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College of Dentistry

The Periodontal Restorative Interrelationships: Biological Considerations

A Project Submitted to
The College of Dentistry, University of Baghdad, Department of Periodontology in Partial Fulfillment for the Bachelor of Dental Surgery

By
Amna Shaker Mahmoud

Supervised by:
Assist. Lec. Rasha Salah
B.D.S, M.Sc. (periodontology)

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Certification of the Supervisor

I certify that this project entitled **" The periodontal restorative interface: esthetic considerations (A Literature Review)"** was prepared by fifth year student **amna shaker mahmoud** under my supervision at the College of Dentistry / University of Baghdad in partial fulfillment of the graduation requirements for the bachelor degree in dentistry.

Supervisor's name

Assist. Lec. Rasha Salah

B.D.S, M.Sc. (periodontology)

Dedication

To my dear parents, sister, brothers and friends for their support and encouragement.

Amna

Acknowledgment

First of all, I would like to thank **God Almighty,** for giving me the ability to complete my graduation project.

grateful thanks to **dean** of College of Dentistry, University of Baghdad **Prof. Dr. Raghad A. AL-Hashimi.**

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List of abbreviations

abbreviation	Phrase
BW	Biological width.
JE	Junctional epithelium.
MM	Millimeter.
CT	Connective tissue.

Introduction

An adequate understanding of relationship between periodontal tissues and restorative dentistry is paramount to ensure adequate form, function and aesthetics, and comfort of the dentition (**Sharma and Khuller, 2009).**

When the restoration margin is placed too far below the gingival tissue crest, it impinges on the gingival attachment apparatus and creates a violation of biologic width (BW) **(Benfenati *et al.*, 1985).**

The concept of the BW was first commenced by a research conducted by **Gargiulo, Wentz,** and **Orban** in which the distance between the apical end of the gingival sulcus and the crest of the alveolar bone was measured on several cadaver specimens. Later on, the term 'biologic width' was introduced by **Cohen** to describe the space over the tooth surface, occupied by the connective tissue and epithelial attachments and this parameter being equivalent to the distance between the bottom of the gingival sulcus and the alveolar bone crest.

The BW is important for the health of the gingiva, and invasion on it may cause disruption and apical migration of the attachment apparatus **(Razi *et al.*, 2019).**

Two different responses can be observed from the involved gingival tissues:-

- possibility is that bone loss of an unpredictable nature.
- gingival tissue recession occurs.

as the body attempts to recreate room between the alveolar bone and the margin to allow space for tissue reattachment **(Newman *et al.*, 2019).**

The interplay between periodontics and restorative dentistry is present at many fronts, including location of restorative margins, crown contours, and response of the gingival tissues to restorative preparations **(Padbury *et al.*, 2003).**

Aims of the study

1. Understanding the effects of the restoration design, tooth preparation and impression procedures on periodontal tissue.

2. Biological width concept and its consideration and the interrelationship with restorative point of view.

Chapter one: Review of literature

1.1Biologic Width

The BW 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 **(Sharma and Khuller, 2009).**

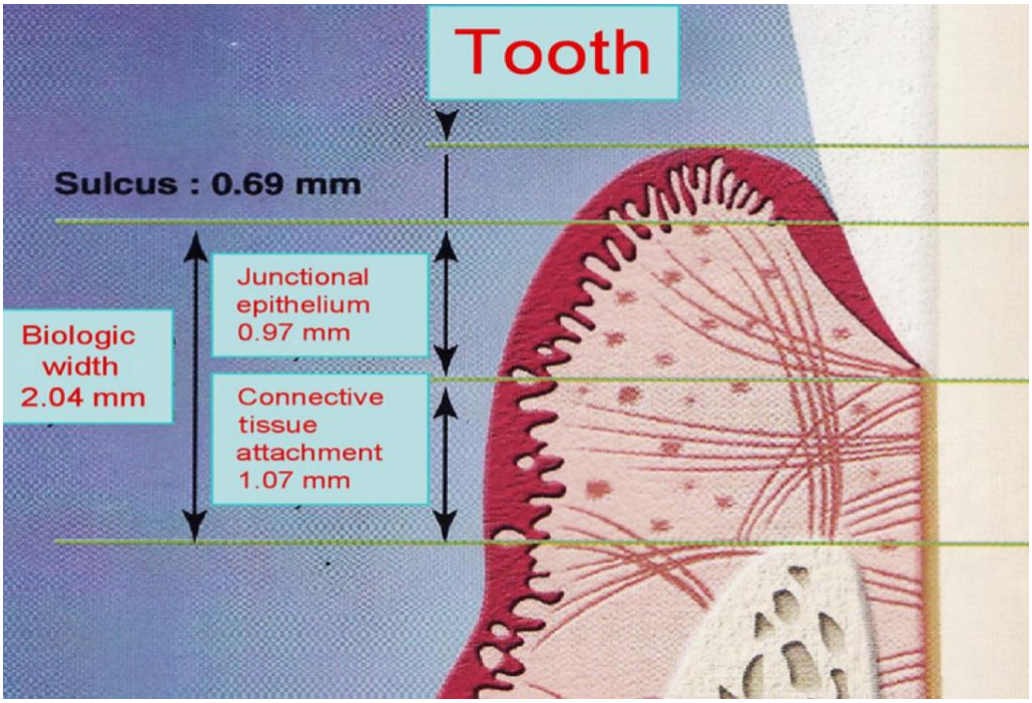

Figure 1.1 biological width anatomy **(Bennani *et al.*, 2017).**

This term was based on the work of **Gargiulo *et al*. (1961)** who described the dimensions and relationship of the dentogingival junction in humans. Measurements made from the dentogingival 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 0.69mm, an epithelial attachment of 0.97mm, and a connective tissue attachment of 1.07mm **(fig. 1.1).** Based on this work, the biologic width is commonly stated to be 2.04mm, which represents the sum of the epithelial and connective tissue measurements.

