

# Crown Lengthening: A Comprehensive Review

Dr. JAYALAKSHMI PA<sup>1</sup>, Dr. SWATHI AMIN<sup>2</sup>

Post graduate<sup>1</sup>, Reader<sup>2</sup>

Department of Conservative Dentistry and Endodontics  
AJ Institute Of Dental Sciences, Mangalore Rajiv Gandhi  
University Of Health Sciences, Karnataka, India

**Abstract:-** Crown lengthening (CL) is a surgical treatment that allows the clinician to rebuild the tooth by extending the supragingival tooth structure. Surgical crown lengthening can make it easier to restore worn teeth. It improves the look and makes dental preparation easier. The amount of height that can be gained by surgery may be limited by anatomical factors. Lasers are the greatest option for crown lengthening because they offer precision, faster wound healing, less discomfort, and superior aesthetics. To attain satisfactory results, cases suggested for crown lengthening in the aesthetic zone require unique considerations. The employment of appropriate diagnostic methods, surgical and restorative criteria, and lasers increases the procedure's certainty and achievement. This review article will go through different aspects of crown lengthening, surgical crown lengthening methods, indications and contraindications, role of orthodontics in crown lengthening as a multidisciplinary approach, and prosthesis placement of margins for prosthetic cases. The functional and aesthetic requirements of laser aided crown lengthening, as well as surgical vs laser assisted crown lengthening methods, are discussed in this article.

**Keywords:-** Crown lengthening, Biological width, Laser assisted-crown lengthening, Laser vs surgery.

## I. INTRODUCTION

Dentists see highly disfigured or highly mutilated teeth on a daily basis in today's dentistry<sup>1</sup>. This complicates clinical decision-making when determining whether the tooth or teeth should be removed or restored<sup>1</sup>. Modern dentistry is primarily concerned with patient safety and minimally invasive procedures<sup>2</sup>. New instruments and materials have been created to achieve this<sup>2</sup>. This is the age of dental implants, an era in which efforts to save severely damaged teeth are dwindling<sup>1</sup>.

Clinical Crown Lengthening procedure is an important alternative in almost all the specialties of dentistry<sup>3</sup>. The term Crown Lengthening (CL) was first coined by DW Cohen in the year of 1962<sup>4</sup>. It's a surgery that involves a blending of hard tissue and soft tissue reduction, as well as orthodontic tooth exposure (with or without braces)<sup>5</sup>. According to the definition of the American Academy of Periodontology, CL is a "Surgical procedure designed to increase the extend of the supragingival tooth structure for the restoration or esthetic purposes by apically positioning the gingival margin, removing supporting bone or both"<sup>5</sup>. Various clinical conditions may need CL such as irregular smile line, gummy smile, mutilated or fractured teeth, worn out teeth by parafunctional habits( eg: bruxism)<sup>6</sup>

CL procedures were classified as either cosmetic or functional according on the clinical state<sup>7</sup>. In the "aesthetic crown lengthening" category, young patients with gummy smiles and short clinical crowns due to altered passive eruption that necessitate an increase in the length of the tooth structure were discussed<sup>7</sup>. In this case, crown lengthening is limited to the anterior aesthetic zone and aids in improving an individual's aesthetic look, whereas CL designed to expose subgingival cavities or a fractured tooth is referred to as "restorative / functional crown lengthening" ( Hempton and Rosenberg, 2010)<sup>7</sup>. In some clinical situations, cosmetic and functional crown<sup>7</sup>.

Crown lengthening can be done with a scalpel, electrocautery, or, more recently, lasers<sup>7</sup>. Lasers have an advantage over the scalpel in functional crown lengthening treatments due to advantages such as little discomfort, quick hemostasis, and immediate placement of restoration, however literature to support the same is sparse. (1993, Pick)<sup>7</sup>.

### A. INDICATION

Indications for the crown lengthening can be subdivided into 3 subgroups

- PROSTHETIC<sup>1</sup>
  - To increase the crown length
  - To create ferrule effect
  - To reposition the borders of restoration impinging the biological width
- ASTHETIC<sup>1</sup>
  - Changed passive eruption
  - In Gummy smile cases
  - In cases of short teeth
  - Teeth with uneven gingival contour
- RESTORATIVE<sup>1</sup>
  - For correction of subgingival caries
  - Analyze perforation in coronal third of root
  - In cervical root resorption.

