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Periodontal Health Is A Priority In Restorative Procedure

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periodontics in Partial Fulfillment for the Bachelor of Dental Surgery

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بِسْمِ اللّٰهِ الرَّحْمٰنِ الرَّحِیْمِ

رَفَعُ دَرَجَاتٍ مِّنْ نَّشَأٍ

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CERTIFICATION OF THE SUPERVISOR

I certify that this project entitled "**Periodontal health is a priority in restorative procedure**" was prepared by the fifth-year student **Alhashmeia saad abdlrazaq And Albatool maitham abass** under my supervision at the College of Dentistry/University of Baghdad in partial fulfilment of the graduation requirements for the Bachelor Degree in Dentistry.

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DEDICATION

This project is dedicated to our parents who have never failed to give us love and support, for teaching us that even the largest task can be accomplished.

To all of our friends and everyone who was always there all these years and make it better.

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AIM OF THE REVIEW

- 1) To focus on the role of periodontal health to success the restorative dentistry.
- 2) To understanding the of biological width ,to achieve the long-term therapeutic target of comfort, good function, longevity & ease of restoration and maintenance care.

Introduction

A beautiful smile can be crafted only against a backdrop of healthy gingiva. A sound periodontium provides a firm foundation for an esthetic and functional prosthesis. The practice of restorative dentistry has a reciprocal relationship with the maintenance of periodontal health. Poor restorative treatment may have adverse effects on the periodontium by increasing accumulation of plaque while untreated periodontal disease will compromise the success of restorative dentistry. [Fugazzato P etbal., 2011] When restorations are designed to be self-cleansing and promote gingival health, the tissues present a harmonious esthetic blend at the restorative-gingival interface.

An adequate understanding of the relationship between periodontal tissues and restorative dentistry is paramount to ensure adequate form, function, esthetics and comfort of the dentition. While most clinicians are aware of this important relationship, uncertainty remains regarding specific concepts such as biologic width, its maintenance and applications of crown lengthening in cases of biologic width violation.

The major cause for periodontal disease as a sequel of restorations is interproximal restorations. The next cause is fixed prosthesis,. The type of restorations and its placement has a direct relationship with the prevalence of periodontal disease; there is also the relationship of the materials used for each individual restoration. [Roxana et al .,2003)

The final finish of the prosthetic restoration also affects the development of biofilm, as increased surface roughness creates a favorable environment for microbial growth. [Avetisyan A et al., 2021]. Hence, a good prosthesis surface finish from proper manufacturing technique is important p. To achieve a successful treatment outcome, prosthodontists and periodontists should collaborate, to enhance the longevity of the restoration and improve periodontal health, as well as improve the quality of life for dental patients [Yin X.J et al 2020]

The biologic width is the guiding factor for placement of the margins of the extra coronal restoration. The biologic width should not be violated at any cost.

Chapter one: literature review

1.1 inflammatory gingival response to dental restoration

The presence of restorative materials on tooth surfaces is perceived to be a contributing factor to periodontal disease. This observation is a result of the increased accumulation of plaque on restorations adjacent to the gingiva, which may lead to gingivitis. Plaque is believed to adhere better to restorations than to enamel. This may be due to the surface characteristics of restorative materials such as surface roughness and surface-free energy inherent in the materials (Litonjua LA et al., 2012)

The accuracy of marginal and internal adaptation is essential for the final result and survival of a fixed prosthetic treatment. A marginal discrepancy results in thick cement, which is affected by the oral environment more, resulting in cement dissolution and deposition of dental biofilm, microleakage, margin discoloration, increased gingival crevicular fluid (GCF) flow, recurrent caries, pulp infection and, lastly, periodontal lesion and bone loss, which lead to the failure of prosthetic treatments [Heboyan A et al., 2019].

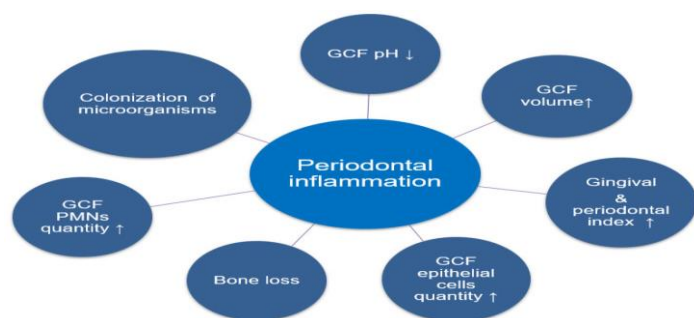


figure (1-1) inadequately margin fit [Heboyan A et al., 2019]].

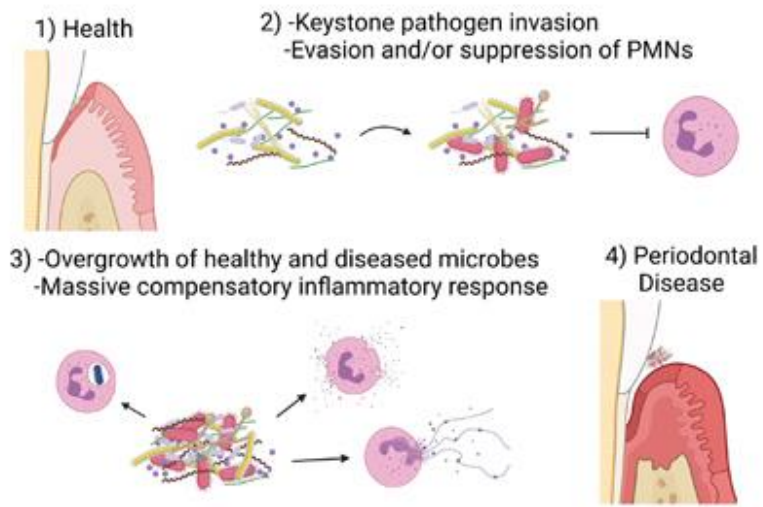
shows an adequate margin fit of the crown and an inadequate margin fit leading to undesirable consequences. Hence, to protect the periodontium, especially the gingival margin and tissue-biomaterials interface, the fixed dental

prosthesis should be appropriate, healthy, and durable [Spagnuolo G et al., *Dent Mater.* 2013].