One must realize however that significant variations of dimensions were observed, particularly the epithelial attachment, which ranged from 1.0 to 9.0mm. The connective tissue attachment, on the other hand, was relatively constant (**Padbury *et al.*, 2003).** Similar BW dimensions were also reported by **Vacek *et al.* (1994)** Evaluating 171 cadaver tooth surfaces, they observed mean measurements of 1.34 mm for sulcus depth, 1.14 for epithelial attachment, and 0.77 mm for connective tissue attachment. This group also found that the connective tissue attachment was the most consistent measurement.

the BW functions as a barrier against the entrance of microorganisms into the internal medium of the periodontal ligament and into the gingival and osseous connective tissue **(Sharma *et al.*, 2012).**

1.1 The periodontal Restorative Interrelationships: biological considerations

1.2.1 Margin Placement

Restorative clinicians must understand the role of BW in preserving healthy gingival tissues and controlling the gingival form around restorations. They must also apply this information in the positioning of restoration margins, especially in the aesthetic zone, where a primary treatment goal is to mask the junction of the margin with the tooth **(Newman *et al.*, 2019).**

Restoration margins for full crowns or veneers must frequently be extended into the gingival crevice for a number of reasons,

1. in the case of subgingival caries.
2. to increase retention and resistance forms for a short clinical crown.
3. for aesthetics.

Studies on both animals and humans have demonstrated that a favourable periodontal response is associated with restorative margins which are placed coronal to, or at, the level of the gingival margin **(Silness *et al.*, 1970; Waerhaug *et al.*, 1978).**

Orkin *et al.* (1987) demonstrated that subgingival restorations had a greater chance of bleeding and exhibiting gingival recession than supragingival restorations.

Renggli and Regolati (1972) demonstrated that gingivitis and plaque accumulation were more pronounced in interdental areas with well adapted subgingival amalgam fillings compared to sound tooth structure.

Waerhaug (1978) stated that subgingival restorations are plaque retentive areas that are inaccessible to scaling instruments. These retentive areas continue to accumulate plaque even in the presence of adequate supragingival plaque control.

The supragingival margin has the least impact on the periodontium. Classically, this margin location has been applied in unaesthetic areas because of the marked contrast in colour and opacity of traditional restorative materials against the tooth. With the advent of more translucent restorative materials, adhesive dentistry, and resin cements, the ability to place supragingival margins in aesthetic areas is now a reality **(newman *et al.*, 2019).**

The greatest biologic risk occurs when placing subgingival margins **(Marcum, 1967),** These margins are not as accessible as supragingival or equigingival margins for finishing procedures. the most important consideration for intracrevicular restorative dentistry is locating the base of the gingival sulcus or periodontal pocket **(Nevins and Skurow, 1984).**

The effect of the location of an artificial crown margin on plaque accumulation and gingival health is well documented **(Flores-de-Jacoby *et al.*, 1989).**

if the margin is placed too far below the gingival tissue crest, it violates the gingival attachment apparatus. Bone loss and gingival recession occur as the body attempts to recreate room between the alveolar bone and the margin to allow space for tissue reattachment. This is more likely to occur in areas where the alveolar bone surrounding the tooth is very thin. This fragile tissue recedes leading to the gingival recession **(Sharma and Khuller, 2009).**

Other factors that may impact the likelihood of recession include:-

(1) whether the gingiva is thick and fibrotic or thin and fragile.

(2) whether the periodontium is highly scalloped or flat in its gingival form.

It has been found that highly scalloped, thin gingiva is more prone to recession than a flat periodontium with thick fibrous tissue **(fig. 1.2), (Olsson and Lindhe, 1991).**