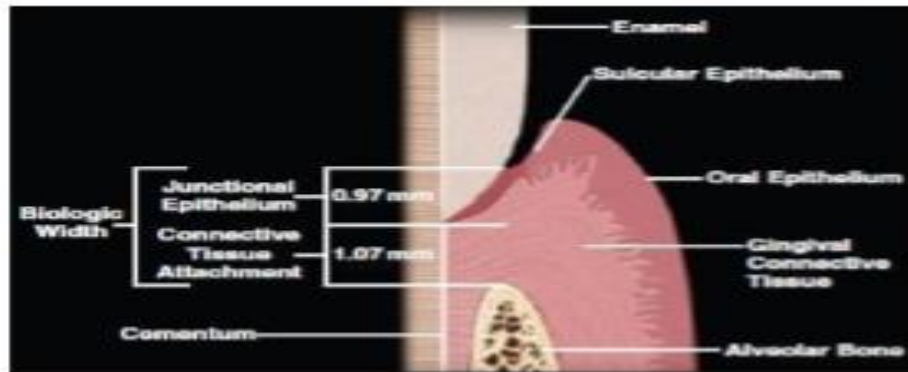
### B. CONTRA-INDICATIONS

- Insufficient Crown to Root ratio
- Unrestorability of caries or root fracture
- When it affects esthetic appearance
- High furcation
- Inappropriate predictability
- Tooth arch relationship inaccuracy
- Compromised adjacent periodontium or esthetic
- Improper restorative space
- Unable to maintain.

### C. BIOLOGIC WIDTH<sup>9</sup>

The notion of biologic width was initially introduced by Gargialo, Wentz, and Orban, who used cadaver specimens to measure the distance between the apical end of the gingival sulcus and the crest of the alveolar bone<sup>10</sup>. That distance, now known as the biologic width, was observed to

be an average of 2.04 mm in areas with periodontal health, with the junctional epithelium occupying around 0.97 mm and connective tissue attachment to the root surface occupying 1.07 mm.<sup>2</sup> The physiologic location of biologic width might alter with age, tooth migration due to loss of arch or occlusal integrity or orthodontic treatment.<sup>2</sup>



(Figure 1)



(Figure 2)

Biologic width ( Fig 1 , Fig 2 )

## II. VIOLATION OF BIOLOGIC WIDTH ANALYSIS

### A. CLINICAL METHOD

When a periodontal probe is used to check the restoration margin levels and the patient experiences tissue irritation, it signifies the margin has extended into the attachment and a biologic width infringement has occurred. Chronic escalating gingival inflammation near the restoration, bleeding on probing, localised gingival hyperplasia with minor bone loss, gingival recession, pocket formation, clinical attachment loss, and alveolar bone loss are all signs of biologic width breach. Alternate passive eruption and subgingivally positioned restoration borders are the most common sites for gingival hyperplasia.<sup>26</sup>

### B. BONE SOUNDING

Under local anaesthetic, probe to the bone level (called "sounding to bone") and subtract the sulcus depth from the resultant measurement to get the biologic width. A diagnosis of biologic width violation can be validated if the distance obtained is less than 2 mm at one or more places. To ensure accuracy and reduce individual and location variance, this measurement should be conducted on teeth with healthy gingival tissues and repeated on several teeth<sup>27</sup>. It is used to decide the placement of the alveolar crest on the labial and

proximal aspects, and also for cosmetic crown lengthening procedures<sup>22</sup>. Bone sounding is used to determine the thickness of soft tissue layer and proximity of the alveolar bone during the planning stages of various surgical procedures<sup>22</sup>.

### C. EVALUATION BY RADIOGRAPHS

The interproximal breach of biologic width can be distinguished using a radiographic approach. Because of dental superimposition, radiographs are not useful on the mesiofacial and distofacial line angles of teeth<sup>28</sup>. Sushama and Gouri introduced a new parallel profile radiography (PPR) approach for determining the size of the dentogingival unit (DGU). Because it is easy, rapid, non-invasive, and repeatable, the authors conclude that the PPR technique can be used to precisely measure both the length and thickness of the DGU, as well as to eliminate individual and location variance<sup>29</sup>.

**• To avoid biologic width violations, there are groups of biologic width and margin position guidelines.**

Based on total attachment measurement and sulcus depth following bone sounding dimensions, Kois proposed three biologic width classifications: There are three types of crests: normal, high, and low <sup>30,31</sup>. [Fig 2] 2nd Figure

**• Patient with a normal crest**

The mid-facial dimension of a Normal Crest patient is 3.0 mm, while the proximal dimension ranges from 3.0 mm to 4.5 mm. [Fig 2] a. Normal Crest occurs around 85 percent of the time. The gingival tissue in these circumstances is likely to remain stable for a long time. The crown's edge must be no closer than 2.5 mm from the alveolar bone. As a result, in the Normal Crest patient, a crown margin that is 0.5 mm subgingivally is expected to be well-tolerated by the gingiva and stable over time.

