



Periodontal considerations determining the design and location of margins in restorative dentistry

Arvind Shenoy, Nina Shenoy¹, Roopa Babannavar

Department of Conservative Dentistry, Bapuji Dental College and Hospital, Davangere, ¹Department of Periodontics, A B Shetty Institute of Dental Sciences, NITTE University, Mangalore, India

Address for correspondence: *Dr. Arvind Shenoy, E-mail: drashenoy@gmail.com*

ABSTRACT

The first and most basic objective of restorative dentistry is preservation of the tooth structure. However, for the long-term survival of restoration the periodontium must also remain healthy or vice versa. The connective tissue of the attachment apparatus consists of three-dimensionally oriented fibers connecting firmly the tooth structures to the surrounding gingiva. Both the epithelial as well as connective tissue attachment contribute to a 'protection mechanism' in a most challenging area where the natural tooth penetrates the ectodermal integrity of the body. The attainment of this objective would be far less complex if it could be considered independent of restoration of function, comfort and esthetics, but such is not the case. The latter objectives usually require sophisticated restorative dentistry as often such esthetic restorations require placement of intra-crevicular margins without compromising on the periodontal health.

Key words: Esthetics, intracrevicular margins, tissue damage

INTRODUCTION

The relationship between periodontal health and the restoration of teeth is intimate and inseparable. Although it is widely accepted that the best restorative margin is one that is placed coronal to marginal tissue, most restorations have margins in the gingival crevice, and permanent tissue damage is common.^[1] In 1921, Gottlieb initially described that the "epithelial attachment" around the natural tooth covering distinct areas of the enamel surface or the cementum and is not just attached to the cemento-enamel junction at a certain point or level, respectively.^[2] Later on these findings have been confirmed by Orbans & Muller.^[3] Subsequently, Feneis showed that connective tissue consists of three-dimensionally oriented fibers firmly connecting tooth structures to the surrounding gingiva.^[4] Thus, it became

clear that both epithelial as well as connective tissue attachment contribute to a 'protection mechanism' in a most challenging area where the natural tooth penetrates the ectodermal integrity of the body.

For long-term survival of restoration, both functionally and esthetically, certain biological considerations are very critical to preserve the health of the periodontium and thus must be given due importance in clinical practice. The article overviews, highlights and discusses these periodontal (biological) considerations for the contemporary esthetic restorations in dentistry.

PERIODONTAL (BIOLOGICAL) CONSIDERATIONS

Biologic width

Sicher coined the term "dentogingival junction" in 1959.^[5] In 1961, Gargiulo *et al.*, found out that the vertical dimension of the dentogingival junction comprising sulcus depth (SD), junctional epithelium (JE), and connective tissue attachment (CTA), is a physiologically formed and stable dimension, subsequently called "Biologic Width", which forms at a level dependent on the location of the crest of the alveolar bone.^[6]

Access this article online

Quick Response Code:



Website:
www.jidonline.com

DOI:
10.4103/2229-5194.94184



The significance of the 'biologic width' is its presence around every tooth; actually it is a three-dimensional concept, which is not limited to a single linear plane. In effect, this natural barrier or shield protects the two most vulnerable structures of a tooth—the periodontal ligament and alveolar bone, which ultimately determine the survival and longevity of the dental elements.^[7]

It has been suggested that the margin of the final prosthesis/restoration should be placed 1 to 2mm supragingivally wherever possible as locating the margins too close to the bone may cause periodontal destruction because of hindrance to plaque removal by routine oral hygiene procedures. If required, for esthetic considerations, the margin can be placed at the gingival crest or, at the most, 0.25mm to 0.5mm into the gingival sulcus. This ensures that the biologic width remains healthy. Therefore, the most critical factor regarding the long-term gingival health is the relationship between the supracrestal fiber attachment and margin location and the location of the base of the sulcus. If the tooth preparation margins are placed into the zone of the biologic width, a very important biologic principle is being violated. When the biologic width is violated, an inflammatory response results in alveolar bone resorption, increased pocket depths, increased loss of periodontal support, exacerbation of accumulation of subgingival bacteria, increased chronic inflammation, and further localized periodontal breakdown.