The fixed prosthetic constructions may cause inflammation, and when it becomes chronic, the adaptive mechanisms of immunity are stimulated, involving cellular and non-cellular immunity. These immune mechanisms have a critical role for the further limitation of the inflammatory reaction, and in the recovery process with the regeneration and the restoration of injured tissues. Thus, self- and acquired immune mechanisms should be synchronized to return the damaged tissue to homeostasis [Cekici A et al., 2014]

The early development of the lesion takes place as a reaction of local leukocytes and endotheliocytes to the dental plaque around the prosthetic restoration margins. The metabolic byproducts of these microorganisms activate junctional epitheliocytes, promoting cytokines and stimulating neuropeptides release, which leads to the dilatation of blood vessels. With the development of the pathological process, increased numbers of various cells such as neutrophils, macrophages, plasma cells, lymphocytes, and mast cells migrate towards the pathological foci. When the pathological foci are formulated, a transformation from the self- to the acquired immune response occurs.

Plasma cells and macrophages, as well as B and T lymphocytes prevail; IgG3 and IgG1 subtypes of B lymphocytes also exist. Blood flow disturbance, as well as collagenolytic activity amplification, is also observed. There is also an amplified collagen production by fibroblasts. This clinical phase is accompanied by gingival bleeding, gingival color, and contour alterations, and is assessed as moderate to severe gingivitis. Clinically, the advancement of lesions results in the development of periodontitis. In this stage, irreversible periodontal attachment and alveolar bone loss are detected, clinically and histologically. With the advancement of inflammation, periodontal pocket development occurs.



Figure(1-2) inflammatory gingival response (Oveisi et al.,2019)

1.2 Margin placement

The selection of crown margin plays a vital role as it is directly related with periodontal tissue. Aesthetics is an integral outcome of dental restoration which along with gingival margin placement, gingival pigmentation, gingival biotype depends on multiple other factors. which should be placed in a healthy sulcus at a minimal depth, just short of the junctional epithelium. The detrimental effects of management may occur in restorative rehabilitation, majorly due to inadequate teeth preparation, choosing inappropriate margin geometry and location. **(Hadyaoui et al., 2014)**

There are different types of margin geometry and locations to be followed based on location of teeth, teeth height, crown root ratio, vitality of the teeth, amount of remaining tooth substance and aesthetic requirements. **(Shankar et al.,2020)**

(Atlas et al 2019) reported that marginal fit of crown is consider more significant in reference to inflammation then crown length. Moreover, other factors also contribute to poor periodontal health around crowns, such as open and over-hanging margins, irregular surface texture and improper emergence profile due to over-contoured morphology.¹⁸ Therefore, consideration should be given to precise planning of gingival margins because the gingival inflammation around margins can be avoided by following proper oral hygiene regime.

1.2.1 Restorative margin placement

Three type of margins can be placed while carrying out the restorations. Relationship of the gingival margin of restorations in respect to the biologic width. **(Jain A et al.,2020)**

1. Supragingival margin

It is placed above the level of marginal gingiva. This margin has been used for non-esthetic areas or when visibility of cervical third is not present, when the defect is above the marginal gingiva.



Figure (1-3): Supragingival margin design (Frank M et al., 2009)

Advantages

Easy to prepare, Easy Duplication of margin, Exact replication of margin of restoration, Exact finishing and polishing of margins, Non/ least irritating, Supragingival margins do not lead to enhanced plaque/calculus accumulations. Moreover, the possibility of secondary caries is negligible due to direct hygiene procedures, possible with these margins. These margins, being distant from the gingival fluid do not lend themselves to a higher rate of dissolution [Aboelsaad Nayer,2019]

Disadvantages

Unaesthetic, Differentiation between the tooth and restoration is obvious.

Materials

Supragingival margins can be placed when the following materials are used – Layered and pressed feldspathic porcelain, All ceramic (Zirconia-in non-aesthetic areas), Composite, Gold for posterior teeth restoration, Amalgam restoration (Posterior teeth), GIC, Compomer.

2. Subgingival margin

It is placed below the level of marginal gingiva.



Figure (1-4): subgingival margin design (Frank M., 2009)

Advantages

More esthetic.

Disadvantages

Most irritating to the periodontium, Highest occurrence of periodontitis, most difficult to maintain.

Materials

Porcelain fused to metal, Gold for posterior tooth restoration.

3. Equisingular margin

It is placed at the level of marginal gingiva.

Advantages

Less impact on periodontium, Conservation of tooth structure, Esthetic goals can be achieved. To overcome the challenges associated with finishing, as well as maintaining the subgingival margins, equisingular margin was proposed.

These can be prepared relatively easily than the subgingival margin. Esthetics is easily achieved, and they are easier to maintain. [**Aboelsaad Nayer,In 2019,**]

Disadvantages

Higher plaque accumulation, higher possibility of gingivitis.

Placement of subgingival margins is complicated because of presence of the free marginal gingiva. This situation can be overcome by employing a retraction cord. (**P Sushma,2010**)

1.3 Marginal roughness

Surface roughness is the main factor determining bacterial adhesion, biofilm growth and plaque formation on the dental surfaces in vivo. Proper finishing and polishing of dental restorations are critical features that improve esthetics and prolongs the restorations longevity. Rough surfaced restorations may lead to plaque accumulation, gingival inflammation, marginal staining, caries, and esthetic impairment [**Litonjua et al., Contin. Educ. Dent. 2011**]

Oral conditions offer difficult surroundings for survival of the dental restorations. Various factors may affect the surface roughness and the adherence of the bacterial plaque, such as the type of polymerization, parafunction, and the patient's diet Current trends in modern dentistry show an increasing shift towards the use of resin composite materials as plastic restorations, instead of amalgam [**Zabrovsky et al.,2019**].