**• Patient with a high crest**

High Crest is a strange natural phenomenon that occurs only about 2% of the time. There is one location where High Crest is particularly noticeable: on a proximal surface near an edentulous area. The mid-facial dimension is less than 3.0 mm, and the proximal dimension is less than 3.0 mm in the High Crest patient [Figure 2]b. In this situation, an intracrevicular margin is unlikely to be placed since it would be too close to the alveolar bone, causing biologic width impingement and persistent inflammation.

**• Patient with a low crest**

In the Low Crest patient group, the mid-facial dimension is greater than 3.0 mm, and the proximal dimension is greater than 4.5 mm. [fig 2] c About 13% of the time, there is a Low Crest. The Low Crest patient has been demonstrated to be more prone to recession due to the implantation of an intracrevicular crown margin. Attachment apparatus is harmed when a retraction cord is installed during crown preparation. As the offended attachment heals, it returns to its original place of the Normal Crest, causing gingival recession.

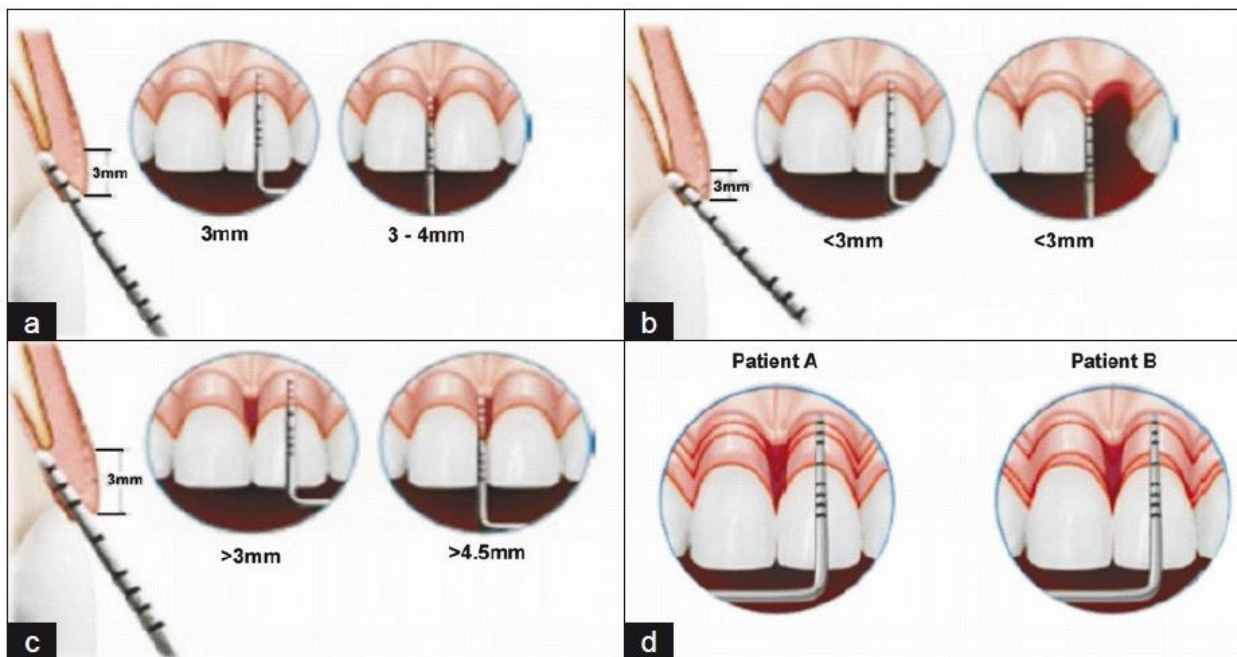


Fig.3: (a) Normal crest showing biologic width on labial and interproximal site, (b) High crest showing biologic width on labial and interproximal site. (c) Low crest showing biologic width on labial and interproximal site, (d) Patient A Low crest unstable; and, Patient B-. Low crest stable

**D. ORDER OF TREATMENT (ALLEN 1993)11**

Clinical and radiographic assessment :

- Caries has to be managed
- Removal of faulty restorations is to be performed
- provisional restorations has to be placed
  - Inflammation has to be reduced
  - Superior evaluation of crown lengthening needed
  - Enhanced surgical access, mainly interproximally
  - Better placement of margin post surgically