Evaluation of biologic width

The basic techniques employed in day-to-day dental practice for the evaluation of biologic width are:

- By Radiographs
- By using a Periodontal probe

Categories of biologic width

In order to operationally define biologic width, Kois suggested that the restorative dentist must determine the total distance from the gingival crest to the alveolar crest.^[8,9] This procedure is termed bone sounding. The Glossary of Periodontal terms describes sounding as the *penetration of anesthetized soft tissue by a probe in order to determine the topography of the alveolar process.*

The patient is anesthetized and the periodontal probe is placed in the sulcus and pushed through the attachment apparatus until the tip of the probe engages alveolar bone. The measurements are made on anterior teeth mid-facially and at the facial/interproximal line angles.^[10] Based on this measurement, the three categories of biologic width described are:

- a. Normal Crest
- b. High Crest
- c. Low Crest

Normal-crest patient

The mid-facial measurement is 3.0mm and the proximal measurement is in the range of 3.0-4.5mm. It occurs approximately in 85% of patients. The margin of a crown should generally be placed no closer than 2.5mm from the alveolar bone. Therefore, a crown margin which is placed 0.5mm subgingivally tends to be well-tolerated by the gingiva in such patients.^[10]

High-crest patient

The mid-facial measurement is less than 3.0mm and the proximal measurement is also less than 3.0mm. Usually, it is not possible to place an intracrevicular margin because the margin will be too close to the alveolar bone, resulting in a biologic width impingement and chronic inflammation. It occurs approximately 2% of the time and is most often seen in a proximal surface adjacent to an edentulous site due to collapse of interproximal papilla following tooth removal.^[10]

Low-crest patient

The mid-facial measurement is greater than 3.0mm and the proximal measurement is greater than 4.5mm. Occurs in 13% of cases and is most susceptible to recession secondary to the placement of an intracrevicular crown margin. Healing of the injured attachment, subsequent to the crown preparation, lead to a normal crest position, resulting in gingival recession.^[10] However, not all low-crest patients react similarly to an injury to the attachment as some may have quite stable attachment apparatus depending on the depth of the sulcus.^[11]

Importance of determining the crest category

Determination of the crest category allows the operator to determine the optimal position of margin placement, as well as inform the patient of the probable long-term effects of the crown margin on gingival health and esthetics.^[10]

If the sulcus is in the shallow range, the dentist may treat this stable Low-Crest patient like a Normal-Crest patient. An intracrevicular margin can be placed with a reasonable expectation of long-term stability and esthetics. However, if the sulcus is in the deeper range, the dentist would expect that an intracrevicular crown margin placed in this unstable Low-Crest patient would result in gingival recession.^[7-10]

CORRECTION OF BIOLOGIC WIDTH VIOLATION

Correction of Biologic Width Violation can be achieved by two methods:

- a. Surgical Crown Lengthening
- b. Orthodontic Extrusion



Crown lengthening procedures

To select the proper treatment approach for crown lengthening, an analysis of the individual case with regard to crown-root alveolar bone relationships should be done.

External bevel gingivectomy

When there is more than adequate attached gingiva and no bone involvement, one method of eliminating excessive pocket depth and or of exposing additional coronal tooth structure is by external-bevel gingivectomy.

Internal bevel gingivectomy

Reduction of excessive pocket depth and exposure of additional coronal tooth structure in the absence of a sufficient zone of attached gingiva with or without the need for correction of osseous abnormalities requires a surgical procedure, wherein the flap must always be internally beveled so as to expose the supporting alveolar bone.

Apically positioned flap with bone recontouring

It is used to expose sound tooth structure in cases of tooth fracture or caries. As a general rule, at least 4 mm of sound tooth structure must be exposed at the time of surgery or the tissue will proliferate coronally to cover 2-3 mm of the root, thereby leaving only 1-2 mm of supragingivally located sound tooth structure. It is indicated for the crown lengthening of multiple teeth in a quadrant and contraindicated for a single tooth in the esthetic zone.

Forced tooth eruption

Orthodontic tooth movement can be used to extrude teeth in adults. The tooth must be extruded a distance equal to or slightly longer than the portion of the sound tooth structure that will be exposed in the subsequent surgical treatment. After the tooth has reached the intended position and has been stabilized, a full-thickness flap and bone recontouring is performed to expose sound root structure. For esthetic reasons it is important that the bone and soft tissue levels at adjacent teeth remain unchanged.

Forced eruption may serve as a treatment modality in three different clinical situations.