Due to their aesthetic properties, dental resin composite materials are being widely employed In addition to the tooth color advantage, resin composites have good physical, mechanical, chemical, optical, thermal, and wear properties. The two major components of resin composite materials are the resin matrix (organic) and ceramic (inorganic) fillers. [**Yadav, R. Et al. 2022**]

Roughness in the subgingival area is said to be a major contributing factor to plaque accumulation and subsequent gingival inflammation .The subgingival zone is composed of the margin of the restoration, the luting material, and the prepared as well as the unprepared tooth surface.



Figure (1-5) overhang restoration (Yadav, R. Et al. 2022)

The restoration procedure should be done carefully to avoid trauma and make the risk as minimum as possible. Restoration may stimulate plaque accumulation and each rough surface and overcontour will make it easier for plaque to be deposited despite cleaning efforts. Gingival irritation will increase if the restoration surface is rough or if there is a defect or overhang in the restoration.

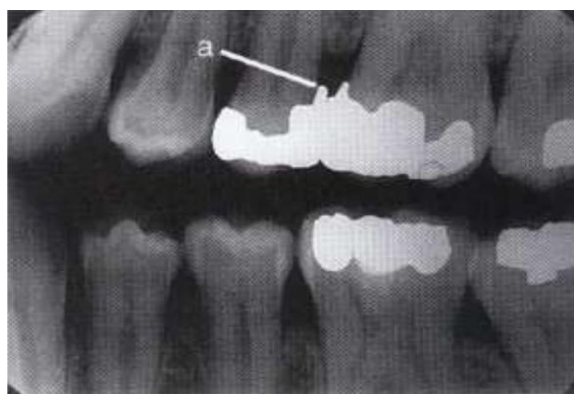


Figure (1-6) Radiograph of approximal filling with overhang(Zabrovsky 2019)

The surface imperfect restoration often causes mechanic stimulus in the form of iatrogenic irritant in the gingival tissue that is started by the presence of plaque retention area followed by gingival inflammation.

The requirements that should be met in order to achieve good restoration include anatomical shape, maximum smoothness of the restoration , and good contact points. Caries is started from the part under the dental contact point. This concept suggests making dental restoration that matches the natural dental shape and contour. Restoration that is too big or restorations that do not match the natural dental shape and contour are referred as overhanging restoration.

The restoration contour and anatomical shaping is referred as contoured filling which is aimed at reconstructing the approximal area, maintaining dental function, maintaining dental arch, preventing food impaction and maintaining the teeth so that they are healthy and comfortable to be used by the patient. This concept is aimed at reducing the occurrence of secondary carie.

1.3.1 Marginal roughness is because of following sources:

- 1) Grooves and scratches present in the surface of carefully polished acrylic resin, porcelain, or gold restorations.

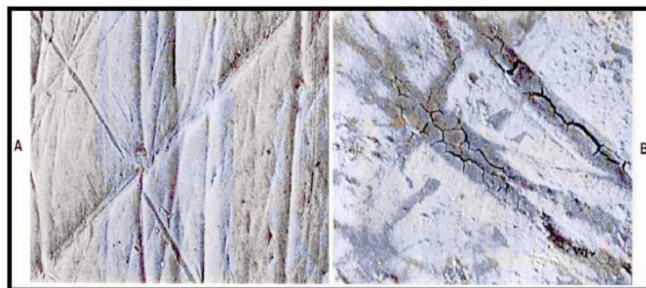


Figure (1-7) groove and scratches

2) Separation of the restoration margin and luting material from the cervical finish line, thereby exposing the rough surface of the prepared tooth



Figure(1-8) rough surface of the prepared tooth

3) Dissolution and fragmentation of the luting material between the preparation and the restoration, leaving a space .

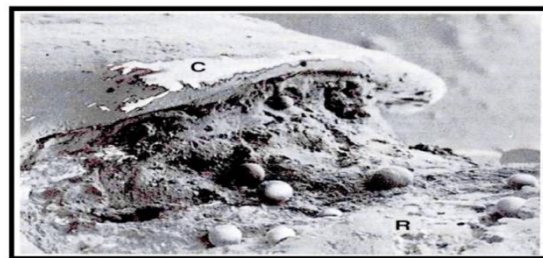


Figure (1-9) fragmentation of luting material

1.4 gingival veneer

(also called removable artificial gingiva or gingival mask)

consists of a prosthesis made of thermoactivated acrylic resin in a color similar to the gum tissue. It is placed on the labial surface of the teeth. The veneer's function is to restore the mucogingival contour and esthetics in areas where periodontal tissues are deficient. [Rocchietta I et al.,2008]



Figure (1-10) Sanghavi D2014 Masking the unmasked-gingival veneer.

A gingival veneer is a conservative, simple, and inexpensive treatment. It is indicated in cases of gingival unevenness in the contour of the concave labial arc, poor esthetics characterized by interdental “black triangles,” exposed root surfaces and/or crown margins, food packing in interproximal spaces, lack of saliva control, impaired speech, and root–dentin sensitivity. The use of these veneers is contraindicated in situ actions in which patients present poor oral hygiene, limited manual dexterity, high caries activity/risk, incomplete periodontal therapy, and allergy to fabrication materials

When using gingival veneers, it is important to observe continuity between the artificial and the natural gingivae, minimizing the visibility of the interface and reinstating the gingival architecture and papilla form.[Barzilay et al.,2003] The gingival veneer is border molded during fabrication and fits passively over the labial hard and soft dental tissues. The gingival veneer's stability is ensured by the pressure exerted by the labial musculature and by its close adaptation to the proximal niches, which favors prosthesis retention and prevents air escape Although such a prosthesis is considered auxiliary and is somewhat fragile, it can be made easily, with minimal additional effort and costs, to provide these patients

with a greater sense of psychological satisfaction.[**Emami E, Séguin J et al 2007**]

Case review

A 37-year-old female patient sought dental care due to dissatisfaction with the esthetics of the maxillary anterior teeth. During the anamnesis (interview), information about systemic conditions and the history of dental treatments was collected. On oral physical examination, the soft tissues, muscles, teeth, periodontal and occlusal relationships, and oral hygiene were examined. At the end of the clinical examination, asymmetries were observed in the shape and contour of the maxillary central incisor and irregularities in the gingival regular concave arch of the left maxillary central and lateral incisors. For the improvement of dental esthetics, the patient was in the final stage of orthodontic treatment. The left maxillary central incisor had a temporary crown over a mispositioned implant. A panoramic radiograph was requested for the analysis of the tooth and bone condition.