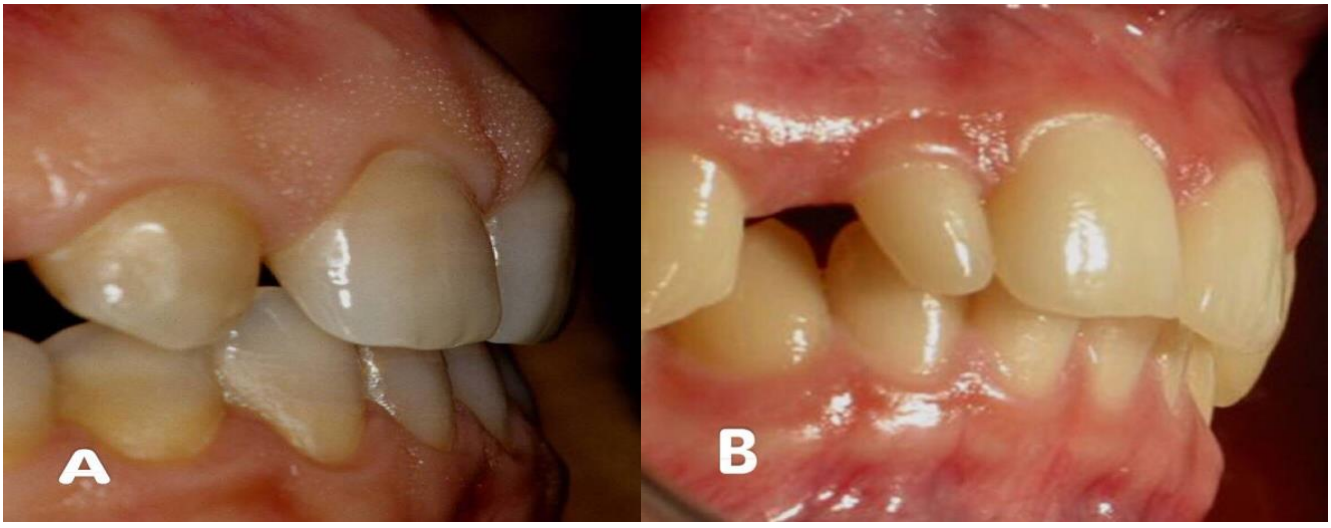

Figure 1.2 gingival tissue biotype **(Bennani *et al.*, 2017). A** thick and flat biotype, **B** thin and scalloped biotype.

The more common finding with deep margin placement is that the bone level appears to remain unchanged, but gingival inflammation develops and persists. To restore gingival tissue health, it is necessary to establish space clinically between the alveolar bone and the margin. This can be accomplished either by surgery to alter the bone level or by orthodontic extrusion to move the restoration margin farther away from the bone level **(newman *et al.*, 2019).**

1.2.2 Biologic Width Evaluation

BW can be evaluated by means of clinical examination and radiographs, 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)**.

The biologic, or attachment, width can be identified for each individual patient by probing under anesthesia to the bone level **(referred to as "sounding to bone")** and subtracting the sulcus depth from the resulting measurement. The information obtained is then used to definitively diagnose biologic width violations, the extent of correction needed, and the parameters for placement of future restorations **(Sharma and Khuller, 2009).**

If this distance is less than 2mm at one or more locations (between the bone and restorative margin), a diagnosis of biologic width violation can be confirmed. This assessment is completed circumferentially around the tooth to evaluate the extent of the problem **(newman *et al.*, 2019).**

However, biologic width violations can occur in some patients in whom the margins are located more than 2 mm above the alveolar bone level **(Günay *et al.*, 2000).**

Vacek *et al.* 1994 also investigate the biologic width phenomenon. Although their average width finding of 2 mm was the same as that previously presented by **Gargiulo and associates**, they also reported a range of different biologic widths that were patient specific. They reported biologic widths as narrow as 0.75 mm in some individuals, whereas others had biologic widths as tall as 4.3 mm.

If a patient experiences tissue discomfort when the restoration margin levels are being assessed with a periodontal probe, it is a good indication that the margin extends into the attachment and that a biologic width violation has occurred **(newman *et al*., 2019).**

Kois in (2000) proposed three categories of biological width based on the total dimension of attachment and the sulcus depth following bone sounding measurements. These are normal crest, high crest and low crest **(fig. 1.3).**

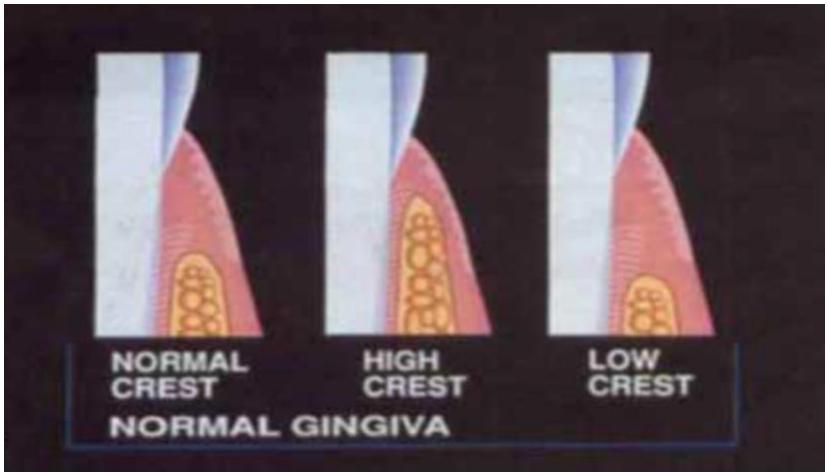

Figure 1.3 (**Kois, 2000)** three categories of biological width based on the total dimension of attachment and the sulcus depth following bone sounding measurements.

Normal crest patient

In the normal crest patients, the mid facial measurement is 3 mm and the proximal measurement ranges from 3 mm to 4.5 mm. Normal crest occurs approximately 85% of time. In these cases gingiva tends to be stable for a long term.

High crest patient

This is an unusual finding in nature and occurs approximately 2% of the time. There is one area where high crest is seen more often, in a proximal surface adjacent to an edentulous site. In the high crest patient, the mid facial measurement is less than 3 mm.

