



Evaluation of Oral Hygiene Status After Cementation of Modified Crown on Mandibular Molar Tooth

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Received: 05 August 2021

Revised: 23 September 2021

Accepted: 01 October 2021

Published: 22 October 2021

Abstract

Background: Maintains oral hygiene is the main important factor for the success of any prosthesis. The prosthesis should always be favorable for oral hygiene and it should not be detrimental to the oral health status. The contour of artificial crowns has and continues to be highly controversial. Most of the controversy centered on whether the under contoured or the over contoured crown is more favorable for the maintenance of oral hygiene. **Objective:** The purpose of this study was to evaluate the effects of modified crown contour (over contoured and under contoured) on oral hygiene status. **Methods:** This study was conducted in the department of Prosthodontics, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh to find out the successful artificial crown contour that is favorable for oral hygiene status. 50 patients (Group-A) whose full veneer crown was fabricated with under contouring form and cemented on mandibular molar teeth and another 50 patients (Group-B) whose full veneer crown was fabricated with over contouring form and cemented on mandibular molar teeth. Clinical examination and evaluation were done after three (3) weeks, six (6) weeks, three (3) months, and six (6) months of post prosthesis follow up period. Data were collected on the basis of flowing parameters like Plaque index, Calculus index and gingival index on a predesign data collection sheet. Statistical analysis (Chi-Square Test and unpaired t-test) was done to find out the significance value ($P < 0.001$). **Results:** It is observed that the result was highly significant ($p < 0.001$) between two groups regarding Plaque accumulation, Calculus deposition and gingival inflammation. **Conclusions:** This study revealed that under contoured crown is more favorable for the maintenance of oral hygiene than over contour crown on mandibular molar tooth.

Keywords:- Modified crown; Crown contour; Oral hygiene; Restoration.

INTRODUCTION

When a tooth structure is destroyed by any means it needs to be restored by using

restoration. Full veneer crowns have been one of the best options of restoration in fixed prosthodontics in the recent decades, as they have an outstanding capability to protect a



weakened tooth structure and improve esthetics and functions. Many factors influencing the long-term biological success of the full veneer crowns such as the location of crown margin, marginal adaptation and the contour of the crown. There is a direct cause-and-effect relationship between crown contour and bacterial plaque accumulation and calculus deposition around the tooth margin. There cannot be a possible healthy mouth with a diseased periodontium. Plaque and calculus deposition around the tooth is the main cause of periodontal tissue destruction following unhygienic oral condition. If the tooth itself is sound but its periodontal tissue is affected by any diseased condition, the tooth may be lost in spite of having healthy coronal tooth structure. The contour of the tooth may cause plaque/calculus accumulation along the gingival margins, so the design of the coronal contour of a full veneer crown should be in such a way that it will not cause any plaque accumulation that follows unhygienic oral condition. Reduction of bacterial plaque accumulation is effected by the elimination of surface convexities that prevent rubbing action of the lips, cheeks and tongue; this action aids in debriding the surface of a tooth and its gingiva.^[1] During mastication, food bolus comes on the occlusion surfaces by propelling action of lips, cheeks and tongue. The confining walls of the buccal and lingual surfaces are the hard tooth on one side and a free movable soft tissue curtain on the other side and the frictional contract depend on the buccal and lingual surface configuration of the tooth. If the tooth surfaces are bulge or overcontour in these areas the frictional contract will be less but if the surfaces are flat or undercontour the frictional contract will be more that cause more self-cleaning action.^[2] Natural crown contours with a maximum cervical bulge are inadequate

protection against an impaction mechanism. For example, the lingual tilt of mandibular posterior teeth cancels the effect of the bulge on the buccal surfaces of the teeth. For this reason, the lingual areas are the most common site for plaque and calculus deposition but opposite scenarios on the buccal region.^[3,4] Although the natural protection from the crown makes the gingival crevice readily accessible to food, the crevice is not easily entered. The supra-alveolar connective tissue fibre system holds the free gingival tissue firmly against the crown. This evidence by the meticulous care required to purposely impact impression material into the crevice as far as the finishing line when making an impression. An outward current of serum also flushes foreign matter from the gingival crevice. Heavy muscular activity and hard foods increase serum flow. The freely moving tissues of the lip, cheek, and tongue constantly pass over the gingival margin, moulding, massaging, and cleansing it. When changes in tooth position and contour prevent this intimate contact, the gingivae grow longer and thicker, and food particles remain. The food is not impacted but rather shifts into the space and remain stagnant, out of reach of muscular action.^[5] The embrasure presents a different situation because of its hard, confining proximal borders. An open contact leads to food impaction, which becomes worse when hard foods are involved. Embrasure contours are possibly even more important than buccal or lingual contours. The embrasure is a sheltered space at best and responds to over-contouring with a rapid dramatic response. The papilla becomes inflamed and hyperplastic. Variation in the shape of contact or embrasure dimensions that prevents intimate soft tissue contact with the gingival margin results in gingival thickening, food retention, and inflammation.