To fix the gingival gap and malpositioning of the implant, was proposed following treatments: increasing the clinical crown on the left maxillary lateral incisor, removal of the implant of the left maxillary central incisor with further bone grafting and insertion of a new implant, or the preservation of the tooth implant with the fabrication of a gingival veneer. For the improvement of dental esthetics, the placement of a crown on the maxillary central incisor and a resin laminate veneer on the right maxillary lateral incisor was accepted by the patient, with written informed consent.[**Burhan R, et al 2015**]

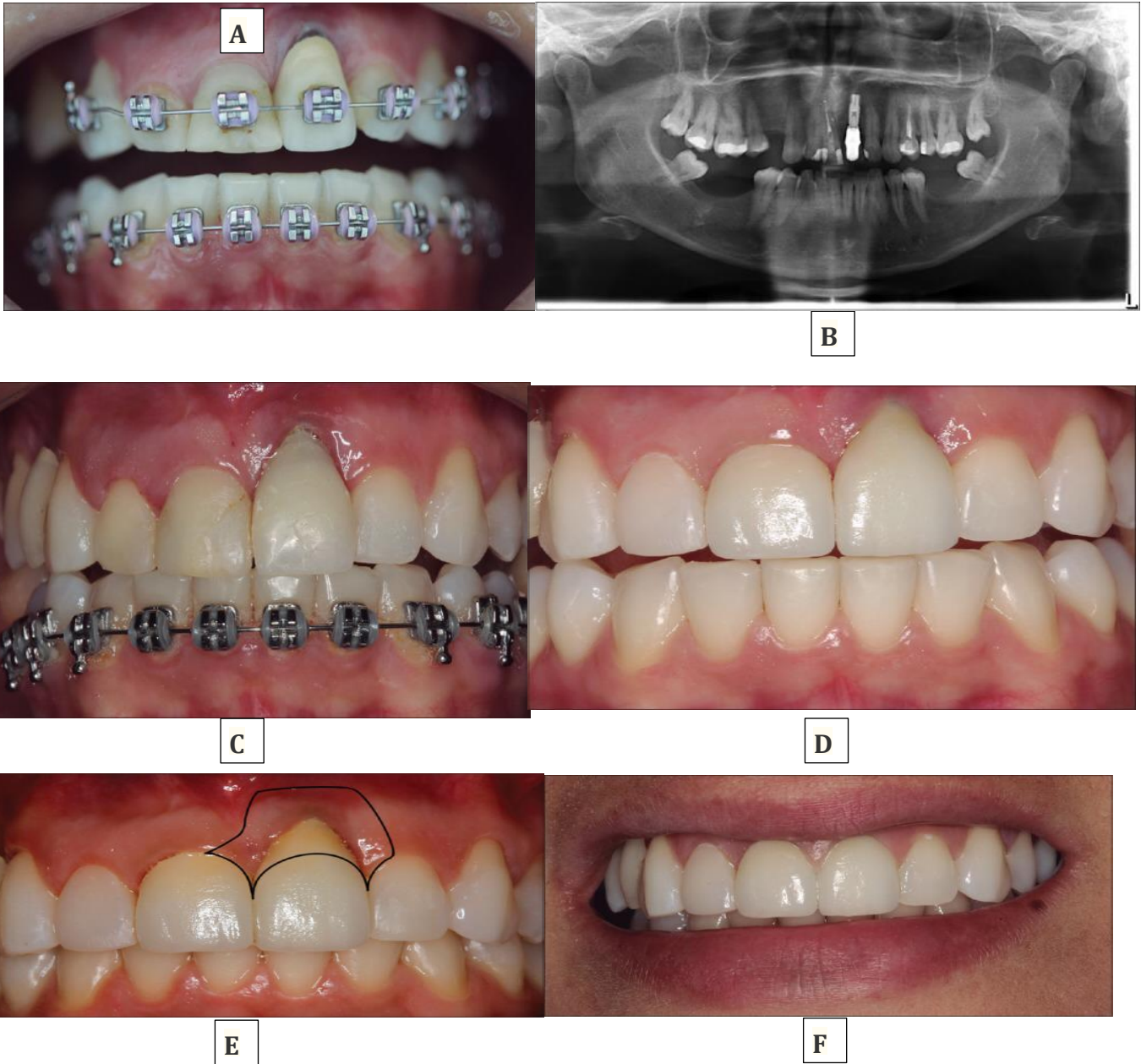


Figure (1-11)

- A. Patient's initial view of the final stage of orthodontic treatment
- B. A panoramic radiograph for the analysis of the tooth and bone condition
- C. After finishing the orthodontic treatment, a new provisional crown on the left maxillary central
- D. Cementation of lithium disilicate crown in the left maxillary central incisor with resin cement
- E. Future shape of gingival veneer
- F. The patient's smile after installation of the gingival veneer

Therefore, the use of gingival veneers is a quick, simple, and inexpensive option for restoring lost gingival tissues. It eliminates the need for periodontal mucogingival surgery, which may not be a feasible option for some patients.[**Allen E, Irwin C, et al 2007**] This may offer a good interim solution for patients who may wish to have time to consider their options for more advanced and complex treatment. Some patients may choose to wear the veneer as a long-term solution when the burden/risk of further advanced treatment may outweigh the benefits.[**Gopakumar A, et al 2012**]

1.5 Pair technique (direct veneer)

Some clinical situations, such as the closure of pronounced diastemas, and the transformation of malformed, small, or peg-shaped teeth, require a rebalancing of dental proportions accompanied by a modification of the gingival contour. A traditional treatment plan can include surgical, prosthetic, and/or orthodontic treatments. In some cases, it can be considered too invasive, and not all patients are willing to undertake long therapies. To overcome these limitations, a possible solution could be the application of the Biologically Active Intrasulcular Restoration (BAIR) technique, which allows us to modify the natural emergence tooth profile using simple intrasulcular direct restorations. (**Ercoli et al., 2021**)