Low crest patient

In the low crest patient group, the mid facial measurement is greater than 3 mm and the proximal measurement is greater than 4.5 mm. Low crest occurs approximately 13% of the time. Traditionally a low crest patient has been described as more susceptible to recession secondary to the placement of an intracrevicular crown margin **(Nugala *et al.*, 2012).**

1.2.3 Margin Placement Guidelines

The base of the sulcus can be viewed as the top of the attachment, and therefore the clinician accounts for variations in attachment height, by ensuring that the margin is placed in the sulcus and not in the attachment **(Armitage *et al.*, 1977).**

The variations in sulcular probing depth are then used to predict how deep the margin can safely be placed below the gingival crest. With shallow probing depths (1 to 1.5 mm), extending the preparation more than 0.5 mm subgingivally risks violating the attachment. This assumes that the periodontal probe will penetrate into the JE attachment in healthy gingiva an average of 0.5 mm. With shallow probing depths, future recession is unlikely because the free gingival margin is located close to the top of the attachment.

Deeper sulcular probing depths provide more freedom in locating restoration margins farther below the gingival crest. In most circumstances, however, the deeper the gingival sulcus, the greater is the risk of gingival recession. Locating the restorative margin deep subgingivally should be avoided, as it increases the difficulty in making an

accurate impression, finishing the restoration margins, and increases the likelihood of inflammation and recession **(newman *et al.*, 2019).**

1.2.4 Provisional Restorations

Three critical areas must be effectively managed to produce a favourable biologic response to provisional restorations. The marginal fit, crown contour, and surface finish of the interim restorations must be appropriate to maintain the health and position of the gingival tissues during the interval until the final restorations are delivered **(Amsterdam and fox, 1959).**

Inaccurate provisional restorations with poor adaptation at the margins being over contoured with rough or porous surfaces result in inflammation, overgrowth, or recession of gingival tissues **(Yuodelis and Faucher, 1980).**

Provisional restorations may be used to improve periodontal health before making the final preparation and final impression **(fig. 1.4)** when replacing iatrogenic restorations that have damaged the soft tissues **(Bennani *et al.*, 2017).**

Fig. 1.4 Patient complaint of a black line on old porcelain fused to metal crowns, **(Bennani *et al.*, 2017). (A)** Over contoured porcelain fused to metal crowns are associated with gingival recession. **(B)** Provisional restorations in place to improve periodontal health before the final preparation and final impression. Note the healthy contour of the gingiva. **(C)** Profile view of the previous porcelain fused to metal crown. Note the over contoured cervical profile. **(D)** Matching view with provisionals in place. Note the proper emergence profile, allowing good support of the gingival margin.

1.2.5 Marginal Fit

Inflammatory response in the periodontium is directly proportional to gap at the tooth-restoration interface. Ideally, there should not be any gap at the tooth restoration interface. Studies have suggested that gap of 50 um is clinically acceptable **(Nithisha *et al.*, 2018).**

the quality of marginal finish and the margin location relative to the attachment are much more critical to the periodontium than the difference between a 20-µm fit and a 100-µm fit **(Newcomb, 1974).**

1.2.6 Crown Contour

Restoration contour is extremely important to the maintenance of periodontal health. Properly designed contours provide access for hygiene, have the fullness to create the desired gingival form, and have a pleasing visual tooth contour in aesthetic areas **(newman *et al.*, 2019).**

Some report that an artificial crown should follow the original anatomy of tooth contour to permit functional stimulation and to maintain gingival health. Others advise that crowns should be under contoured for better periodontal health **(Padbury *et al.*, 2003).**

Yuodelis *et al.* (1973) demonstrated that the greater the amount of facial and lingual bulge of an artificial crown, the more the plaque retained at the cervical margin **(fig. 1.5).**