- Treatment of an isolated infra bony defect using slow vertical extrusive forces to eliminate an osseous angular defect.
- Treatment of an isolated, extensively broken down tooth where the problem is in the root cervical third (e.g., fracture, deep caries, perforation, external root resorption). As the focus is on the root position related to the alveolar crest, the rate of eruption is rapid compared to the first situation mentioned above. The reason is to gain a lag period between the movement

of the root and its attachment apparatus and reduce or eliminate corrective periodontal surgery.

- Treatment of soft-tissue deformities appearing as a discrepancy in the gingival architecture, mainly in the anterior part of the mouth. The extrusive forces applied in this situation are also slow.

LOCATION OF THE MARGIN (MARGIN PLACEMENT)

A clinician is presented with three options for margin placement:

- a. Supragingival
- b. Equigingival (even with the tissue)
- c. Subgingival Intracrevicular

It is widely believed that the best biological place for a restorative margin is supragingival. Supragingival margins stay away from the periodontal tissues, and have the following advantages:

- Preservation of tooth structure during tooth preparation.^[12]
- Impressions are more predictable, with minimal or no cord packing.
- Provisional restorations are easier to make, and the soft tissues will be healthier when the patient returns for cementation of the final restoration.
- Removing excess cement is much easier when the margin is visible.

Conventionally equigingival margins were not recommended as they were thought to retain more plaque than supragingival or subgingival margins and therefore cause greater gingival inflammation. There was also the concern that any minor gingival recession would create an unsightly margin display. These concerns are not valid today, not only because the restoration margins can be esthetically blended with the tooth but also because restorations can be finished easily to provide a smooth, polished interface at the gingival margin. From a periodontal viewpoint, both supragingival and equigingival margins are well tolerated. The greatest biologic risk occurs when placing subgingival or equigingival margins for finishing procedures, and in addition, if the margin is placed too far below the gingival tissue crest, it violates the gingival attachment apparatus. Not only do restorative margins placed subgingivally risk invading the attachment apparatus, but also unwanted tissue effects appear to result merely due to their subgingival location, regardless of the depth of the sulcus penetration.

With the advent of more translucent restorative materials, adhesive dentistry, and resin cements, the ability to place supragingival margins in esthetic areas is now a reality. Therefore whenever possible, these restorations should be



chosen not just for their esthetic advantage but for their favorable periodontal impact as well.

However, due to dental disease and/or esthetic demands, it is not always possible or desirable to leave restorative margins supragingival. Sulcular margin placement must be considered when restoring teeth that:

- are dark, or endodontically treated
- are short, cervico-incisal and in need of more length for retention purposes
- have contacts that need to be lengthened apically to avoid dark triangles

For darker underlying tooth structure and when doing corrective contouring, placing the margin (intracrevicular margins) in the bottom half of the sulcus many times will give the best esthetics and profiles. Intracrevicular margins are defined as those confined within the gingival crevice. The following factors may force the clinician to place a restoration margin intracrevicularly:

- Need to improve the resistance and retention form of a short clinical crown;
- Presence of caries or restorations extending apical to the gingival margin;
- Modification of the emergence profile; and
- Aesthetics.

In these cases, the key factors for achieving a healthy and esthetically pleasing result are proper margin placement during tooth preparation, gentle tissue management techniques during impression taking, and the fabrication of restorations (both provisional and definitive) with high-quality margins.

Usually periodontal tissues show more signs of inflammation

around crowns with intracrevicular or subgingival margins than those with supragingival margins due to defective margins, inaccurate fit, roughness of the tooth–restoration interface, improper crown contour, and violation of the connective tissue attachment and greater pathogenicity of the subgingival dental plaque [Figure 1 a-f]. Therefore, the following three rules can be used to place intracrevicular margins:

- If the sulcus probes 1.5 mm or less, place the restoration margin 0.5 mm below the gingival tissue crest. This is especially important on the facial aspect.
- If the sulcus probes more than 1.5 mm, place the margin one half the depth of the sulcus below the tissue crest. This places the margin far enough below the tissue so that it still is covered if the patient is at higher risk of recession.
- If a sulcus greater than 2 mm is found, especially on the facial aspect of the tooth, then evaluate to see whether a gingivectomy could be performed to lengthen the teeth and create a 1.5 mm sulcus.

