

THE INTER-RELATIONSHIP BETWEEN THE PERIODONTIUM AND CONTOURS OF ARTIFICIAL CROWNS. A REVIEW

K. Fareed, BDS, MS*; R. Omar, BSc, BDS, LDSRCS, MSc, FRACDS**

تبدلت وجهات النظر في افتراض أن الحشوات الرديئة الصنع تؤدي إلى أمراض اللثة فقط ولكن أيضًا يمكن أن
يكون للحشوات الجيدة الصنع دور هام في ظهور أمراض اللثة.
إن العاملين الأساسيين اللذين يؤثران بالأنسجة هما طريقة تلاقي أطراف الحشوة مع نسيج السن وعلامة الحشوة
مع الشكل الخارجي للسن.
سوف تناقش أساليب وأهداف طرق تلاقي أطراف الحشوة وأيضًا أشكال عدة حشوات صممت من قبل في ضوء
المواد التقنيات المتاحة.

The subject of axial contour of artificial crowns has and continues to be highly controversial. Much of the controversy centers around whether the gingival sulcus is really in need of protection from buccal and/or lingual convexities, or whether a flatter emergence profile affords "self-cleansing" muscle action. Evidence is reviewed in this part which suggests that overcontouring is probably more detrimental to gingival health than undercontouring. The critical role played by proper tooth reduction in attaining correct axial contour is shown and a rationale presented for the important interplay between preparation design, properties of the restorative materials to be employed, and physiologic contour.

The subject of axial contours of artificial crowns has and continues to be highly controversial. When considering the effect of contours on the periodontium, one is primarily concerned with the contour in the gingival third of the restoration. Much of the controversy centers around whether the gingival sulcus is really in need of protection from buccal and/or lingual convexities, or whether a flatter emergence profile affords "self-cleansing" muscle action, and routine oral hygiene measures. This paper reviews the literature on the subject of crown contour and its relationship to periodontal health.

Review of Literature

It has been stated that convexities in the facial

and lingual axial surfaces were to protect the free gingival margin during mastication. Food is deflected from the margin to the keratinized gingival tissue. Therefore, it was suggested that crown restorations should incorporate these convexities from a physiologic standpoint. These convexities would hold the gingiva under some tension and protect the vulnerable tissue by "shunting" the food material. This "shunted" food in turn was responsible for tissue massage. The idea was based upon the questionable premise that forceful contact of food against the marginal gingiva was responsible for gingival disease.¹⁻³

Herlands et al⁴ and Morris⁵ questioned the above "food-deflection" concept. They felt that such contours resulted in overcontoured restorations causing gingival inflammation. They felt that gingival inflammation was due to the lack of self-cleansing actions of the muscles, saliva, and lack of accessibility to oral hygiene methods. An overcontoured crown could militate against this muscle action.

Microbial plaque has been shown to be the primary etiologic factor in periodontal disease.⁶⁻⁸

*Lecturer, Department of Restorative Dental Sciences, King Saud University, College of Dentistry

**Associate Professor and Chairman, Department of Restorative Dental Sciences & Director of Research Center, King Saud University, College of Dentistry

Address reprint requests to: Dr. K. Fareed, Department of Restorative Dental Sciences, P.O. 60169, Riyadh 11545, Saudi Arabia

Perel⁹⁻¹⁰ studied the effect of axial contours on the marginal gingiva in full-grown mongrel dogs. Undercontours and overcontours were produced on the buccal and lingual surfaces of the mandibular teeth crowns. Clinical and histologic evaluations were made of the marginal gingiva and crevicular areas. He concluded that:

1. Undercontouring did not produce any significant changes in healthy gingiva.
2. Overcontouring of the axial surfaces resulted in inflammatory and hyperplastic changes in the marginal gingivae.

These conditions were observed both clinically and histologically after four weeks. His experiments showed that a deflective contour was detrimental to gingival health in a periodontally sound environment. This type of morphology facilitated the stagnation of food during mastication, and prevented the cleansing action of tongue, cheek, and lips.