For years, intrasulcular restorations have sparked debates on possible effects on the health of periodontal tissues. it is important to evaluate possible complications, as well as to examine the surrounding soft tissues. if such intrasulcular restorations are carried out through careful control of all of the clinical steps, and local hygiene is maintained by the patient, then they can integrate perfectly with the surrounding periodontium, without being themselves a cause of inflammation. (**Frese, Et al ., 2014**)

The goal of the technique is to change the emergence profile of the tooth by performing intrasulcular restorations. Through the creation of a new “artificial CEJ”, it is possible to modify the angle between the root and the crown both on the vestibular–palatal and on the mesio-distal plane. These changes allow us to guide the positioning of the soft tissues, which are supported by a sort of “shelf” represented by the restoration itself. This allows us not only to change the length of the clinical crown . and correct defects of the shape or structure, but also to harmonize the design of the gingival parables, to close diastema spaces, and to allow for a “virtual” modification of the inclination of the dental axes to improve the smile, and harmonize the gingival profile.(**Nugala et al.,2012**)

The proposed method makes use of a simple circular metal matrix, and this allows for the isolation of the operative site, and, at the same time, moves the soft tissues and therefore provides clear access to the intrasulcular portion of the tooth. The layering of the composite allows for the modification of the emergence angle, and the reconstruction of a new “artificial CEJ”

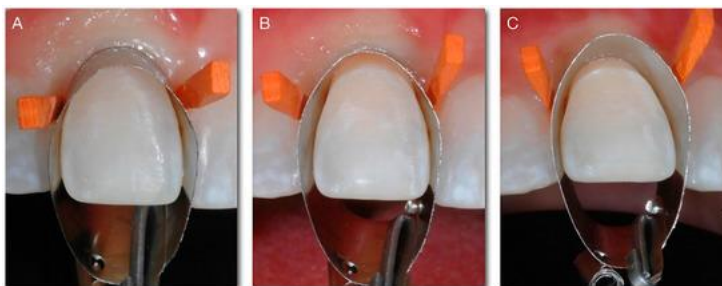


Figure (1-12) circular metal matrix (**Giachetti,2020**)

The intrasulcular composite is polymerized in contact with the metal so it is perfectly smooth and cured, since there is no oxygen inhibition of the polymerization. In this way, the intrasulcular part of the restoration does not require finishing and polishing, avoiding surface roughness that can interfere with the adaptation of the periodontal tissues to the restoration. The new emergence profile will guide the soft tissues to adapt in the desired position. The composite

is over-layered due to the position and shape of the matrix. The right volumes, in the palate-vestibular direction, are subsequently restored using a subtractive modelling technique [Giachetti et al 2020]

Cases review

16-year-old girl at the end of orthodontic treatment.



Figure (1-13) (Giachetti,2020)

There is a noticeable disharmony between the size of the central incisors and those of the lateral incisors and canines (A). There are also diastemas that the patient does not like, and which make the smile unpleasant (B). In a single session, without the need to give anesthetic, it was possible to enlarge the microdontic teeth, close the diastemas, correct the vestibular inclination of 2.3, and, at the same time, give a better balance to the gingival parables (C), thus obtaining a more pleasant smile (D).

Case review

20-year-old man at the end of orthodontic treatment.



Figure(1-14) (Pachêco,2015)

The frontal sector shows small teeth, and large diastemas (A). To meet the aesthetic needs of the patient, it was necessary to enlarge the teeth with intrasulcular restorations, and to recreate the contact points that allowed the papillae to close the unsightly black triangles (B). Although the patient does not maintain optimal oral hygiene, the gingival tissues are in excellent health.

1.6 what is the biological width?

In the human body, ectodermal tissue serves to protect against invasion from bacteria and other foreign materials. However, both teeth and dental implants must penetrate this defensive barrier. The natural seal that develops around both, protecting the alveolar bone from infection and disease, is known as the biologic width.[**Makigusa Et,al. in 2009**].

The biological width is defined as the dimension of the soft tissue, which is attached to the portion of the tooth coronal to the crest of the alveolar bone.

This term was based on the work of (**Gargiulo et al.,1961**) who described the dimensions and relationship of the dent gingival junction in humans. Measurements made from the dent gingival components of 287 individual teeth from 30 autopsy specimens established that there is a definite proportional relationship between the alveolar crest, the connective tissue attachment, the epithelial attachment, and the sulcus depth. They reported the following mean dimensions: A sulcus depth of 0.69 mm, an epithelial attachment of 0.97 mm, and a connective tissue attachment of 1.07 mm.

Based on this work, the biologic width is commonly stated to be 2.04 mm, which represents the sum of the epithelial and connective tissue measurements.

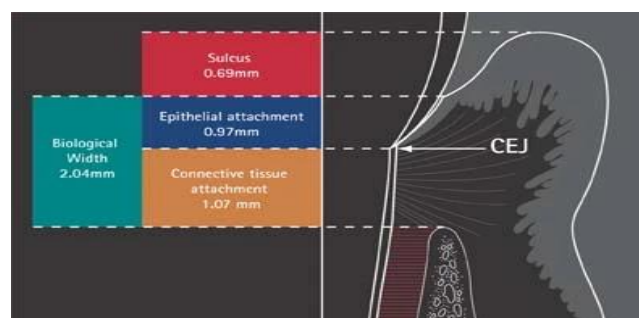


Figure (1-15): biological width. (**Babitha Nugala et al.,2012**)

The biological width is considered to be essential for maintaining healthy gingiva, especially in the case of teeth which needs restoration. [**Carranza's et.al in 2006**].