Thus, the critical areas which must be appropriate to maintain the health and position of the gingival tissues are marginal fit, contour and surface finish. Poorly adapted margins, over-contoured or under-contoured restoration, and rough or porous surface can cause: Inflammation, gingival recession or overgrowth. Open margins can provide shelter for micro-organisms and may be responsible for inflammatory response. When creating crown contours:

1. Buccal and lingual contours should be “flat, not fat”;
2. Embrasures should be kept open;
3. The location of contact areas should be oriented toward the incisal and the buccal aspects of the restored tooth; and



Figure 1: Reasons of gingival inflammation around crowns: (a) Defective margins; (b) Poor marginal fit; (c) Bulky restoration; (d) Bulky crowns with poor contours; (e) Knife edge margins and gingival inflammation; (f) Grey discoloration; (g) Gingival recession



4. The crown margins over furcation areas in molars and premolars should be fluted or barreled out.

ensure sufficient bulk of marginal porcelain to resist fracture and to resist the tendency of porcelain to shrink towards its greatest bulk during firing [Figure 2e-f].

FINISH LINE/RESTORATION MARGIN DESIGN

Types of finish lines

Beveled shoulder

When porcelain-fused-to-metal (PFM) restorations were introduced, the metal collar was considered an ideal margin for this type of prosthesis. Thus, the prescribed finishing line was the beveled shoulder, based on the notion that its use would reduce the marginal opening of the gold casting.

Knife edge

For PFM restorations if a knife-edge finishing line is to be used then the butt joint necessary to accommodate the porcelain has to be created within the metal coping further coronally. Despite its theoretical conservatism, combination of this finishing line with PFM restorations tends to under-prepare the axial walls leading to the resulting crown being bulky and unaesthetic. Conversely, the preparation may become overtapered leading to an unretentive final restoration.

Flat shoulder

This design has, over time, replaced the beveled shoulder as the resulting butt joint permits the use of a bulk of porcelain at the margin, thus removing the need for a metal collar. A shoulder width of 1 mm to 1.5 mm at a 90° to 100° angle to the root surface is ideal. The axial line angle should be rounded to reduce stress concentration in that area. This design is sometimes referred to as the radial shoulder.

Slant shoulder

The slant shoulder can be used with a metal collar or with the so-called disappearing margin. In this case the shoulder is slanted coronally at an angle of approximately 40°. However, the disappearing margin is inherently rough due to the presence of three different materials at the terminus of the margin. This design is seldom used in modern practice.^[13]

Chamfer

This is now the finishing line of choice for most cast veneer preparations and hence recommended for most ceramic restorations. Chamfers are less likely to have undercuts and are generally considered to be more conservative than shoulder preparations although a similar degree of tooth reduction is required.

If chamfers are to be used in conjunction with a porcelain margin [Figure 2d] then they must be deep enough to

CRITERIA FOR SELECTION OF FINISH LINE

Specific criteria must be used to assist the clinician in determining which margin design is optimum for a given clinical situation.^[14] The following criteria for margin selection seem reasonable:

- a. The selected margin must provide a predictable level of marginal integrity. The cervical margin designs that meet this criterion include: The shoulder, the shoulder-bevel, and the slant shoulder.
- b. The shoulder and shoulder bevel meet the criterion to provide smooth materials to the gingival sulcus so as to minimize plaque accumulation. The shoulder can be used with a metal margin, which can be highly polished, or with a porcelain margin, which results in glazed porcelain in the sulcus.
- c. *In situations where esthetics are important, the clinician has three options.*
 - For an all-ceramic crown, a shoulder margin with a rounded internal angle or a deep chamfer should be prepared to end at approximately 90° to the external angle of the labial or buccal surface with a depth of 1 and 1.5 mm. A slight slant of no more than 5° is acceptable. If a more pronounced slant is produced, tensile forces occur in function, which can result in half-moon fractures in the cervical area.^[15,16]
 - Traditional metal-ceramic restorations are completely opaque, thus preventing light from passing into the tooth and root. This results in a root that appears dark, and the margin appears gray; even the gingiva appears gray [Figure 1f]. When using highly translucent feldspathic porcelain clinicians can achieve a “contact lens” effect, making the margin disappear. As a result there is no need to hide the margin subgingivally. When using a more opaque zirconia crown the margin can safely be placed at the gingival margin in the esthetic zone.
 - In an ideal world, all restoration margins would be placed supragingivally. When placing supragingival margins, different clinical rules apply for bonded feldspathic porcelain versus full zirconia crowns, and for the highly esthetic zone (anterior and bicuspid) versus the molar regions.^[17] Contemporarily, there is less justification for using PFM restorations to restore anterior teeth given their lack of translucency and even if the margins of PFM restorations were to be placed slightly subgingivally it is usually only a matter of time before the gingival tissues recede



