposive sampling was followed to select the subjects of this study. Total sample size was 30. Written informed consent of patient and guardian was taken. Patients were divided into two groups – Group-I: Consisted of 15 patients treated with three quarter crown. Group-II: Consisted of 15 patients treated with full veneer crown.

Each of the selected patients was evaluated by thorough medical and dental history as well as clinical examination, diagnostic model analysis and radiographic examination as per history sheet. After providing treatments and instruction of maintenance of the restoration, patients were advised to revisit after 4 weeks, 3 months, 6 months for evaluation and follow up for some specific parameters: preservation of natural tooth structure, gingival and periodontal health, esthetics and comfort, prevalence of secondary caries, oral hygiene maintenance.

Periodontal health of abutment was assessed by using gingival inflammation, depth of gingival sulcus of abutment teeth and mobility, under the references of following standard indexes: Gingival inflammation was scored according to gingival index (GI)⁶. Periodontal status was scored according to Periodontal Index (PI)⁷. The teeth were disclosed with erythrosine solution and the patients were permitted one rinse with water to remove excess disclosing solution. Esthetic and comfort are the subjective parameters which were evaluated according to the patients satisfaction limit. Development of secondary caries was detected by both clinical and radiological examination.

Results

Data analysis was done by using computer based programme via statistical package for social science (SPSS) window software version 12. The result was presented in tables, figures and diagrams. Chi-square test was done. P-value < 0.05 was considered and accepted as statistically significant. The study was done to conserve the tooth structure with minimal pulpal and periodontal insult. A total 30 patients were evaluated. The results are shown in tables.

Table 1: Conservative considerations of this study by group

Study group	Surface involved	Surface conserved	Gingiva (Buccal wall)	Finish line placement
Group I	OcclusalLingual Proximal	Conserved	Not often involved	Most often Supragingival
Group II	All surface	Not conserved	Involved often	Most often Subgingival

Table 2: Distribution of patients by the development of periodontal disease and group

Follow up	Periodontal disease	Group I(n=15)		Group II(n=15)		p value
		No.	%	No.	%	
Baseline	Normal	15	100.0	15	100.0	NA
	Mild	0	0.0	0	0.0	
4th wk	Normal	15	100.0	15	100.0	NA
	Mild	0	0.0	0	0.0	
3rd month	Normal	14	93.3	15	100.0	0.500
	Mild	1	0.0	0	0.0	
6th month	Normal	13	86.7	12	80.0	0.624
	Mild	2	13.3	3	20.0	
Degradation(%)		13.3%	20.0%	0.624		

p value reached from Chi square test (p>0.05) ns= not significant (p>0.05),

Table 2: Periodontal health of the abutment was almost similar in both the groups and the difference was statistically not significant (p>0.05).

Table 3: Distribution of patients by aesthetic alteration and group

Follow up	Esthetic	Group I(n=15)		Group II(n=15)		p value
		No.	%	No.	%	
Baseline	Altered	0	0.0	0	0.0	NA
	Not altered	15	100.0	15	100.0	
4th wk	Altered	0	0.0	0	0.0	NA
	Not altered	15	100.0	15	100.0	
3rd month	Altered	0	0.0	1	6.7	0.309
	Not altered	15	100.0	14	93.3	
6th month	Altered	3	20.0	4	26.7	0.665
	Not altered	12	80.0	11	73.3	

p value reached from chi square test, ns= not significant (p>0.05)

Table 3: It was observed that 3 and 4 cases altered in group I and group II respectively, but no significant change of esthetic in both the groups of patients (p>0.05) was found.

Table 4: Distribution of patients by the comfort/satisfaction and group

Follow up	Comfort/ satisfaction	Group I(n=15)		Group II(n=15)		p value
		No.	%	No.	%	
Baseline	Good	15	100.0	15	100.0	NA
	Fair	0	0.0	0	0.0	
	Poor	0	0.0	0	0.0	
4th wk	Good	11	73.3	12	80.0	0.665 ^{ns}
	Fair	4	26.7	3	20.0	
	Poor	0	0.0	0	0.0	
3rd month	Good	11	73.3	12	80.0	0.665 ^{ns}
	Fair	4	26.7	3	20.0	
	Poor	0	0.0	0	0.0	
6th month	Good	11	73.3	10	66.7	0.690 ^{ns}
	Fair	3	20.0	4	26.7	
	Poor	1	6.7	1	6.7	
Degradation (%)		26.7	33.3	0.665 ^{ns}		

p value reached from unpaired student t-test, ns= not significant (p>0.05)

Table 4: The study aimed to assess the different qualitative parameters for better feeling. For quantitative assessment of selected parameters such as feeling of comfort score was given. Initially both groups were equal and during subsequent follow up no statistically significant (p>0.05).