The dimension of biologic width is not constant always, it depends on the area of the tooth in the alveolus, differ from tooth to tooth, and also from the appearance of the tooth. It has been shown that 3 mm between the preparation margin and alveolar bone maintains periodontal health for 4 to 6 months. [**Jorgic et al .,2000**]

This 3 mm aggregate on an average for supra-crestal connective tissue attachment (1 mm), junctional epithelium (1 mm) and for gingival sulcus (1 mm). This allows for adequate biologic width even when the restoration margins are placed 0.5 mm within the gingival sulcus. [**Rosenberg et al .,1999**]

1.7 profiles of biologic width to prevent biologic width violation

Based on the total dimension of attachment and the sulcus depth following bone sounding measurements, (Kois in 2000) proposed three categories of biologic width namely:

- 1) Normal Crest, 2) High Crest and, 3) Low Crest [Figure 1.16] [Table 1-1]

Table 1-1: categories of biological width (Freeman K,et al., 2000)

	Normal crest	High crest	Low crest
Mid-facial measurements	3mm	<3mm	>3mm
Proximal measurements	3-4.5mm	<3mm	>4.5

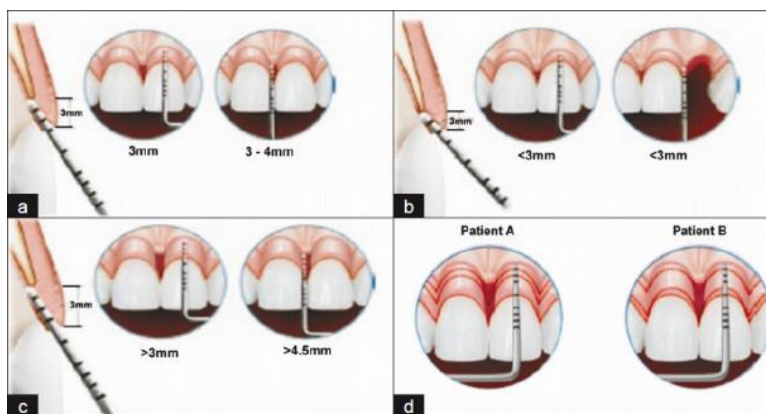


Figure (1-16): (a) Normal crest showing biologic width on labial and interproximal site, (b) High crest showing biologic width on labial and interproximal site. (c) Low crest showing biologic width on labial and interproximal site, (d) Patient Allow crest unstable; and, Patient B-. Low crest stable (kois 2000)

1.Normal crest patient:

It occurs in almost 85% of patients. 3.0 mm is the mid-facial measurement and the proximal measurement is in the range of 3.0-4.5 mm. The margin of a crown shall generally be placed no closer than 2.5 mm from the alveolar bone. In this the gingival tissue seems to be substantial for a long term. Therefore, a crown margin which is placed 0.5 mm sub- gingivally tends to be well-tolerated by the gingiva in such patients. **(Robbins JW. 2007)**

2.High crest patient:

High Crest is a rare finding and occurs in approximately 2% of the patients. This is seen mostly in a proximal surface adjacent to an edentulous site due to the collapse of interproximal papilla following tooth removal. Usually, it is not possible to place an intra-crevicular margin because the margin will be very close to the alveolar bone, resulting in a breach of biologic width that will eventually lead to chronic inflammation. **(Robbins et al. 2007)**

3.Low-crest patient:

It occurs in almost 13% of patients. Generally, the Low Crest patient has been illustrated as more vulnerable to recession secondary to the placement of an intra-crevicular crown margin.

[Kois JC. 2000]

1.8 Evaluation of Biological Width

1-Radiographic evaluation Radiographs are of value in assessing biologic width, except that only interproximal biologic width violations can be ascertained, radiographs are not diagnostic because of tooth superimposition (**Nithisha *et al.*, 2018**).

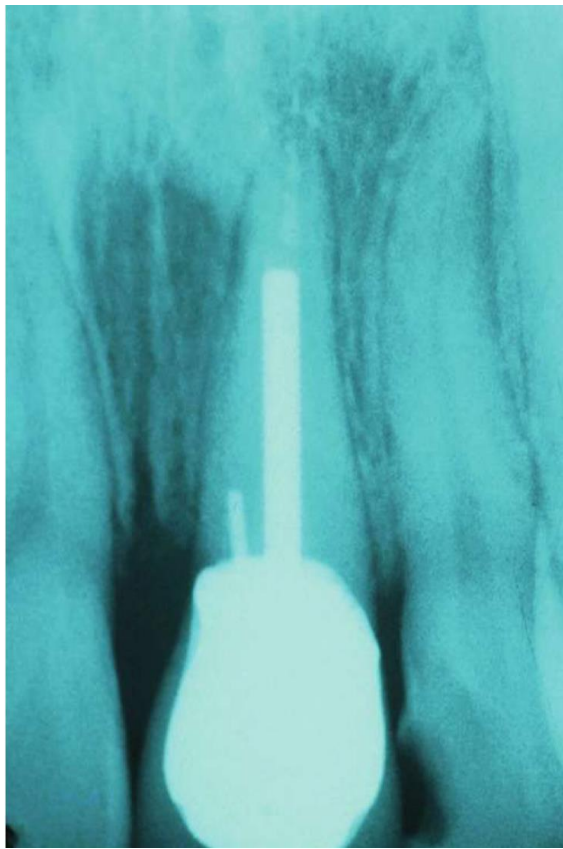


Figure 1_17 radiographic evaluation of biological width (**Tarnow DP *et al.*, 1992**).

2-Clinical method

The biologic width can be done following the administration of a local anesthesia, a measuring instrument (probe) is utilized to puncture and penetrate the mucosa until contact is made with the underlying bone (referred to as "sounding to the bone") and subtracting the sulcus depth from the resulting measurement. During this periodontal evaluation, bone sounding assists in determining the level of the alveolar crest and thus the need for osseous contouring (**galgali and gontiya, 2011**).

The following considerations must be considered for bone sounding:

1. The gingiva must be healthy.
2. The measurement should be repeated on more than one tooth to ensure accurate assessment, and reduce individual and site variations.

1.9 complications of a biologic width violation

Authors have compared Bermuda triangle to biological width. Like the Bermuda triangle where a number of aircraft and sea vessels are said to have disappeared, the margins of the prosthetic crowns are extended so much that the dentist loses the access and vision where the margin is actually located, in the sulcus region. This leads to periodontal complications and eventually leading to prosthetic failure (sharma *et al.*, 2012).