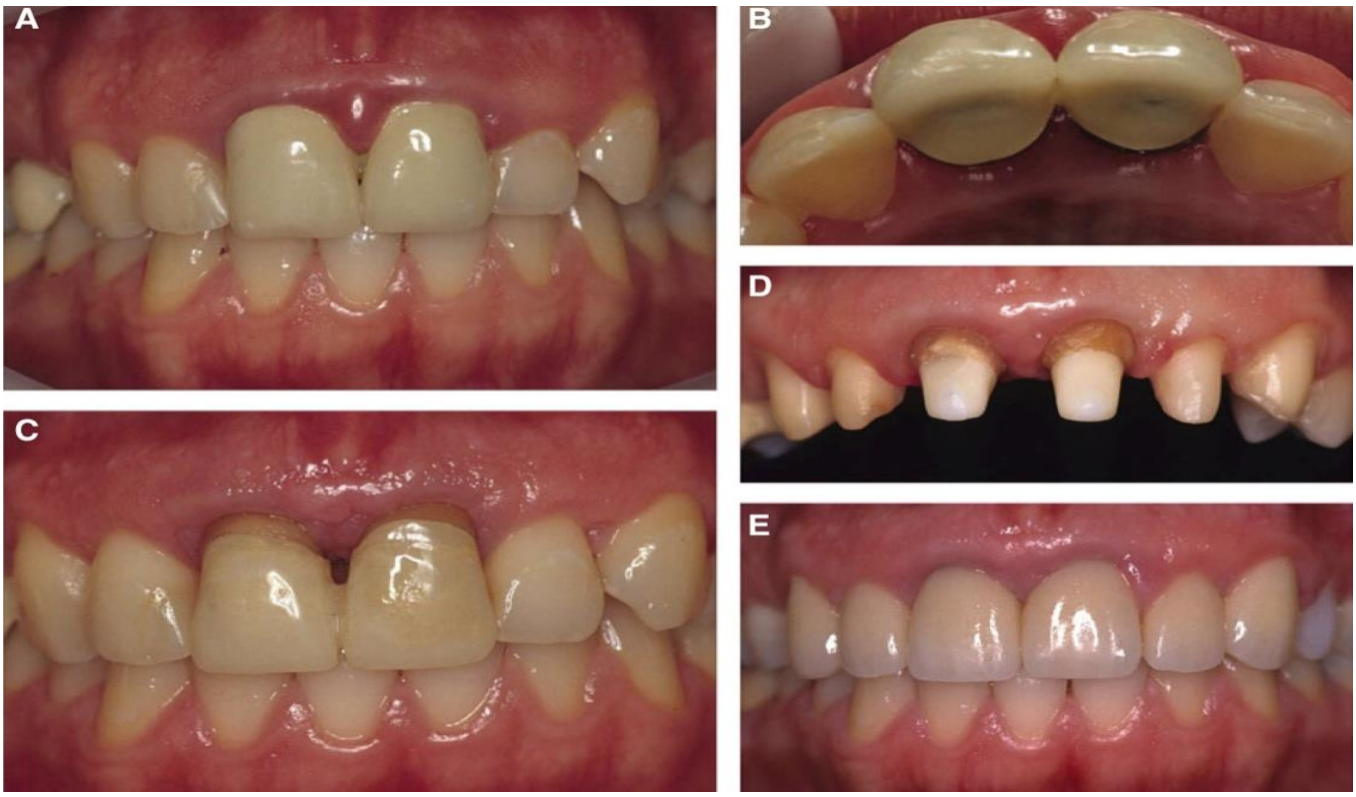

Figure 1.5 Patient complaint of 'bleeding gums and unpleasant appearance **(Bennani *et al.*, 2017). (A)** Inflammation of gingival tissue, gingival suppuration and unesthetic crowns. Note the uneven gingival frame on teeth 13, 12, 22 and 23. **(B)** Occlusal views. Note the inflammation of the interdental papilla, the overcontoured buccal surfaces of teeth 11 and 21 and the exposure of opaque ceramic on the palatal surface. These over contoured restorations are the result of inadequate tooth reduction. **(C)** After placement of adequate provisional restorations and suitable preparation of teeth, the soft tissue was allowed to heal partially. Then, periodontal crown lengthening was performed to recreate adequate biological width. The gingival frame on the adjacent teeth was addressed with a full thickness flap from tooth 13 to tooth 23. **(D)** Three months after surgery. **(E)** after new crowns with correct contour, Note the improved contour of the gingival frame, the health of the gingival tissues and the maturation underway of the interdental papillae.

1.2.7 Subgingival Debris

Leaving debris below the tissue during restorative procedures can create an adverse periodontal response. The cause can be retraction cord, impression material, provisional material, or either temporary or permanent cement **(Price and Whitehead, 1972).**

The diagnosis of debris as the cause of gingival inflammation can be confirmed by examining the sulcus surrounding the restoration with an explorer, removing any foreign bodies, and then monitoring the tissue response. It may be necessary to provide tissue anaesthesia for patient comfort during the procedure **(newman *et al.*, 2019).**

1.2.8 Correcting Biologic Width Violations

Overhanging restorations violating BW area can result in gingival inflammation**,** loss of periodontal tissue attachment, and unpredictable bone loss **(fig. 1.6)**. Clinically, it can be detected as gingival bleeding, periodontal pocket formation, and gingival recession **(Vivek govila *et al.*, 2015).**

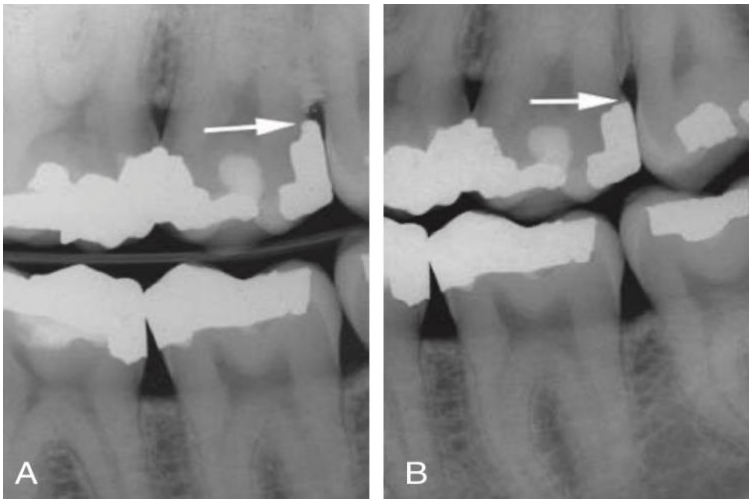

Figure 1.6 (A) Radiograph of an amalgam overhang on the distal surface of the maxillary second molar that is a source of plaque retention and gingival irritation. **(B)** Radiograph depicts the removal of excessive amalgam **(newman *et al.*, 2019).**

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

a) Surgical Crown Lengthening.

b) Orthodontic Extrusion.