and the dark, unattractive, margins become visible [Figure 1g]. An important characteristic of all non-metal restorations is translucency. Layered and pressable feldspathic porcelain is very translucent, while alumina and zirconia are much more opaque, but still are translucent. In many clinical situations however, the translucency of pressed ceramics is an advantage and permits the use of equigingival, or even supragingival margins [Figure 2a-c]. For a supragingival transition between restoration and tooth not to be observable the margin of the ceramic should be extremely thin and feathered

and extreme care has to be taken when bonding the restoration to the underlying enamel.

RECOMMENDED FINISH LINES

Full-veneer metal crowns

The knife-edge finishing line is commonly used in these situations because of its simplicity and conservative nature. Chamfers and shoulders are also possible although problems may arise should shrinkage of the metal during casting lead to a gap between tooth and preparation.

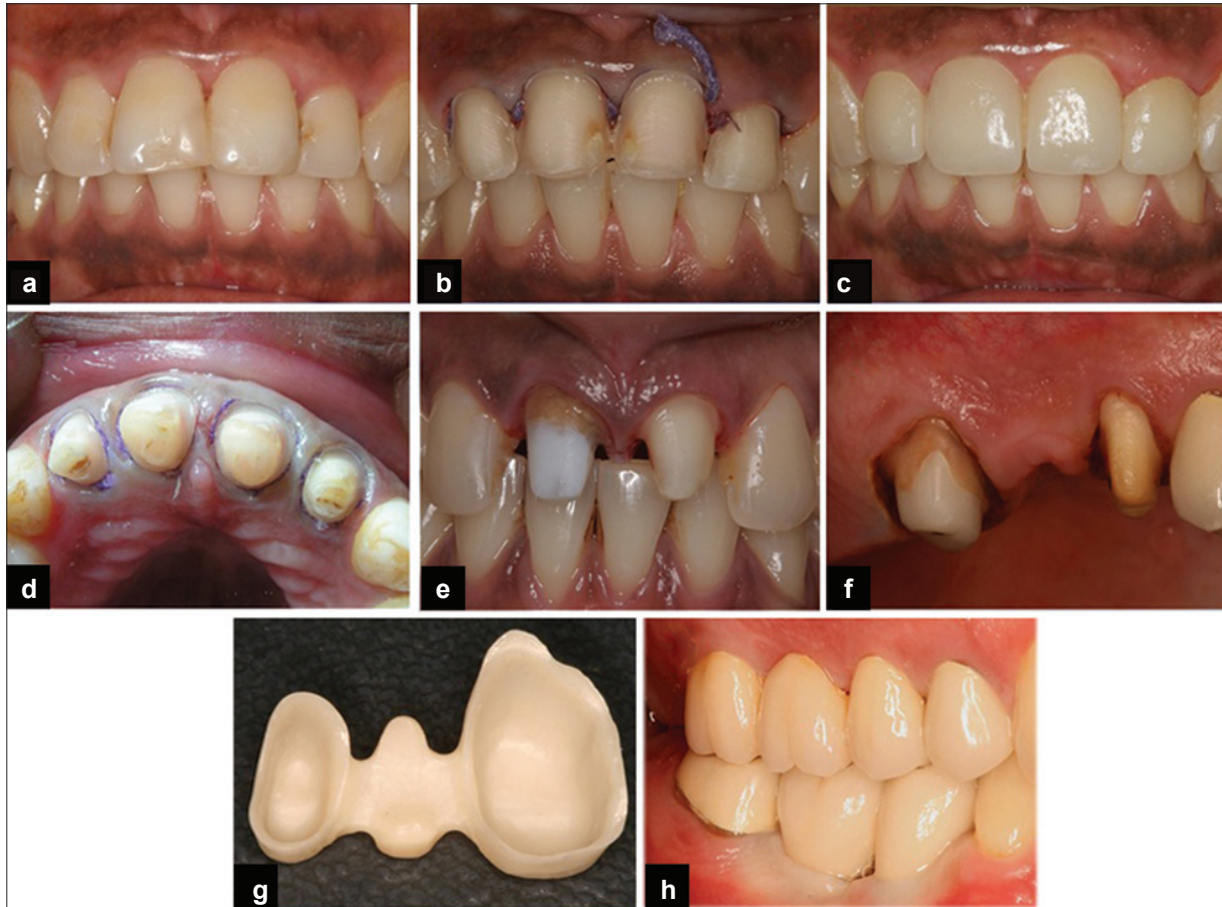


Figure 2: Finish Lines (a) Preoperative view; (b) Equigingival margins for pressed ceramic veneers; (c) Postoperative view; (d) PFM crown with labial shoulders and lingual chamfers; (e) Accentuated chamfers for pressed ceramic crowns; (f) Tooth preparation for Lava Zirconia Bridge; (g) Zirconia Framework; (h) Completed bridge