Table 5: Distribution of the patients by secondary caries development and group

Follow up	Secondary caries	Group I(n=15)		Group II(n=15)		p value
		No.	%	No.	%	
Baseline	Developed	0	0.0	0	0.0	Na
	Not developed	15	100.0	15	100.0	
4th wk	Developed	0	0.0	0	0.0	Na
	Not developed	15	100.0	15	100.0	
3rd month	Developed	0	0.0	0	0.0	Na
	Not developed	15	100.0	15	100.0	
6th month	Developed	2	13.3	1	6.7	0.542
	Not developed	13	86.7	14	93.3	
1 year	Developed	3	20.0	2	13.3	0.624
	Not developed	12	80.0	13	86.7	
Degradation (%)		20.0	13.3	0.624		

p value reached from unpaired student t-test, p value reached from Chi square test (p>0.05), ns= not significant (p>0.05), ** significant = p < 0.05

Table 5: At 6th month follow up caries developed 13.3% and 6.7% in group I and group II patients respectively. At 1 year follow up caries developed 20.0% and 13.3% in group I and group II patients respectively.

Table 6: Distribution of patients by maintenance of oral hygiene during follow-up period and group

Follow up	Maintenance of oral hygiene	Group I(n=15)		Group II(n=15)		p value
		No.	%	No.	%	
Baseline	Good	15	100.0	15	100.0	
	Fair	0	0.0	0	0.0	
	Poor	0	0.0	0	0.0	
4 th wk	Good	15	100.0	14	100.0	
	Fair	0	0.0	1	0.0	
	Poor	0	0.0	0	0.0	
3 rd month	Good	14	93.3	13	86.7	
	Fair	1	6.7	2	13.3	
	Poor	0	0.0	0	0.0	
6 th month	Good	13	86.6	11	73.3	
	Fair	1	6.7	3	20.0	
	Poor	1	6.7	1	6.7	
Degradation (%)		13.3	26.7	0.361 ^{ns}		

p value reached from unpaired student t-test, ns = not significant (p>0.05)

Table 6: shows that initially both groups was similar regarding the maintenance of oral hygiene and at the subsequent follow up no statistically significant change was found between two groups (p>0.05). Analysis of data indicated that the percentage of degradation was slightly higher in group II patients than group I patients.

Discussion

This prospective type of study was carried out to observe the effectiveness of three quarter crown over conventional full veneer crown in relation to the conservation of the natural tooth structure. Occurrence of periodontitis: the periodontal health of the abutment in both groups was similar. The percentage of degradation after six month follow-up shows 13.3% and 20.0% in group I and group II respectively which was slightly greater in group II than group I patients. Maintenance of the periodontal health and its best results could be expected from margins that are as smooth as possible and are fully exposed to a cleansing action. Whenever possible, the finish line should be placed in an area where the margins of the restoration can be finished by the dentist and kept clean by the patient⁸.

Most of the patients were aesthetically satisfied in group-I due to preservation of their natural sound buccal wall. Only 3 (20%) patients slightly complained about the metallic display at the facial aspect of the occlusal surface but in group-II 4 patients (26.7%) of the prosthesis were mild to

moderate dissimilar to the adjacent teeth due to alteration of all surfaces including buccal surface of the tooth. The result stated that esthetics deteriorated in group-II because some of the prosthesis showed metal at their gingival margins with the advancement of time, gingiva receded after several months of the cementation of conventional full veneer crown. To hide metal display, finish line can be placed in the gingival sulcus⁹, or crown margin can be fabricated by all ceramics which eliminate the black shade due to metal collar¹⁰.

At the six months follow-up the secondary caries developed 13.3% and 6.7% in group I and group II patient respectively. But during 1 year follow-up 3 patients (20%) in group I developed secondary carries and 2 patients (13.3%) in group II developed secondary caries which is not significant but slightly greater in group I patients. Black GV established the traditional concept to place margins as for subgingival as possible¹¹, based on the mistaken concept that the subgingival sulcus is caries free, later it is described as a major etiological factor in development of caries¹². Deeper the restoration

margin resides in the gingival sulcus, the greater the inflammatory response¹³.

Evaluation of oral hygiene maintenance showed 13 patients of group-I found with good oral hygiene, during 6 months follow-up period, where only one showed fair and one showed poor which is 13.3% degradation in group-I patients. But 11 patients were found with good oral hygiene in group-II, three patients were found with fair and only one was poor. This is 26.7% degradation in group-II. The clear accessible margin to the dentist for finishing and to the patient for cleaning in three quarter crown lowers the incidence of poor oral hygiene².

Conclusion & Recommendation

Application of three quarter crown, as a partial veneer restoration is equally effective for the restoration of the tooth and can be used as an alternative to conventional full veneer crown in the posterior teeth where there has been considerable destruction of tooth structure but with the buccal surface remaining intact. The successful outcome of this method is dependent on strict case selection, proper tooth preparation and quality of laboratory work. The method is more conservative and functionally effective. The study showed similar result as the conventional full veneer crown in respect to the periodontal, gingival health, oral hygiene maintenance, with negligible alteration in patient's esthetics as well as functional activities and persons comfort and satisfaction.

Further study on three quarter crown is needed with large sample size to find out the advantages of it over conventional full veneer crown. The study should be conducted on a long-term basis with increased follow up to observe and compare the advantages of three quarter crown over conventional full veneer crown.

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