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

Surgical Crown Lengthening:-

Is a surgical procedure that is performed clinically (i.e., before restoration delivery) to intentionally create space for the BW **(fig. 1.7)** to reestablish **(newman *et al.*, 2019).** Surgery is more rapid of the two treatment options. It is also preferred if the resulting crown lengthening creates a more pleasing tooth length **(Rosenburg *et al.*, 1980).**

There is a potential risk of gingival recession after removal of bone. If interproximal bone is removed, there is a high likelihood of papillary recession and the creation of an unaesthetic triangle of space below the interproximal contacts **(Bragger *et al.*, 1992).**

Figure 1.7 (A) patient presents with a lingually fractured mandibular second molar. **(B)** Flap reflection demonstrates a tooth fracture within 2 mm of the osseous crest, as well as extensive lingual osseous ledging. **(C)** Following crown lengthening osseous surgery, healing, and subsequent restoration, the area is healthy periodontally and restoratively **(Fugazzotto, 2011).**

If the BW violation is on the interproximal side, or if the violation is across the facial surface and the gingival tissue level is correct, orthodontic extrusion is indicated **(fig. 1.8), (Ingber, 1995; newman *et al.*, 2019).**

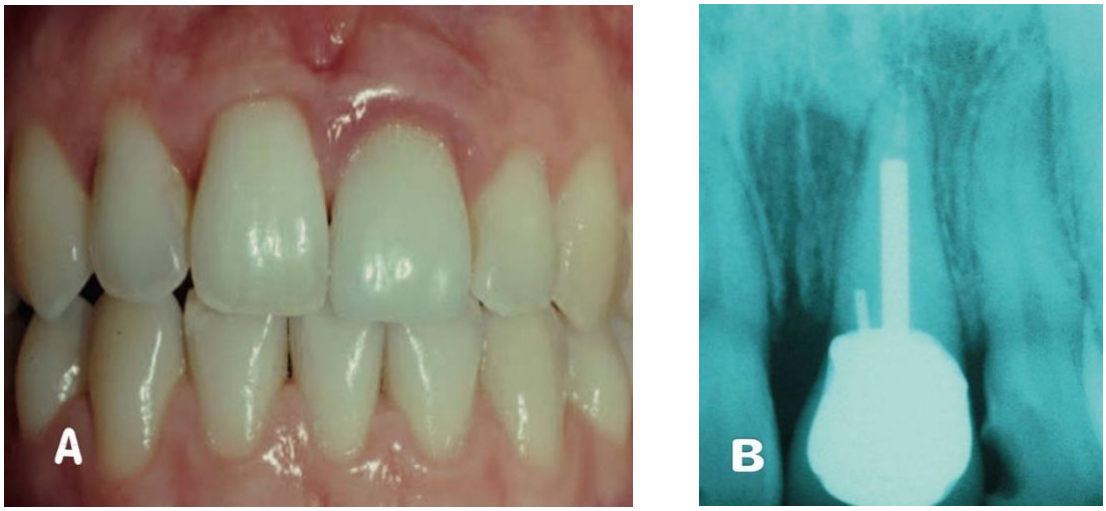

Figure 1.8 The left central incisor was fractured in an accident 12 months ago and restored at that time. **(A)** The patient is unhappy with the appearance of the tissue surrounding the restoration. **(B)** Radiograph reveals a biologic width violation on the mesial surface interproximally. Removal of interproximal bone would create an aesthetic deformity. This patient is better treated with orthodontic extrusion. ((**Newman *et al.*, 2019).**

Orthodontic procedures: Orthodontic extrusion can be performed in two ways (Razi *et al.*, 2019) :-

1.Slow

This is done by applying low orthodontic force, the tooth eruption is slow, bringing the alveolar bone, and gingival tissue along with it. The tooth is extruded until the bone level has been drifted coronal to the optimal level by the amount that needs to be removed surgically for correcting the biologic width violation. Stabilization of the tooth is done in this position and then treated with appropriate surgical procedures to correct the bone and gingival tissue levels.

2.Rapid

The tooth is erupted to the desired amount for several weeks (with supracrestal fibrotomy performed weekly in an intentional to prevent the tissue and bone from succeeding the tooth). Then the tooth is stabilized minimum for 12 weeks prior to surgical correction.

1.2.9 Clinical Procedures in Margin Placement

The first step in using sulcus depth as a guide in margin placement is to manage gingival health. the following three rules can be used to place intracrevicular margins **(Newman *et al.*, 2019)** :-

Rule 1: If the sulcus probes 1.5 mm or less, place the restoration margin no more than 0.5 mm below the gingival tissue crest. This is especially important on the facial aspect and will prevent a BW violation in a patient who is at high risk in that regard.

Rule 2: If the sulcus probes more than 1.5 mm, place the margin no more than half the depth of the sulcus below the tissue crest. This places the margin far enough below tissue so that it will still be covered if the patient is at higher risk of recession.

Rule 3: If a sulcus greater than 2 mm is found, especially on the facial aspect of the tooth, evaluate to see if a gingivectomy could be performed to lengthen the teeth and create a 1.5mm sulcus. Then the patient can be treated using **rule 1**. deep margin placement is more difficult and the stability of the free gingival margin is less predictable when a deep sulcus exists.

1.2.10 Tissue Retraction

The preparation margin must be extended to the appropriate depth in the sulcus, applying the guidelines presented previously. In this process the tissue must be protected from abrasion, which will cause haemorrhage and can adversely affect the stability of the tissue level around the tooth. Access to the margin is also required for the final impression, with a clean, fluid controlled environment **(newman *et al.*, 2019).**

It is important that the technique employed is not traumatic to the periodontal tissues **(Meraner, 2006).** A momentary trauma is seen in the region of JE and CT of gingival sulcus with all retraction methods **(Nithisha *et al.*, 2018)**.