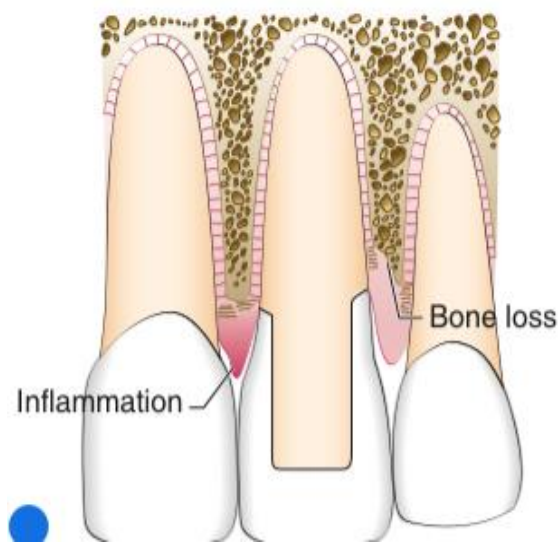


Figure 1-18 violation of biological width (carranzas *et al.*, 2019) On the mesial surface of the left central incisor, bone has not been lost, but gingival inflammation occurs. On the distal surface of the left central incisor, bone loss has occurred, and a normal biologic width has been reestablished.

1.9.1 Signs of biological width biological width violation:

1. Chronic progressive gingival inflammation around the restoration.



Figure(1-19) (carranzas *et al.*, 2019).

2. Bleeding on propping
3. Localized gingival hyperplasia with minimal Bone loss.



Figure(1-20) (Seymour RA, 2006).

Why sometimes there is bone loss with biological width and sometimes there is only gingival inflammation?

- **Depend on bone density in biological width violation area.**

4. Gingival recession

5. Alveolar bone loss.

1.10 Correction of Biologic Width Violation

Encroachment of biologic width becomes of particular concern when considering the restoration of a tooth that has fractured or been carious near the alveolar crest. Also, esthetic concerns often require hiding of restorative margins below the gingival margin that is pushing them down into the gingival sulcus leading to the violation of biologic width. The biologic width has inter-personal and intrapersonal variability. There is no magic number which can be recommended and each site of each patient must be evaluated before coming to a definite conclusion. (**Schmidt *et al.*, 2000**).

Biologic width violations can be corrected by either surgically removing bone away from proximity to the restoration margin, or orthodontically extruding the tooth and thus moving the margin away from the bone (**newman *et al.*, 2019**).

Case report

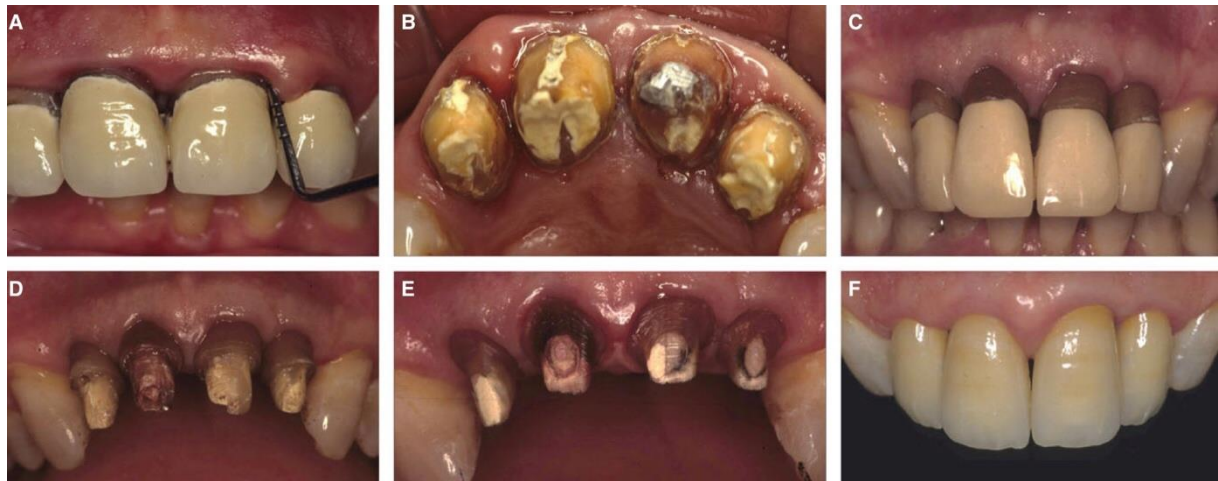


Figure 1.21 Patient complained of bleeding gums and unpleasant appearance **Bennani *et al.*, 2017**. **(A)** Pocketing > 7 mm, inflammation of gingival tissue, gingival recession and unesthetic crowns. Note that the opaque layer is showing at the gingival third of the porcelain-fused-to-metal crowns. **(B)** Occlusal views after removal of the crowns. Note the lack of reduction on the finishing lines and iatrogenic interproximal preparations, and invasion of the biological width requiring a periodontal crown lengthening procedure. **(C)** Matching view 12 weeks after periodontal crown lengthening with the first set of provisional restorations in place. **(D)** Same view, provisionals removed. Note the gain of vertical height, allowing proper space for the attachment and for the future restorations. **(E)** Placement of new finishing lines; note that these are kept slightly supragingivally. **(F)** Second set of provisionals in place allowing for further maturation of the supporting tissue. These provisionals are also used to evaluate esthetics, phonetics and function.

1.10.1 Surgical Crown Lengthening

Indications (Jorgic-Srdjak K *et al.*, 2000).

- a) Inadequate clinical crown for retention due to extensive caries, subgingival caries or tooth fracture, root perforation or root resorption within the cervical 1/3rd of the root in teeth with adequate periodontal attachment.
- b) Short clinical crowns.
- c) Unequal, excessive, or unesthetic gingival levels for esthetics.
- d) Teeth with excessive occlusal wear or incisal wear.
- e) Teeth with inadequate interocclusal space for proper restorative procedures due to supraeruption.
- f) Restorations which violate the biologic width.
- g) In conjunction with tooth requiring hemisection or root resection.

Contraindications (Jorgic-Srdjak *et al.*, 2000).

