Gingival retraction in prosthodontics - A review

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ABSTRACT

A common objective for impressions and interim crowns or fixed dental prostheses is to register the prepared abutments and finish lines accurately. For all impression procedures, the gingival tissue must be displaced to allow the subgingival finish lines to be registered. Swift increase in research work in the recent past leaves no option for a clinician, but to be updated and to possess the optimum knowledge to rationalize the use of materials and techniques that are employed for gingival displacement in proximity to teeth. Numerous advancements have occurred in impression making for fixed prosthesis in the present century. The purpose of this article is to review the latest advancements in the field of tissue retraction and analyze their merits and demerits so that adequate amount of unprepared tooth structure can be recorded with least distortion of impression material as well as minimal damage to attachment apparatus of the tooth.

KEY WORDS: Gingival displacement, Gingival retraction Paste, Gingival retraction, Retraction cord

INTRODUCTION

Gingival Retraction

Gingival retraction is defined as the deflection of marginal gingiva away from a tooth (GPT 2005).[1] Accurate impressions for subgingival crown margins require gingival tissue retraction. Various materials, methods, and techniques exist for gingival retraction. This review presents various studies related to gingival architecture, materials, techniques, and tissue reaction following gingival retraction.

Ideal Requirements of Gingival Retraction Agent

A gingival retraction agent should be effective for its intended use, safe both locally and systemically, and the effects should be spontaneously reversible, wearing off in a short time, leaving no permanent tissue displacement (Jokstad 1999).[2]

Importance of Biologic Width

Biologic width is defined as the dimension of soft tissue, which is attached to the portion of the tooth coronal to the crest of the alveolar bone. The biologic width is commonly stated to be 2 mm, which represents the sum of epithelial and connective tissue measurements (Block 1987). Biologic width is also defined as the total of supracrestal fibers, junctional epithelium, and gingival sulcus (Nevins and Skurow).

Dimensions of Biologic Width[3,4]

Gargiulo et al. reported in 1961 a certain uniformity of the dimension of some components of biologic width: mean depth of the histologic sulcus is 0.69 mm, mean junctional epithelium measures 0.97 mm (0.71–1.35 mm), and mean supraalveolar connective tissue attachment is 1.07 mm (1.06–1.08 mm). The total of the attachment is, therefore, 2.04 mm (1.77–2.43 mm) and is called the biologic width, essential for the preservation of periodontal health, and removal of irritation that might damage the periodontium (prosthetic restorations, for example). If the biologic width is violated during the preparation of the tooth, some authors claim that there will be no place left for the attachment and the result in the development of attachment loss and pocketing can be observed. Violated biologic width can result in uncontrolled bone resorption and might grow over the quantity of the bone necessary for the supralimbal insertions of the connective tissue attachment on the tooth root. The result is advanced periodontitis.

KEY WORDS:
- Gingival displacement
- Gingival retraction Paste
- Gingival retraction
- Retraction cord

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Margin Placement and Biologic Width

Two basic factors should be taken into account. First is the shape and the method of preparation, which depends on the therapist. The second factor is the ultimate success of the restoration, which is influenced by a number of items. It is desirable to place the margin in a location that will facilitate the following: Preparatation of the tooth and finishing of the margin (easiest supragingivally):

- Duplication of the margins with impressions that can be removed past the finish line without tearing or deformation (easiest supragingivally).
- Fit and finish of the restoration and removal of excess material (easiest supragingivally).
- Verification of the marginal integrity of the restoration (easiest supragingivally).

A number of factors hold some importance for the success of a prosthetic restoration:

- Brushing, flossing, and maintaining the restoration on a daily basis (easiest supragingivally).
- Removing plaque, calculus, and performing periodic inspection of the marginal integrity of the restoration without damaging the marginal fit or scratching the restorative material (easiest supragingivally).
- Avoiding changes in gingival contour (easiest supragingivally).
- Improving the esthetics.
- Root sensitivity. Subgingival margin placement is only a temporary solution if the gingival recession progresses. Good oral hygiene and local fluoride treatment resolve most root sensitivities.
- Subgingival extension of caries, restorations, or fractures. In the past, subgingival margin placement was advocated for teeth, in which insufficient or questionable retention could be gained from supragingival margins. This was to give greater length and surface area, and sometimes more parallelism, for increased retention. Today, the best way to achieve is preprosthetic surgical crown lengthening procedure, which establishes an adequate biologic width and allows correct margin placement (Ksenija JorgiÊ-Srdjak 2000).