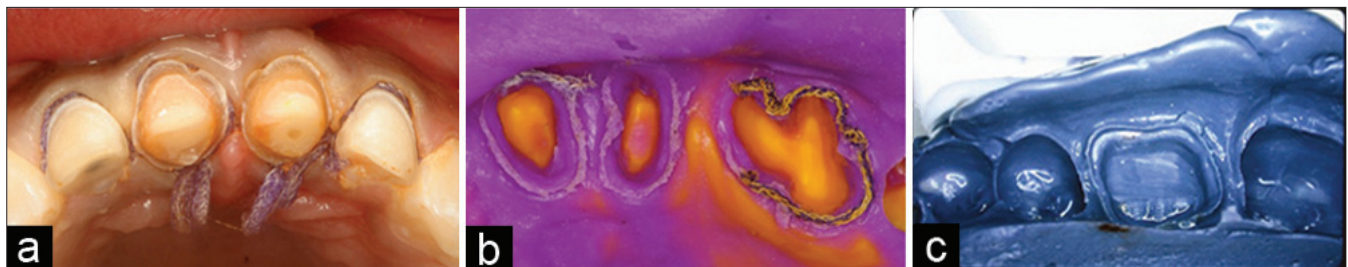


Figure 3: Gingival Tissue Management (a) Tissue management with retraction cord; (b) Addition silicone impression showing good margin reproduction; (c) Impression showing the accurately reproduced "cuff"



Porcelain-fused-to-metal restorations

PFM restoration may appear lifeless and unnatural due to inadequate tooth reduction leaving the technician with insufficient space for sufficient thickness of veneering porcelain to block out the metal substructure. The result is usually an overbuilt dull, opaque-looking crown.

A number of different designs of finishing line have been advocated for PFM.

- *The chamfer:-* The finishing line of choice for most cast veneer preparations and hence recommended for any part of a PFM restoration with a metal margin. If chamfers are to be used in conjunction with a porcelain margin then they must be deep enough to ensure sufficient bulk of marginal porcelain to resist fracture and to resist the tendency of porcelain to shrink towards its greatest bulk during firing.
- For PFM restorations to have any chance of appearing lifelike, sufficient tooth structure must be removed to accommodate both metal and ceramic and requires a facial reduction of between 1.4mm and 1.7mm. Certain early designs had the somewhat small metal collar on the facial aspect of the crown to be tucked slightly under the facial gingival tissue. This would often be esthetically adequate for some finite period of time; however, eventually a small amount of recession would uncover this collar. Within recent years, cut-back techniques have been developed to hide any metal from being seen around the facial margin.
- The margin of choice in esthetic situations when using metal-ceramic crowns is a shoulder design with a porcelain labial margin. This design allows for an adequate thickness of ceramic material for predictable esthetics along with excellent strength.^[16,18,19]

Metal-free ceramic restorations

Non-zirconium-based all-ceramic restorations require adequate tooth reduction, permitting sufficient ceramic thickness, so that the porcelain is fully supported. Finish lines for metal-free ceramic restorations are:^[20]

- Ideal finishing line design for metal-free ceramic restorations is a 1 mm (minimum 0.8mm)-wide 360 degrees deep (accentuated) chamfer with no sharp internal line angles [Figure 2e].
- Shoulder finish lines are sometimes recommended for all-ceramic crowns that are not etched and bonded to the teeth. The internal line angles should, however, be well-rounded.
- The finishing line should follow a smooth curvature that remains relatively shallow inter-proximally.