- Endodontic therapy:
  - To be performed before surgery
- Monitoring of gingival inflammation
  - Plaque control
  - Scaling and root planning.
- Re-assessment for:
  - Orthodontic therapy
  - Surgical therapy
- Surgery

**E. CROWN LENTHENING CLASSIFICATION**

Type I crown lengthening is distinguished by adequate gingival tissue coronal to the alveolar crest, allowing the surgical alteration of the gingival margin levels without the need for osseous recontouring. A gingivectomy or gingivoplasty method is usually operated to avoid biological width violation by creating a suitable gingival margin.

Soft tissue measures distinguish Type II crown lengthening, which allows surgical adjustment of the

gingival edge without exposing the osseous crest. Later, after the gingival excision, osseous correction is required to recontour the alveolar crest to a level where the biologic width is replaced.

Bone sounds for Type III crown lengthening may show a condition where moving the gingival edge may expose the osseous crest. Type IV crown lengthening is used for situations in where an excessive amount of connected gingiva compromises the degree of gingival resection<sup>5</sup>.

CLASSIFICATION	CHARACTERISTICS	ADVANTAGES	DISADVANTAGES
TYPE I	Sufficient soft tissue allows gingival exposure of the tooth without exposure of the alveolar crest and violation of the biologic width.	May be performed by the restorative dentist. Provisional restorations of the desired length may be placed immediately	
TYPE II	Sufficient soft tissue allows gingival excision without exposure of the alveolar crest but in violation of the biologic width.	Will tolerate a temporary violation of the biologic width. Allows staging of the gingivectomy and osseous contouring procedures. Provisional restorations of the desired length may be placed immediately.	Requires osseous contouring. May require a surgical referral.
TYPE III	Gingival excision to the desired clinical crown length will expose the alveolar crest.	Staging of the procedures and alternative treatment sequence may minimize display of exposed subgingival structures. Provisional restorations of desired length may be placed at second stage gingivectomy.	Requires osseous contouring. May require a surgical referral. Limited flexibility.
TYPE IV	Gingival excision will result in inadequate band of attached gingival		Limited surgical options. No flexibility. A staged approach is not advantageous. May require a surgical referral.

Table 1: CROWN LENTHENING CLASSIFICATION

**F. PRESURGICAL ASSESSMENT**

Smukler and Chibi (1997)<sup>10</sup> put forward the following presurgical clinical analysis prior to crown lengthening procedures:

- To locate the finish line before surgery
- If it cannot be located, it should be anticipated
- Transcervicular circumferential probing is done before the surgery for locating the biologic width (Bone Sounding)
  - Surgical site
  - Contralateral site
- The amount of alveolar bone removal will be determined by the biologic width requirements.
- The overall amount of tooth structure that required to be exposed is determined by a combination of biologic width and prosthetic requirements.
- The topography, architecture, and curvature of the tooth structure are determined for the following:

- Osseous scallop
- Gingival form

**III. GENERAL TISSUE ASSESSMENT BEFORE UNDETAKEING CROWN LENTHENING**

**A. Soft Tissue Assessment**

- Situation 1 : If the width of the attached gingiva appropriate (>3mm) - external bevel gingivectomy or internal bevel gingivectomy
- Situation 2 : If the width of attached gingiva inappropriate (<3mm) - apically positioned flap

**B. Hard Tissue Assessment (Figure 3)**

- Situation 1 :If the bone crest level is apically or low then there is no need for ostectomy.
- Situation 2 : If the bone crest level is more coronal or high then ostectomy is performed.



Fig. 4: Hard Tissue Assessment

### C. TREATMENT METHODS I

- External bevel gingivectomy
  - Scalpel
  - Laser
  - Electrocautery
  - Chemosurgery
  - Cryosurgery
- Internal bevel gingivectomy
- Apically displaced flap with or without bone resection
- Rapid Orthodontic Extrusion
- Combined technique (Surgical and Orthodontic)

## IV. EXTERNAL BEVELGINGIVECTOMY

### A. SCALPEL

External bevel gingivectomy with scalpel is commonly performed when there is sufficient sulcular depth and keratinized tissue to ensure that the incision does not breach the biological breadth and when low bony forms do not necessitate osseous resection. Goldman first introduced this approach in 1951<sup>32</sup>.