Youdelis et al¹¹ stated that plaque retention is greatest in regions that are relatively inaccessible to routine oral hygiene measures. These regions are the interproximal, and the facial and lingual cervical areas of the teeth. To maintain these vulnerable areas in a plaque-free state, the close relationship between the morphologic characteristics of the clinical crown and the degree of accessibility must be recognized. They felt that overcontouring, to protect the gingival crevice from food material, in fact, encourages the accumulation of plaque in the areas of inaccessibility for routine oral hygiene measures. They doubted the need for protection of the gingival sulcus for the following reasons.

1. There is very little in our modern diets that could injure the free gingival margin.
2. Proprioceptive response usually provides adequate protection for the free gingiva during the mastication of hard foods.
3. The potential impact of food as the bolus passes over the axial contour of teeth is usually dissipated by the time the food reaches the gingiva since it is directed by the cheeks, lips, tongue, and other parts of the mouth into a position for deglutition.
4. Most human dentitions have little, if any, clinical bulge and yet these tissues do not suffer

trauma from mastication.

5. The dentitions of lower species of animals do not provide this theoretical protection since their buccal and lingual bulges are usually sub-gingival. This demonstrates the importance of the proprioceptive system to protect the gingiva from the traumatic effect of food that is coarse.

It has been suggested that the restoration should not follow the original anatomic crown but should follow the contours of the root portion. This is particularly needed for accessibility to the gingival third of fluted and furcation regions.¹¹⁻¹²

Several authors¹³⁻¹⁶ introduced the concept of crown contour which simulated the anatomy of natural healthy teeth. They considered this to be a biologic contour that was self-protective contour to the supporting tissues which defended the gingival unit, attachment apparatus, and protected bone from trauma and irritation. They stated that the facial and lingual convexities form the height of contour of tooth crowns, which are located at the gingival third of each tooth and are approximately one-half millimeter wider than the adjoining cemento-enamel junction. Exceptions are the lingual surface of the lower molars and second premolars; here the convexities measure approximately one millimeter and are located halfway between the occlusal plane and the gingival margin.

The contours of the crown restorations in the interproximal embrasure areas is a significant factor, too, often ignored by clinicians. The interproximal embrasure could be considered a "yard stick" for monitoring periodontal health.^{12, 17-20}

Overcontouring is primarily a consequence of inadequate tooth preparation by the clinician. If insufficient tooth structure is removed during the preparation, the dental laboratory technician will overcontour the crown to obtain minimum thickness of metal and porcelain compatible with durability and esthetics.²¹ Also, when the dies are trimmed, the true relationship between the margin of the restoration and the gingival tissue is lost. The dental technician may overcontour the restoration if he is not aware of the original anatomy and its relationship to the gingival tissues.²² The situation is further compromised by the unfortunate practice of "die-ditching". A possible solution to the absence of gingival tissue has been described. The techni-

can could be provided with a silicone matrix of the axial contours and soft-tissue casts which have the gingival tissues duplicated in form to facilitate proper contour in the fabrication of restorations.²³

Conclusion

Most of the literature on contours has been based on clinical evidence and the experience of clinicians with very few histologic facts. The literature suggests the following:

1. Microbial plaque is the primary etiologic factor in periodontal disease.
2. There is no need for "protection" of the gingival sulcus by developing convexities in the artificial crown.
3. These convexities, in fact, provide areas for plaque accumulation and prevent "self-cleansing" muscle action and routine oral hygiene measures, leading to gingival inflammation.
4. Overcontouring appears to be more detrimental to gingival health than undercontouring.
5. Therefore, the gingival third of crowns may follow the contours of the root portion on the facial and lingual axial surfaces to provide the needed accessibility for "self-cleansing" and routine oral hygiene measures.
6. Overcontouring should be especially avoided in the interproximal embrasure areas.
7. Adequate tooth preparation is essential in establishing proper final contour of crowns.
8. Guides to crown preparation and fabrication procedures of crowns are the essential precludes for establishing proper contour.

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