The zirconium substructure is also opaque, nevertheless it is much lighter in color therefore masking it is less of

a problem than with a PFM restoration. It is possible for the technician to trim the coping back in order to create a more natural cervical margin. A deep/accentuated chamfer is again the ideal marginal preparation to allow for the zirconium coping and overlying veneering ceramic [Figure 2f-h]. The ideal finishing line design is therefore a 1 mm (minimum 0.8 mm)-wide 360 degrees deep chamfer with no sharp internal line angles.^[21]

Designing and recording the finish line

To determine the position of the final margin relative to the hard and soft tissues, a periodontal probe is utilized to sound down to the bone to determine if 3mm of tooth structure is available from the free gingival margin to the osseous crest for biologic width. When gingival position permits, location of the finish lines close to the identical occluso-cervical locations on all axial surfaces increases all-ceramic crown strengths. Making the proximal finish lines as level as possible facio-lingually also reduces stress.

One of the most challenging procedures in dentistry is the impression of a subgingival margin for a PFM crown, posing challenges in terms of placement of the retraction cord, capturing a good impression of the margins, managing the soft tissues and difficulty in isolation during crown cementation.^[22] A subgingival margin associated with marginal adaptation can have a devastating effect on periodontal health.^[22] Also, caries may also develop after cementation, and this usually goes undetected for years.

To avoid these aversive effects, a retraction cord can be packed intrasulcularly that acts as a buffer for the gingival attachment and to retract the gingival tissue in order to assist with margin placement [Figure 3a]. Techniques commonly employed for tissue retraction include:

- Single-cord Technique—one appropriately sized cord to displace the tissue
- Double-cord technique—
 - a. Two cords, one smaller and one larger [Figure 3b,c]
 - b. Smaller cord 000 or black silk placed early on in the preparation at the bottom of the sulcus
 - c. Second larger cord #1 or #2 placed prior to impressioning.^[23]

CONCLUSION

The health of the periodontal tissues is dependent on properly designed restorations. Undoubtedly it is preferable if margins can remain coronal to the free gingival margin. Obviously, subgingival margin placement is often unavoidable. If restorative margins need to be placed near the alveolar crest, crown-lengthening surgery or orthodontic extrusion should be considered to provide adequate tooth structure while simultaneously assuring the integrity of the biologic width. Although individual

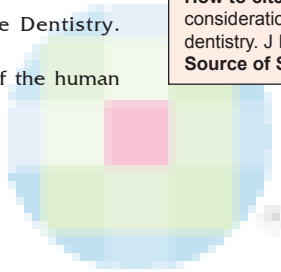


variations exist in the soft tissue attachment around teeth, a minimum of 3 mm should exist from the restorative margin to the alveolar bone, allowing for 2 mm of biologic width space and 1 mm for sulcus depth.

REFERENCES

1. Maynard JG, Wilson RD. Physiologic dimensions of the periodontium significant to the restorative dentist. *J Periodontol* 1979;50:170-4.
2. Gottlieb B. Der Epithelansatz am Zahne. *Deutsche Monatsschrift für Zahnheilkunde* 1921;5:142-7.
3. Orban B, Mueller E. The gingival crevice. *J Am Dent Assoc* 1929;16:1206-42.
4. Feneis H. Anatomy and physiology of the normal gingiva. *Dtsch Zahnärztl Z* 1952;15:467-76.
5. Sicher H. Changing concepts of the supporting dental structures. *Oral Surg Oral Med Oral Pathol* 1959;12:31-5.
6. Gargiulo AW, Wentz FM, Orban B. Dimensions and relations of the dentogingival junction in humans. *J Periodontol* 1961;32:261-7.
7. Ingber IS, Rose LF, Coslet JG. The "biologic width" a concept in periodontics and restorative dentistry. *Alpha Omegan* 1977;70:62-5.
8. Kois JC. Altering Gingival Levels: The Restorative Connection Part I: Biologic Variables. *J Esthet Restor Dent* 1994;6:3-7.
9. Kois JC. The restorative-periodontal interface: Biological parameters. *Periodontol* 2000. 1996;11:29-38.
10. Robbins JW. Tissue Management in Restorative Dentistry. *Funct Esthet Restor Dent Series 1, Number 3*
11. Vacek JS, Gher ME, Assad DA. The dimensions of the human dentogingival junction. *Int J Periodont Restor Dent* 1994;14:154-65.
12. Schillingburg HT Jr, editor. *Fundamentals of Fixed Prosthodontics*. 3rd ed. Chicago, IL: Quintessence Publishing; 1997. p. 119-35.
13. Sozio RB. The marginal aspect of the ceramo-metal restorations: The collarless ceramometal crown. *Dent Clin North Am* 1977;21:787.
14. Donovan TE, Prince J. An analysis of margin configurations for metal-ceramic crowns. *J Prosthet Dent* 1985;53:153.
15. Gavelis JR, Morency JD, Riley ED, Sozio RB. The effect of various finish line preparations on the marginal seal and occlusal seat of full crown preparations. *J Prosthet Dent* 1981;45:136.
16. Donovan T, Chee W. Cervical margin design with contemporary esthetic restorations. *Dent Clin North Am* 2004;48:417-31.
17. Magne P, Belser U. *Bonded Porcelain Restorations in the Anterior Dentition*. Chicago, IL: Quintessence Publishing; 2002. p. 168-9.
18. Barghi N, Lorenzana RE. Optimum thickness of opaque and body porcelain. *J Prosthet Dent* 1982;48:429-31.
19. Chiche GJ, Pinault A. *Esthetics of anterior fixed prosthodontics*. Chicago: Quintessence Publishing Co; 1995.
20. Lehman ML, Hampson EL. A study of strain patterns in jacket crowns on anterior teeth resulting from different tooth preparations. *Br Dent J* 1962;20:337-49.
21. Improving your margins. Philip Newsome and Siobhan Owen. *International dentistry SA Vol. 11, No. 6*
22. Christensen GJ. Porcelain fused to metal vs non-metal crowns. *J Am Dent Assoc* 1999;130:409-11.
23. Donovan T, Chee W. Current concepts in gingival displacement. *Dent Clin North Am* 2004;48:433-44.