Evaluation of Biologic Width

Radiographic interpretation can identify interproximal violations of biologic width. A more positive assessment can be made clinically by measuring the distance between the bone and the restoration margin using a sterile periodontal probe. If this distance is <2 mm at one or more locations, a diagnosis of biologic width violation can be confirmed. The biologic, or attachment, width can be identified for the individual patient by probing to the bone level (referred to as sounding bone) and subtracting the sulcus depth from the resulting measurement. This measurement must be done on teeth with healthy gingival tissues and should be repeated on more than one tooth to ensure an accurate assessment (Michael G Newman 2006).

VIOLATION OF BIOLOGIC WIDTH

If the biologic width is violated, it is impossible to maintain periodontal health due to (a) bone loss under the preparation margin that violated the biologic width. Pocket and progressive periodontal tissue loss (periodontal ligament and bone) develop and (b) gingival recession and localized bone loss develop. This happens in cases where the labiobuccal bone is thin. (c) Localized gingival hyperplasia with minimal bone loss (Michael G Newman 2006).

Correcting Biologic Width Violations

Biologic width violation 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. Surgery is more rapid of the two treatment options; the bone should be moved away from the margin by the measured distance of ideal biologic width for that patient, with an additional 0.5 mm of bone removed for a safety zone.

Critical Sulcular Width

Critical sulcular width: 0.2 mm (SF Rosenstiel 2001)

Impression with width <0.2mm:
- ↑ Incidence of voids in the marginal area.
- ↑ Tearing of impression material
- ↓ Marginal accuracy.

Margin Placement Guidelines

The first step in using sulcus depth as a guide in margin placement is to manage gingival health. Once the tissue is healthy, the following three rules can be used to place intracrevicular margins

1. Rule 1: If the sulcus probes 1.5 mm or less, place the restoration margin 0.5 mm below the gingival tissue crest. This is especially important on the facial aspect and will prevent a biologic width violation in a patient who is at high risk in that regard.
2. Rule 2: If the sulcus probes more than 1.5 mm, place the margin 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.
3. Rule 3: if a sulcus >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 1.5 mm sulcus. Then, the patient can be treated with rule 1 (Michael G Newman 2006).
Classification and Methods of Gingival Retraction

(Barkmeier and Williams 1978)
1. Surgical retraction (gingivectomy and gingivoplasty, periodontal flap procedures, electrosurgery, and rotary gingival curettage).
2. Non-surgical retraction (rubber dam and clamps, retraction cord-impregnated/non-impregnated, retraction rings, copper bands).

(Thompson M.J 1959)
2. Radical.

(Benson et al., 1986)
1. Mechanical method
2. Chemomechanical method
3. Rotary gingival curettage
4. Electrosurgical methods.

Methods of Retraction
Mechanical: Physically displacing the gingiva was one of the first methods used for insuring adequate reproduction of the preparation finish line.
- Rubber dam
- Copper rings (copper band and tube)
- Aluminum shell
- Cotton twills with ZnO-E cement
- Plain cotton cords.

Copper band retraction method was found to be most satisfactory as it produced the least evidence of trauma and less marked inflammatory reaction, and after 8 days, the copper band retraction areas were completely healed and least recession values (0.1 ± 0.1 mm) followed by cord (0.2 ± 0.1 mm) and electrosurgery (0.6 ± 0.2 mm) (Ruel, Schuessler et al. 1980). Various advantages of copper band gingival retraction technique (rubber base material in copper bands) are as follows:
- The gingival tissue retraction is maximal and superior to indirect retraction methods.
- The margins may be established at maximum subgingival depth.
- The band impression made under pressure will have no air bubbles or voids.
- The wax-lined tray has close border adaptation and ensures a bubble and void-free impression on the adjacent oral structures.
- The technique can be used for sectional or complete arch impression, inlays, three-quarter crowns, or full coverage crowns.
- Only the tray type of impression material is required.
- It is not necessary to pour the cast as soon as the impression is made (Darby and Darby 1973).

Chemico-Mechanical
Gingival retraction using chemically impregnated retraction cord is a mechanico-chemical method of displacement. Two forms:
(a) Chemical aspect
(b) Mechanical aspect.