### B. CONTRAINDICATIONS:<sup>33</sup>

- When crown lengthening requires bone surgery or a detailed assessment of the anatomy and morphology of the bones.
- When the pocket's bottom is apically positioned near the mucogingival junction. Situations that necessitate aesthetics, such as in the anterior maxilla.

### C. MERITS:

- Flap elevation is not necessary
- It is very easy to do
- It helps to practice in a easy manner

### D. DEMERITS

- Surgical area will be exposed.
- Increased postoperative pain.
- Healing of the tissues will be delayed

### E. INDICATIONS

- Elimination of suprabony pockets, regardless of their depth, if the pocket wall is fibrous and firm.
- Elimination of gingival enlargements.
- Elimination of suprabony periodontal abscesses.

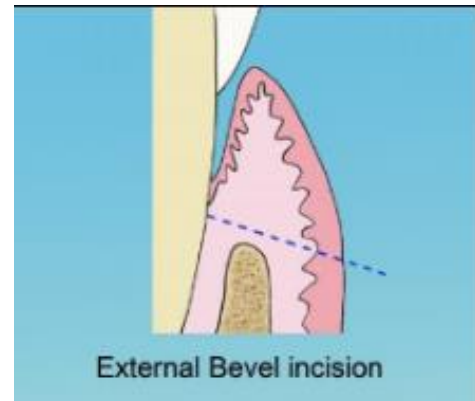


Fig. 5: INCISION GIVEN IN EXTERNAL BEVEL GINGIVECTOMY

### F. INSTRUMENTS REQUIRED:

- Diagnostic instruments: Mouth mirror, periodontal probe.
- Periodontal pocket markers
- Bard-Parker blade with blade holders.
- Periodontal Knives, scissors, and nippers:
- Kirkland gingivectomy knife.
- Orban's interdental knife.
- Goldman fox periodontal scissors.
- Goldman fox nippers.
- Gingivoplasty diamond burs.
- Curettes

### G. PROCEDURE

- Marking the pockets: either with periodontal pocket marker or with periodontal probe. Each pocket at several areas to outline the course on the surface.

### H. External bevel incision:

- The incision is started apical to the points marked and is directed coronally to a point between the base of the pocket and the crest of the bone.
- The incision should be bevelled approximately 45 degrees to the tooth surface and is primarily directed coronally.
- Clinically the angulation of the external bevel incision is dictated by the volume of the keratinized gingiva, the volume of crest of the alveolar bone and the position of the base of the pocket.
- The incision can be continuous or discontinuous.
- Recreation of normal festooning is mandatory.

- Remove the excised pocket wall.
- Remove granulation and clean the root surface.
- Periodontal pack if necessary.

#### I. LASER PRINCIPLES<sup>5</sup>

Laser-assisted crown lengthening operations have shown to be more accurate. The laser technique varies depending on the device and the wavelength of the laser used<sup>12</sup>. The more the ablation of the tissue, the greater the absorption of laser energy in the target tissue. Selection of laser mainly depends on the effect of laser on the adjacent tissues. Lasers should be carefully used to avoid contact with non – target areas. Carbon dioxide (CO<sub>2</sub>) and Nd:YAG, Argon lasers with wavelengths of 10,600nm and 1064nm, respectively, are the most often utilised soft tissue lasers in dentistry.

#### J. MERITS:

- Dry operating field can be achieved
- Reduced chances of bacterimia due to instant sterilization of the operating field
- Improved healing.
- Decreased post-operative edema and scar formation
- Decreased post-operative pain and discomfort.

#### K. DEMERITS:

- It is very expensive.
- Laser safety precautions must be maintained.

#### L. LASER TECHNIQUES<sup>5</sup>

The fact that laser therapy is bloodless improves the clinician's ability to see tissue shapes and characteristics during surgical treatment. This considerably lessens the anxiety of both the patient and the clinician. In a soft tissue crown lengthening surgery, there are two primary approaches that can be performed. The amount of tissue to be removed<sup>13</sup> usually determines which approach is optimal for removing tissue. When a considerable amount of tissue needs to be removed, an excisional approach is performed, in which the laser is wielded like a knife to remove a huge amount of tissue. When only a little quantity of tissue needs to be removed, ablation is usually the best option. The laser light is delivered in a back-and-forth motion to ablate (vaporize) the tissue in small areas during this procedure.<sup>14</sup>.