An embrasure with adequate height and width, but overcontouring at the Bucco-proximal line angles, is frequently produced even a careful dentist. The error is usually the result of an inadequate preparation, and ill shaped restoration effectively blocks off muscular action. In many clinical and experimental studies indicate that over-contouring restoration causes gingival inflammation, plaque and calculus accumulation as well as periodontal involvement. The contour may vary in different mouths, in different part of the same mouth, or the same tooth. If such contours do not protect against food impaction but rather permit free muscular flow, the final shape of those surfaces will range from flat to the most subtle of convexities. The forms are truly comparable to natural curves and will most likely preserve gingival health.^[6] Some studied the histologic effects of crown contour on human gingiva.^[7] They found that there was an increase in inflammation adjacent to bulbous artificial crowns but that properly contoured artificial crowns exhibited no such increase at the adjacent gingiva.^[8] Total clinical crown contour is related to gingival health. The subgingival convexity of a tooth or a restoration should extend facially or lingually no more than one half of the thickness of the gingiva. This protects the gingival crevice and promotes a knifelike free gingival margin, important in plaque control. The facial and lingual surface contours should have gradual curvatures in all directions to facilitate the rubbing and cleansing function of the lips, cheeks, and tongue. The interproximal contour of adjacent teeth contacts areas, and of the teeth in relation to the gingival papilla must be such that moving tissues can rub or the patient can perform oral hygiene easily. So, the present study was designed to evaluate the oral hygiene status after

cementation of over contour and under contour crown on mandibular molar tooth.

MATERIAL AND METHODS

This prospective comparative experimental study was conducted in the Department of Prosthodontics, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh for the duration of one and half years to find out the successful artificial crown contour that is favorable for maintaining good oral hygiene. Total of 100 patients were included in this study who were candidates for full veneer crown on their mandibular molar tooth. 50 patients (Group-A) whose full veneer crown was fabricated with under contoured restoration and another 50 patients (Group-B) whose full veneer crown were fabricated with over contoured restoration. After proper evaluation of the patient, a primary impression was made with alginate impression materials followed by preparation of diagnostic cast with die stone. The diameter of the tooth to be prepared was measured at the maximum bulging area and recorded. The tooth preparation was done by maintaining the basic principles of tooth preparation (Biologic, Mechanical and Esthetics consideration). The following sequential steps of tooth preparation were followed like occlusal reduction, buccal reduction, lingual reduction, interproximal reduction and finally finished all the prepared surfaces. The supra-gingival chamfer finish line was provide for all the teeth. Final impressions were made by using medium body silicone impression material (Zetaplus, Zhermack Clinical, Italy) with a perforated stock tray. Die stone (Dentamerica, USA) was used to prepare the laboratory cast. Metal ceramic full veneer crowns were fabricated for all the study population. For group-A, the

restorations were fabricated in such a manner that the diameter of restoration was 10% less than the diameter of the tooth is prepared buccal and lingual contour of the restoration were prepared flat, proximal contacts were produced on occlusal third and buccal to the central fossa. But in the case of group B, the diameter of the full veneer crowns were 10% more than the diameter of the tooth is prepared. All the crowns were cemented to their respected tooth with resin cement. Similar oral hygiene

instructions were given to each and every patient. Clinical examination and evaluation were done after three (3) weeks, six (6) weeks, three (3) months, and six (6) months of cementation. Data were collected in terms of different variables like the Plaque index, Calculus index and gingival index in a predesigned data collection sheet. Statistical analysis (Chi-Square Test) was done to find out the statistical significance ($P < 0.001$).

RESULTS

Table 1: Distribution of patients by plaque index in different follow up visits.

Follow up Visit	Plaque index	Group A		Group B		P-value
		n=50	%	n=50	%	
After (3) weeks	Grade I	47	94.0	28	56.0	0.001*
	Grade II	3	6.0	13	26.0	
	Grade III	0	0.0	9	18.0	
	Grade IV	0	0.0	0	0.0	
After (6) Weeks	Grade I	45	90.0	16	32.0	0.001*
	Grade II	5	10.0	15	30.0	
	Grade III	0	0.0	19	38.0	
	Grade IV	0	0.0	0	0.0	
After (3) Months	Grade I	46	92.0	4	8.0	0.001*
	Grade II	4	8.0	24	48.0	
	Grade III	0	0.0	22	44.0	
	Grade IV	0	0.0	0	0.0	
After (6) Months	Grade I	44	88.0	0	0.0	0.001*
	Grade II	4	8.0	8	16.0	
	Grade III	2	4.0	32	64.0	
	Grade IV	0	0.0	10	20.0	

Grade-I= no plaque, Grade-II= Minimum plaque, Grade-III: =Moderate plaque, Grade-IV= Severe plaque.

Table 2: Distribution of patients by Calculus index in different follow up visits.