How to cite this article: Shenoy A, Shenoy N, Babannavar R. Periodontal considerations determining the design and location of margins in restorative dentistry. *J Interdiscip Dentistry* 2012;2:3-10.
Source of Support: Nil, **Conflict of Interest:** None declared.



New features on the journal's website

Optimized content for mobile and hand-held devices

HTML pages have been optimized for mobile and other hand-held devices (such as iPad, Kindle, iPod) for faster browsing speed.

Click on [**Mobile Full text**] from Table of Contents page.

This is simple HTML version for faster download on mobiles (if viewed on desktop, it will be automatically redirected to full HTML version)

E-Pub for hand-held devices

EPUB is an open e-book standard recommended by The International Digital Publishing Forum which is designed for reflowable content i.e. the text display can be optimized for a particular display device.


Click on [**EPub**] from Table of Contents page.

There are various e-Pub readers such as for Windows: Digital Editions, OS X: Calibre/Bookworm, iPhone/iPod Touch/iPad: Stanza, and Linux: Calibre/Bookworm.

E-Book for desktop

One can also see the entire issue as printed here in a 'flip book' version on desktops.

Links are available from Current Issue as well as Archives pages.

Click on  View as eBook



آزاد تجارت پارس
Medical & Dental Products



• آرسی پرپ - ژل ۱۹% EDTA MD.ChelCream

- خاصیت lubricate
- ایجاد تمیزترین دیواره دنتینال پس از خارج کردن لایه جوش خورده
- خارج کردن مواد غیرعالی توسط شلاته کردن Chelation
- پاکسازی کانال ریشه و برداشتن لایه اسمیر
- استفاده راحت توسط نرم کردن دیواره کانال
- دو سرنگ ۷ گرمی



• سیلریس رزینی ADSEAL

- رادیو اپستی خوب ، زیست سازگاری عالی
- سهولت اختلاط خودکاریس و کاتالیست
- عدم ایجاد تغییر رنگ در دندان
- نامحلول در مایعات بافتی
- سرنگ دوقلو ۱۳.۵ گرمی



• هیدروکسید کلسیم + سولفات باریم Metapaste

- پر کردن موقت ریشه
- مناسب جهت درمان کانال های لیکج دار، اپکسیفیکاسیون
- سرنگ مخصوص برای انتقال به داخل کانال
- پالپ کیننگ و پالپوتومی
- خمیر آماده مصرف قابل حل در آب



• هیدروکسید کلسیم + ید Metapex

- جذب مجدد داخلی و خارجی ریشه
- اثر آنتی باکتریال و رادیوپاک عالی
- پر کردن دائم کانال ریشه
- تشکیل دیواره بافت سخت در انتهای ریشه
- مناسب جهت کانال های لیکج دار و اپکسیفیکاسیون
- درمانی آسان برای بستن دائمی اپکس در دندان های شیری