If not properly carried out, gingival retraction can have a negative effect on the soft tissues around the abutments, sometimes causing irreversible damage Depending on **(Bennani *et al.*, 2017)**:-

- the type of soft tissue (thick vs. thin).
- the amount of keratinized attached tissue.
- the position of the preparation margin (at the gingival margin or intracrevicular).

To achieve optimal gingival displacement, two factors should be considered:-

First, there should be a minimum of 0.2 mm exposure of the sulcular grooves to ensure flow and bulk of impression material around the finishing line.

Second, care should be taken that the pressure generated during this process is nontraumatic to the epithelium attachment **(Baharav *et al.*, 2004).**

In deep sulcus, With this initial cord in place, the preparation is extended to the top of the cord, with the bur angled to the tooth so that it does not abrade the tissue. This process protects the tissue, creates the correct axial reduction, and establishes the margin at the desired subgingival level. To create space and allow access for a final impression, it is now necessary to pack a second retraction cord. The second cord is pushed so that it displaces the first cord apically and sits between the margin and the tissue material. The initial cord remains in place in the sulcus until the provisional restoration is completed **(newman *et al.*, 2019).**

The placement of cord and cotton strings into the gingival sulcus may injure the sulcular epithelium **(Loe and Silness, 1963).**

The damage depends on (Ferencz ,1991):-

1. the force used in packing the cord.
2. the chemical with which the cord has been impregnated.
3. the length of time that the cord is left in place within the sulcus.

This could be problematic as the pressure generated by placing cords was recently evaluated in an in vitro study and found to be much higher than the pressure that the epithelial attachment could tolerate **(Bennani *et al.*, 2012).**

Cordless materials (paste and foam) are less traumatic to the gingival tissue, less painful to the patient and quicker to deliver than displacement cords **(Al-Ani *et al.*, 2010).** Studies have shown that gingival tissues recover within a week after an impression has been taken using cordless displacement material **(Phatale *et al.*, 2010).**

What ever the technique used, it is important to inspect the sulcus after the impression to ensure that no foreign material remains, as this would further traumatize the periodontal structures. Several cases of swelling, pain and periodontal inflammation have been reported following the retention of impression materials in the sulcus **(Baba *et al.*, 2014).**

As an alternative to additional retraction cords, electrosurgery can be used to remove any overlying tissue in the retraction process. A fine wire electrode tip is held parallel to the tooth and against the margin in the sulcus and moved through the overhanging tissue, opening up the margin and the retraction cord to visual access. The electrosurgery tip sits on top of the retraction cord in place in the sulcus. This controls the vertical position of the tip and results in the removal of the least tissue needed for access **(newman *et al.*, 2019).**

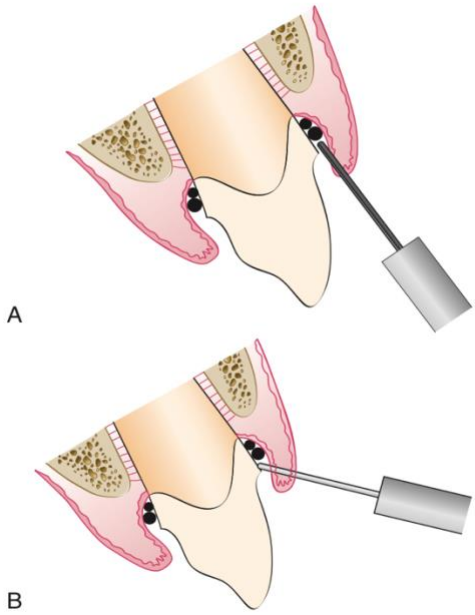

Figure 1.9 (A) Electrosurgery tip being held parallel to the preparation and resting on the previously placed retraction cord. This removes a minimal amount of tissue, and the presence of the retraction cord protects the attachment from the electrosurgery
. **(B)** Incorrect inclination of electrosurgery tip. The tip is leaning away from the preparation. This inclination results in excess tissue removal **(newman *et al.*, 2019).**

When the sulcus is deeper, two larger diameter cords are used to deflect the tissue before extending the margin apically . The top of the second cord is placed to identify margin location at the correct distance. The margin is lowered to the top of the second cord, then a third cord is placed in preparation for the impression **(Sillness, 1970).**

In the patient with a deep sulcus in which the margin may be 1.5 to 2 mm below the tissue crest, electrosurgery is often required to remove overhanging tissue **(fig. 1.10).** To avoid altering the gingival tissue height, it is important to hold the electrosurgery tip parallel to the preparation**(fig. 1.9)**, **(newman *et al.*, 2019).**