#### M. DIODE

A diode laser is a solid-state semiconductor laser made up of Gallium, Arsenide, and other elements such as Aluminum and Indium. Its wavelength varies between 810 and 980 nanometers. Reflection, transmission, dispersion, and absorption are only few of the ways tissue interacts with laser radiant energy. <sup>20</sup> The tissue is warmed (37°C to 60°C), welded (70°C to 900°C), vaporised (100°C to 150°C), and carbonised (200°C) when heat is provided to it via a laser beam. It causes fast cell vaporisation, resulting in the loss of intracellular fluid, chemical mediators, and intracellular material, as well as protein denaturation, resulting in a weakened local inflammatory response.

#### N. OSSEOUS CROWN LENGTHENING USING ERBIUM LASERS

The Erbium laser allows dentists to offer patients a less intrusive option to osseous crown lengthening, reducing the negative side effects of traditional treatment <sup>23</sup>. The wavelength of Er; Cr:YSGG is 2.78 metres. It is absorbed by water and hydroxyapatite, which make up the majority of bone and dentin, and the ensuing reactions cause bone tissue and tooth ablation<sup>65</sup>. To reduce edoema and the requirement for sutures, this type of treatment demands little tissue displacement, resulting in less pain and edema<sup>21</sup>. The Erbium laser allows dentists to offer patients a less intrusive option to osseous crown lengthening, reducing the negative side effects of traditional treatment.

#### O. LASER ASSISTED-CROWN LENGTHENING IN ESTHETIC ZONE

The rationale for crown lengthening procedures has become more esthetic driven due to the increasing popularity of smile enhancement therapy. It is essential for the clinicians to understand the diagnostic criteria, treatment planning process and biological parameters involved to determine the appropriate indications, as well as the surgical and restorative protocols that are available to improve the potential for predictable outcomes in the esthetic zone. Key diagnostic factors in analyzing the amount of gingival excision and bone removal are:<sup>22</sup>

#### P. IN THE ESTHETIC ZONE, LASER ASSISTED CROWN LENGTHENING

As smile improvement therapy has increased in popularity, the motivation for crown lengthening surgeries has shifted from function to aesthetics. To improve the chance of predictable outcomes in the aesthetic area, practitioners must understand the diagnostic criteria, treatment planning process, and biological aspects involved, as well as the surgical and restorative treatments available. When calculating the quantity of gingival excision and bone removal, the following diagnostic factors should be considered:

- Identifying the position of the incisal edge
- Determining an appropriate clinical crown length
- Creating the postsurgical gingival margin borders.

#### Q. LASER VS SURGERY

In traditional dental therapy, lasers are utilised for gingivectomy and gingivoplasty. The use of lasers results in low or no bleeding, as well as proper tooth exposure. Lasers can modify the oral soft tissue more easily than a scalpel, with less bleeding and no need for suturing<sup>15</sup>. When a laser is utilised instead of a traditional scalpel, there is less wound contraction and scarring<sup>16</sup>. If a surgical procedure with a scalpel<sup>17</sup> is required, the area around the teeth that will be subjected to the process must be appropriately sedated. The transgingival probing method is used to assess the initial probing depth and calculate the biological breadth using William's periodontal probe<sup>18</sup>. The amount of gingival tissue to be removed is noted once the biological width is calculated<sup>19</sup>.

Because the laser-assisted soft tissue crown lengthening surgery is a minimally invasive procedure, a topical anaesthetic gel was applied to the area prior to the procedure. Safety precautions were taken by both the doctor and the patient, including the use of safety glasses. After enough anaesthetic has been obtained, a diode laser with a wavelength of roughly 940nm can be employed. The laser equipment was used in a continuous mode with paintbrush-like strokes that went slowly to remove gingival tissue and expose enough dental structure. It had a 400-meter disposable tip. To achieve physiologic gingival form, the tip is examined for debris on a regular basis and cleaned with sterile moist gauze. The procedure emphasises the value of lasers<sup>5</sup>.

## V. ELECTROCAUTERY

Flocken first proposed this approach in 1980<sup>34</sup>. Surgical diathermy is another name for it. It is the division of tissue caused by a high-frequency electrical current administered with a metal tool or needle. It works with 1.5-7.5 million cycles per second high-frequency current.

There are three types of electrodes used: single wire electrodes for incising and excising, loop electrodes for tissue planning, and single wire electrodes for incising and excising. For coagulation procedures, heavier, bulkier electrodes are used.

### A. MERITS:35,36

- It enables for proper tissue shaping
- It aids in the prevention of bleeding.

### B. DEMERITS:37,38,39,40

- If it comes into contact with a bone, it may cause irreversible harm.
- If the electrode comes into contact with the root, it causes sections of cementum to burn.