Follow up Visit	Calculus index	Group A		Group B		P-value
		n=50	%	n=50	%	
After (3) weeks	Grade I	50	100.0	46	92.0	0.001*
	Grade II	0	0.0	4	8.0	
	Grade III	0	0.0	0	0.0	
	Grade IV	0	0.0	0	0.0	
After (6) Weeks	Grade I	48	96.0	32	64.0	0.001*

	Grade II	2	4.0	12	24.0	
	Grade III	0	0.0	6	12.0	
	Grade IV	0	0.0	0	0.0	
After (3) Months	Grade I	45	90.0	0	0.0	0.001*
	Grade II	4	8.0	21	42.0	
	Grade III	1	2.0	6	12.0	
	Grade IV	0	0.0	23	46.0	
After (6) Months	Grade I	39	78.0	0	0.0	0.001*
	Grade II	8	16.0	15	30.0	
	Grade III	3	6.0	23	48.0	
	Grade IV	0	0.0	12	24.0	

Grade-I: No calculus, Grade-II: Supragingival calculus, Grade-III: Subgingival calculus, Grade-IV: Both supra and subgingival calculus.

Table 3: Distribution of the patients by gingival index in different follow up visits.

Follow up Visit	Gingival Condition	Group A		Group B		P-value
		n=50	%	n=50	%	
After (3) weeks	Grade I	48	96.0	45	90.0	0.414
	Grade II	2	4.0	4	8.0	
	Grade III	0	0.0	1	2.0	
	Grade IV	0	0.0	0	0.0	
After (6) Weeks	Grade I	47	94.0	41	82.0	0.135
	Grade II	3	6.0	7	14.0	
	Grade III	0	0.0	2	4.0	
	Grade IV	0	0.0	0	0.0	
After (3) Months	Grade I	48	96.0	26	52.0	0.001*
	Grade II	2	4.0	22	44.0	
	Grade III	0	0.0	2	4.0	
	Grade IV	0	0.0	0	0.0	
After (6) Months	Grade I	46	92.0	16	32.0	0.001*
	Grade II	3	6.0	18	36.0	
	Grade III	1	2.0	12	24.0	
	Grade IV	0	0.0	4	8.0	

Grade-I: Normal gingiva, Grade-II: mild gingival inflammation, Grade-III: moderate gingival inflammation, Grade-IV: Severe gingival inflammation.

DISCUSSION

With regard to gingival condition, it has been found that no significant differences exist between the two groups at 3 weeks and 6 weeks after cementation of restoration ($P > 0.05$). However, the result of group A was

significantly better than group B over the 3 months and 6 months of the monitoring period ($P < 0.001$). The uncounted crown keeps the gingival health better than the over the contoured crown. An experimental study was carried out on six mongrel dogs, where



mandibular teeth were recontoured with full veneer crown.^[8] The buccal surfaces were over contoured with auto-curing acrylic resin which was not in contact with the gingiva. The results showed no apparent gingival pathologies caused by under contour, while overcontouring causes first inflammation and later collectivity of debris, hyperplasia and congestion of gingiva margin, scant keratinisation and deterioration of gingival collar fibres. In terms of periodontal status, the results were not significantly different after 3 weeks of study between two groups, but the results were very significant for the latter after 3 weeks of study ($P < 0.001$) between the two groups.^[8,9,10,11,12] The teeth with a under-contented crown have a good periodontal condition, but the periodontal condition of the crowns has been treated on the other hand. 3 weeks after cementation of crown, 94% of patients with undercontour crown were represented with plaque free gingiva but in case of overcontouring restoration only 56% patients were represent with same category After 6 weeks of study 90% patients with undercontoured restoration were in plaque free gingival condition but only 32% patients of overcontoured were in plaque free situation. After 3 month and 6 month of study the results were improving in undercontoured crown but deteriorating in overcontoured crown comparatively plaque accumulation was more in patient with overcontouring restoration than undercontouring restoration.^[13,14,15,16,17,18]

According to calculus index both supra and subgingival calculus deposition more in overcontouring restoration than undercontouring restoration. The result was

highly significant difference between two groups ($P < 0.001$). Yuodelis RA et al. (1973) stated that the cervical bulge of crown over protects the microbial plaque.^[9,10,11,12] They also stated that to promote accessibility of oral hygiene, final fixed restoration should not follow the original anatomic crown but should recreate the normal contours of root portion. By flattening the buccal and lingual contours of tooth would reduce unnecessary at the gingival third of tooth.

Limitations of the study

This was an observational study with a small sized sample. So, the findings of this study may not reflect the exact scenario of the whole country.

CONCLUSIONS

At the end of the study, it is concluded that under cotouring crown does not produce any significant changes in the oral hygiene but over contouring crown causes significant amount of plaque accumulation, calculus accumulation and gingival inflammation.

Recommendation

This study can serve as a pilot to a much larger research involving multiple centers that can provide a nationwide picture, validate regression models proposed in this study for future use and emphasize points to ensure better management and adherence.



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Source of Support: Nil, Conflict of Interest: None declared