- a) Deep caries or fracture requiring excessive bone removal.
- b) Non-restorable teeth.

c) Tooth with increased risk of furcation involvement.

d) Unreasonable compromise esthetics/adjacent alveolar bone support

Complications after crown lengthening As with any procedure, the patient needs to be informed of any potential complications such as possible poor aesthetics due to ‘black triangles’, root hypersensitivity, root resorption and transient mobility of the teeth (**Jorgic-Srdjak K, et al., 2000**).

Healing after crown lengthening

Restorative procedures must be delayed until new gingival crevice develops after periodontal surgery. In non esthetic areas, the site should be re-evaluated atleast 6 weeks post surgically prior to final restorative procedures. In esthetic areas, a longer healing period is recommended to prevent recession. Wise recommends 21 weeks for soft tissue gingival margin stability. Therefore, restorative treatment should be initiated after 4-6 months. The margin of the provisional restoration should not hinder healing before the biologic width is established by surgical procedures (**Shobha et al., 2010**).

in a study on clinical evaluation of crown lengthening procedure had concluded that the biologic width can be re-established to its original vertical dimension along with 2 mm gain of coronal tooth structure at the end of six months (**Robbins JW, 2007**).

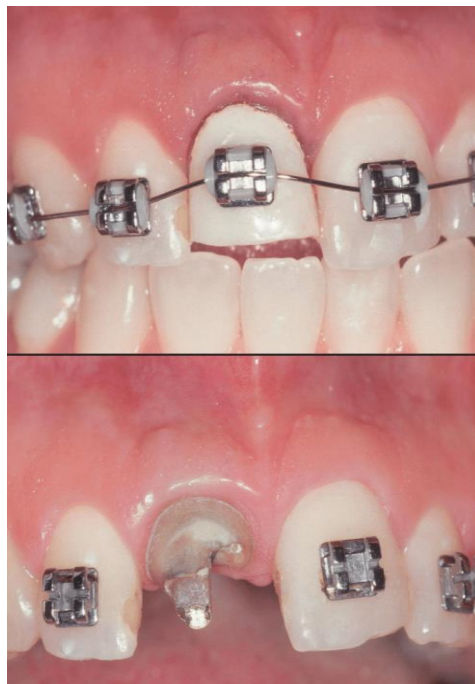
1.10.2 Orthodontic Procedures



Figure (1-22)orthodontic procedures

1. **Forced Eruption:** In forced eruption, tooth is intentionally moved in a coronal direction using gentle continuous force. The force stretches gingival and periodontal fibers resulting in a coronal shift of gingiva and bone (**Heithersay GS, 1973**). It was first advocated by (**Heithersay, 1973**) teeth with horizontal fractures. Orthodontic extrusion was advocated in anterior area where surgical crown lengthening cannot be accomplished. It minimizes gingival recession and loss of bone support on adjacent teeth (**Ingber, 1976**).
2. Orthodontic extrusion requires an activation period of 4-6 weeks and 6-8 weeks retention period for tooth to become stabilized in its new position. Additional surgical crown lengthening may be required after forced eruption. The contraindications are inadequate crown-to-root ratio, lack of occlusal clearance and periodontal complications.

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3. **Forced Eruption with Fiberotomy:** Combination of orthodontic extrusion and severance of supracrestal fibers, termed supracrestal fiberotomy is also used for crown lengthening. If fibrotomy is performed during the forced tooth eruption procedure, the crestal bone, and the gingival margin are retrieved at their pre treatment location. Thus, the tooth gingiva interface at adjacent teeth is unaltered. Fiberotomy is performed once every 7-10 days during the phase of forced tooth eruption (**Tarnow and Magner, 1992**)



Figure(1-23) Forced Eruption with Fiberotomy (Heithersay, 1973).

Chapter Two: Discussion

Periodontal health is a basic requirement for both the longevity of restoration and the aesthetics, as well as, function and maintenance of dentition. However, dental restorations presenting width invasion are a frequently problem in clinical practice and are capable of inducing gingival inflammation, loss of connective tissue and unpredictable bone loss (**Savadi A *et al.*, 2011**). Also, the invasion of the biologic width may cause periodontal pocket which does not imply the diagnosis of periodontal disease.

The relationship between width invasion and bleeding on probing can be explained by the fact that the placement of restorative margins within the width space often leads to gingival inflammation, loss of clinical attachment and bone loss. This is probably due to the destructive inflammatory response of the microbial located deeper into the gingival sulcus (**Sanavi *et al.*, 1998**).

Chapter three: Conclusion

1-Margins placed at the level of the gingival crest cause less severe gingival inflammation compared to sub-gingival placed margins, where as supra-gingival margins are associated with a degree of periodontal health similar to that seen with non-restored inter proximal surfaces .

2-Any rough and irregular margins on the fixed prosthetic constructions can also result in microorganisms 'attachment. The aforementioned factors can worsen oral hygiene conditions and cause gingivitis and further periodontitis.

3-Case selection is important, as patients require good oral hygiene, a low caries rate, and proper prosthetic maintenance. Biofilm accumulation due to inadequate prosthetic hygiene may contribute to microorganism colonization of the intaglio surfaces of prostheses, encouraging opportunistic oral infections.

4-The biologic width is essential for preservation of periodontal health and removal of irritation that might damage the periodontium (prosthetic restorations, for example). The millimeter that is needed from the bottom of the junctional epithelium to the tip of the alveolar bone is held responsible for the lack of inflammation and bone resorption, and as such the development of periodontitis.

5-The biological width is essential for preservation of periodontal health, which itself is dependent on the properly designed restoration. Restorations with supra gingival or equigingival margins should be preferred. 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.

6_The health of the periodontal tissues is dependent on properly designed restorations. Incorrectly placed restoration margin and unadapted restoration violates the biologic width. If the margin must be placed sub-gingival, the factors to be taken into account are: Correct crown contour in the gingival third; correct polishing and rounding of the margin; sufficient zone of the attached gingiva; and, no biologic width violation by the margin. Repeated maintenance visits, patient co-operation and motivation are important for improved success of restorative procedures with pristine periodontal health. The maintenance of the normal structure of the biological tissues should be done and the concept of biologic width must be followed at each procedure. The periodontal health is an important key for the longevity of dental restorations.

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