## VI. CHEMOSURGERY

Commonly used materials are :Potassium hydroxide<sup>41</sup>, 5% paraformaldehyde<sup>42</sup>

### A. MERITS:<sup>43</sup>

- Non-anesthetic tissue removal.
- Tissue removal without discomfort
- Tissue removal without causing haemorrhage

### B. DEMERITS:<sup>43</sup>

- The action of paraformaldehyde is confined to a depth of around 1mm.
- Packing must be repeated here.
- Leaving a pack on for an extended period of time will cause healing to be delayed.
- If the pack is held below the bone edge, bone necrosis can ensue.
- Abscess development is a possibility.
- The action's depth is uncontrollable.
- It is impossible to obtain effective gingival remodelling.

- Chemically treated gingival wounds require longer to heal than scalpel wounds for gingival epithelization, junctional epithelium reformation, and reestablishment of the alveolar crest fibre system.

## VII. CRYOSURGERY<sup>44</sup>:

Cryosurgery is the surgical application of cryoablation, which involves intense cold in surgery to eliminate aberrant or pathological tissue.

### A. MERITS:

- It is possible to achieve a bloodless field of labour.
- Vascular gingival enlargements can be treated with it.
- There is no pain as a result of the inhibition of neuronal transmission.
- There are no signs of a secondary infection.
- It is cost-effective.

### B. DEMERITS:

- The action's depth cannot be regulated.
- Healing is slow and painful, necessitating the use of packs for prolonged periods of time.

## VIII. INTERNAL BEVEL GINGIVECTOMY WITH OR WITHOUT OSTECTOMY (UNDISPLACED FLAP)<sup>45</sup>

It's a procedure for people with low and high bone morphologies who may or may not need osteoplasty and osteotomy. It's known as a periodontal flap procedure. The underlying fibrous tissue and pocket epithelium are removed by lifting a partial thickness flap. Scaling, root planing, and osseous surgery are performed as needed.

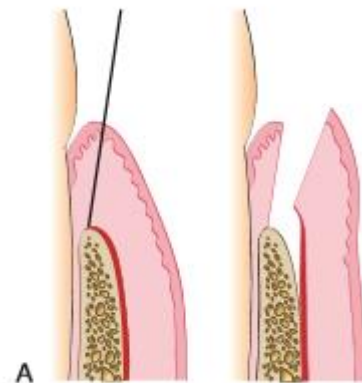


Fig. 6: Diagram of the internal bevel incision (first incision) to reflect a full-thickness (mucoperiosteal) flap. The incision ends on the bone to allow for the reflection of the entire flap.

Most periodontal flap operations start with an internal bevel incision. The flap is mirrored from this incision to expose the underlying bone and root. The internal bevel incision achieves three important goals:

- It removes the pocket lining;
- It preserves the relatively uninvolved outer surface of the gingiva, which becomes attached gingiva when apically positioned; and
- It creates a sharp, thin flap margin for adaptation to the bone-tooth junction.

This incision is also known as the first incision since it is the first incision in the creation of a periodontal flap, and it is also known as the reverse bevel incision because its bevel is in the opposite direction as the gingivectomy incision. The #15C or #15 surgical blade is the most commonly used.



Fig. 7: Position of knife in performing internal bevel incision.

#### A. SURGERY WITHOUT OSTECTOMY

Ensure that adequate linked gingiva remains after the incisions are made to avoid a mucogingival issue. To guarantee that the tooth height is maintained at a minimum of 3 to 5 mm over the whole circle, the final bone level should be carefully measured in all areas surrounding the tooth.

#### B. MERITS:<sup>27</sup>

- The pocket liner is removed.
- It protects the gingiva's comparatively unaffected outer surface.
- It results in a razor-sharp, narrow flap margin that adapts to the bone-tooth interface.
- There are no exposed bare surfaces.
- Healing with a major goal in mind.

#### C. DEMERITS:<sup>28</sup>

- If flap elevation is performed, it may result in crestal bone loss.

### IX. APICALLY DISPLACED FLAP WITH OR WITHOUT OSSEOUS RESECTION

Nabers (1954)<sup>48</sup> was the first to describe a strategy for preserving the gingiva following surgery. Friedman coined the term "apically relocated flap" in 1962 to better accurately characterise Nabers<sup>49</sup>'s surgical approach.

To expose the sound tooth structure, an apically positioned flap approach with bone recontouring (resection) may be employed. At the time of surgery, a minimum of 4mm of sound tooth structure must be revealed. During the healing process, supracrestal soft tissues will extend coronally, covering 2-3 mm of the root and leaving just 1-2 mm of supragingivally located sound tooth structure, as well as broadening the attached gingiva zone, allowing crown lengthening in patients with reduced attached gingiva<sup>50,51</sup>.