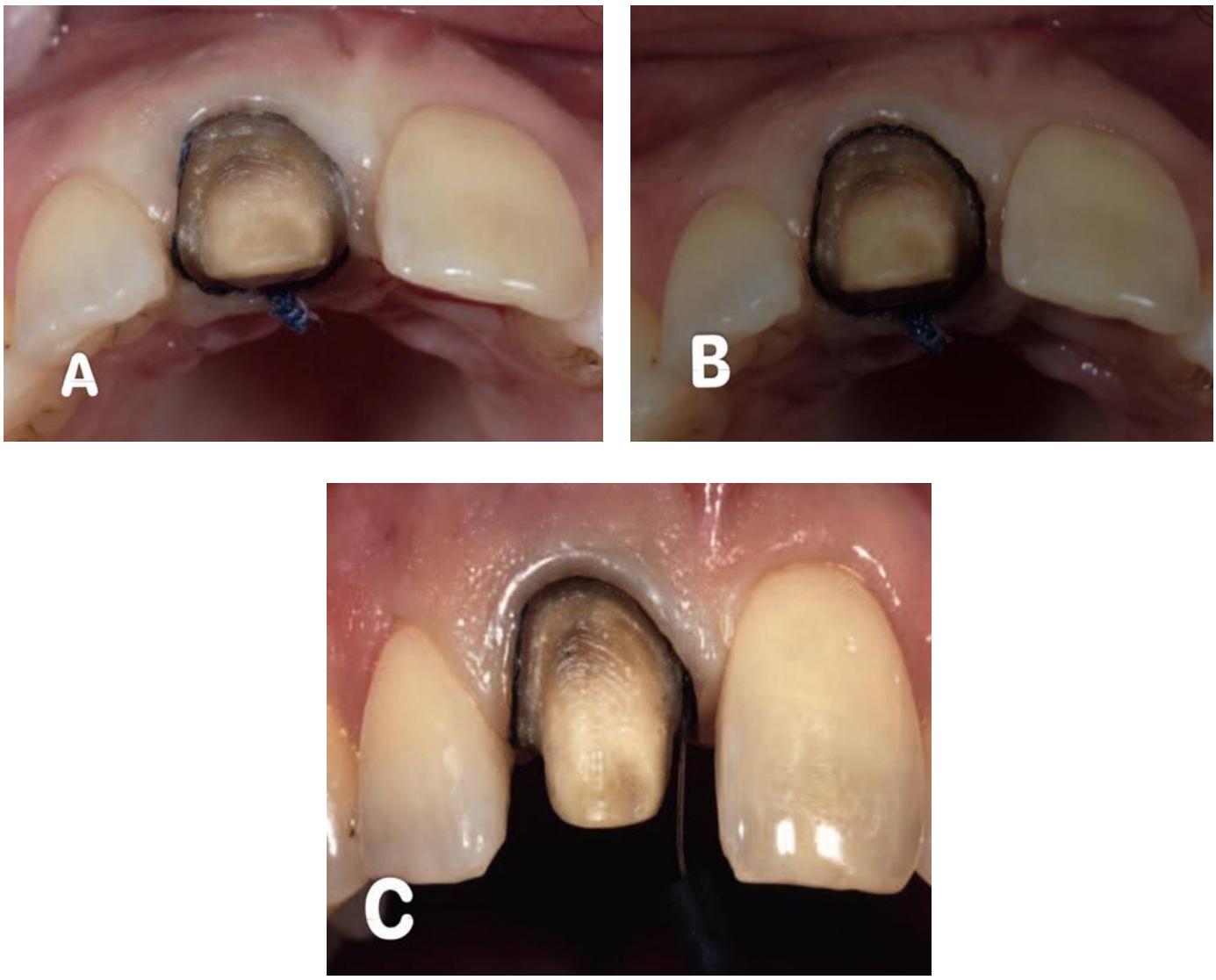

Figure 1.10 (A) Deflection cord and impression cord are in place. The soft tissue is falling over the margins of the preparation. **(B)** Overhanging tissue has been removed and space created for the impression material with electrosurgery. Note that the deflection cord and the impression cord are still in place. **(C)** Using electrosurgery, the fine-wire electrode tip is held parallel to the tooth preparation and rests on the cord as the tip is moved around the tooth **(newman *et al.*, 2019).**

1.2.11 Hypersensitivity to Dental Materials

Unfavourable gingival reactions to alloys used in the oral environment have been documented, Nickel-containing alloys appear to carry the greatest risk **(Lamste *et al.*, 1987; Pierce *at al.*, 1989).** However, alloy reactions responsible for aberrant gingival changes still appear to be very rare. Salivary glycoproteins may neutralize some of the effects of alloy hypersensitivity **(kois, 1996).**

Since contact dermatitis is the most common mode of adverse reactions, the removal of the offending restoration should result in rapid resolution (1 week) of the gingival irritation. Gingival redness also should be limited to the area of direct contact (**Haberman *et al.*, 1993).** these alloys provide an easy solution to the problems encountered with the non-precious alloys (**newman *et al.*, 2019).**

Importantly, tissues respond more to the differences in surface roughness of the material than they do to the composition of the material **(Adamczyk and Speichowics, 1990).** The rougher the surface of the restoration subgingivally, the greater are the plaque accumulation and gingival inflammation. In clinical research, porcelain, highly polished gold, and highly polished resin all show similar plaque accumulation. Regardless of the restorative material selected, a smooth surface is essential on all materials subgingivally **(newman *et al.*, 2019).**

Chapter two: Conclusion

Conclusion

1- Health of periodontal tissue effected by restoration design, preparation of tooth, impression procedure and also finishing of restoration.
2- Clinicians must understand the relation between restorative length and heath of periodontal tissue.
3- Properly designed restoration is vital role in maintaining of health of periodontal tissue. Improper design like over extended crown margin or over hanged restoration cause biological width violation which manifest clinically in inflammation.
4- Open margin and poorly finished subgingival restoration also can traumatize the gingival tissue by acting as plaque retentive factor.

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