#### A. INDICATION:<sup>52</sup>

When there isn't enough gingiva for reduction, the bony contour is too high, or the gingiva isn't connected enough. The crowns of many teeth in a quadrant or sextant of the dentition are extended.

#### B. CONTRAINDICATION

- In the cosmetic zone, surgical crown lengthening of single teeth is not recommended.

#### C. MERITS:<sup>49</sup>

- In the linked gingiva's enlarged zone.
- By primary goal, close proximity of the flap encourages healing.
- The bone provided is completely covered by the flap's viable tissue, eliminating macroscopic sequestration and likely decreasing chronic alveolar crest loss.
- When the amount of gingiva in the postoperative period can be accurately managed.
- The surgeon is able to build a functionally appropriate investing unit by keeping the mucogingival complex and transferring it apically.

### X. RAPID ORTHODONTIC EXTRUSION

Orthodontic extrusion is also known as forced eruption therapy (FET). FET is based on the biologic concept that orthodontically erupted root segments are accompanied coronally by their respective gingiva and supporting structures<sup>53</sup>, and it is used to treat solitary non-restorable teeth as defined by Ingber. According to Reitan and others, eruptive tooth motions stretch gingival and periodontal fibres, causing gingiva and bone to shift coronally<sup>54,55</sup>.

Circumferential Supracrestal Fiberotomy (CSF) is the cutting of the connective tissue attachment (through fiberotomy), which prevents tensile forces from reaching the periodontium and hinders osseous remodelling at a level coronal to the remaining intact fibre attachment.

#### INDICATIONS:

Rapid orthodontic extrusion with CSF is performed when there is an adequate root crown ratio with associated gingival to improve clinical crown length<sup>60</sup>.

#### CONTRAINDICATIONS:<sup>61,62</sup>

- Tooth with a short root length ratio and poor root shape, resulting in an insufficient crown/root ratio after extrusion.
- It should not be done on a tooth that is infected with periodontal disease.

#### MERITS

- Supracrestal fiberotomy is all that is needed.

#### DEMERITS

- It has the potential to cause root resorption, ankylosis, and movement.

Post insertion in an RCT-treated tooth (Fig. 1), wire attachment with composite and e chain (Fig. 3), orthodontic extrusion with button and e chain, and orelastic extrusion are all examples of FET. (Fig 4).



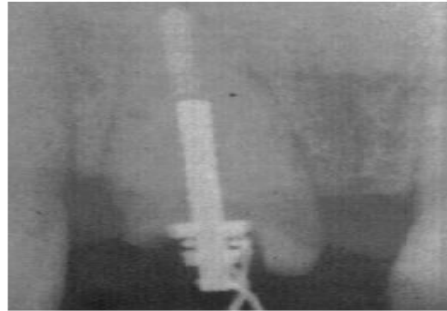


Fig. 8: Radiograph demonstrating post placement 6mm within alveolar bone prior to eruption



Fig. 9: 2mm distance between the serrated post and 0.022x0.025 stainless steel rectangular wire



Fig. 10: Orthodontic extrusion with wire attachment by composite and e-chain



**Fig 4- Orthodontic extrusion with button and e chain or elastic**

Fig. 11: Orthodontic extrusion with button and e-chain or elastic

## XI. COMBINED TECHNIQUE (SURGICAL AND ORTHODONTIC)

Using a combination of surgical and orthodontic extrusion, the bone attachment and diameter of the connected gingiva can be increased. First, Forced Eruption Therapy is performed, followed by surgical excision of soft tissue to expose the teeth.

### A. INDICATIONS:

- Attached gingiva is too thin.

### B. CONTRAINDICATIONS

- Inadequate crown/root ratio post extrusion due to short root length ratio and poor root shape.
- Should not be done on a tooth that has a periodontal problem.

### C. MERITS<sup>64</sup>

- Tensions of periodontal fibres are given to the bone using light forces (30g).
- When a tooth is extruded, the periodontium migrates coronally.

### D. DEMERITS:

- It takes a long period of time.

## XII. CONCLUSION

Crown lengthening procedure is an important procedure in improving treatment outcome in the esthetic zone and an important adjunct to restorative dentistry. Laser technology helps in achieving the patient's desire, shorter healing time, less discomfort and dentist's need to follow sound biological principles and techniques to attain the best possible and long lasting results.

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