Chemical aspect: Chemicals used
- 0.1% epinephrine for 10 min
- 100% alum solution (potassium aluminum sulfate) for 10 min
- 5% and 25% aluminum chloride solution for 10 min
- 13.3% ferric sulfate solution
- 8% and 40% zinc chloride solution for 3 min
- 20% and 100% tannic acid solution for 10 min
- Merocel
- Ferric subsulfate (Monsel’s solution) for 3 min
- Neosynephrine
- 45% Negatol solution (45% condensation product of meta-cresol sulfonic acid and formaldehyde)
- Caustic acid – sulfonic acid, trichloracetic acid.
- Nasal and ophthalmic decongestants.
- Oxymetazoline hydrochloride 0.05%.
- Tetrahydrozoline hydrochloride 0.05%.
- Phenylphrine hydrochloride 0.25%.
- Combinations of chemicals.
- Cocaine 10% with 0.1% epinephrine.
- Zinc chloride with 8% epinephrine.

The materials used in conservative gingival retraction are (1) alum (saturated solution), (2) racemic epinephrine (8:100), (3) alum and racemic epinephrine in equal parts, (4) tannic acid (20% solution), and (5) zinc chloride (8% solution). The chemical agents used are Monsel’s solution (ferric subsulfate) and zinc chloride (40% solution). Injuries caused by retraction agents (alum, zinc chloride, and epinephrine with the cord) on gingival sulcus epithelium were healed within 7–10 days (James 1961). Visine (tetrahydrozoline HCl, 0.05%), afrin (oxymetazoline, 0.05%) produced tissue displacement greater than any of the other agents; neosynephrine (phenylephrine HCl, 0.25%), epinephrine, and alum were more effective than the untreated mechanical control (Plain, untreated cord) (Bowles et al. 1991). Tetrahydrozoline – sympathomimetic vasoconstrictor (Visine) was found to have the lowest inflammatory potential. The ratio of the connective tissue area to that of the inflammatory infiltrate showed that 25% aluminum chloride (racestypine) was the most aggressive and tetrahydrozoline the least aggressive retraction agent used (Kopac et al. 2002). Sympathomimetic vasoconstrictors have a pH of 5.6 (0.05% tetrahydrozoline) and are free of systemic side effects (most retraction agents have pH values from 0.8 to 3.0) T 25% aluminum chloride was the
most aggressive agent that took only 1 min to damage all cell cultures. The proportion of cells damaged after 10 min of exposure to tetrahydrozoline was 60%, which was significantly less compared with other chemicals tested (Kopac et al. 2002). About 25% aluminum chloride produced significantly greater amount of cellular damage more aggressive than 0.05% tetrahydrozoline, which caused only mild changes in the cultured cells rat keratinocytes (Kopac et al. 2002). Negatan solution (an aqueous solution containing in 100 g. approximately 45 g of a condensation product obtained by reacting metacresol sulfonic acid with formaldehyde) was highly acidic and decalcified the teeth. When very high concentrations or amounts of epinephrine were applied locally to lacerated tissue, epinephrine could be absorbed causing an increase in the heart rate and blood pressure. This could be risky for patients with cardiovascular disease, hyperthyroidism, and to certain hypersensitive individuals. Therefore, application of high concentration of epinephrine to large areas of lacerated or abraded gingival tissues should be avoided (Felix 1964). Human blood pressure and pulse rate response to racemic epinephrine retraction cord were (a) the pulse rate of patients after application of racemic epinephrine-impregnated retraction cords depends more on the level of anxiety and stress than on the level of epinephrine; (b) blood pressure is elevated by placement of racemic epinephrine-impregnated retraction cords on an exposed vascular bed or lacerated tissue; (c) 4% racemic epinephrine-impregnated retraction cords cause less elevation of blood pressure than 8% racemic epinephrine cords; (d) although the elevations in blood pressure from 8% cord occur within a narrow range, this range may be hazardous to cardiac patients. Therefore, 4% racemic epinephrine cord should be used; (e) a desirable amount of tissue retraction is produced by 4% racemic epinephrine cord and (f) dry cords do not provide adequate retraction of tissue and are contraindicated for tissue-retraction purposes (Pelzner et al. 1978).

The potential epinephrine reactions that can occur following systemic absorption include increased anxiety after cord placement, limb tremor, diaphoresis, headache, florid appearance, tachycardia, and elevated blood pressure (Malamed 1993). However, there are many variables that make it difficult to predict the physiological effect. These variables include the concentration of epinephrine absorbed from the cord; the length of time the cord is in the sulcus; the condition of the gingival tissue; the presence of crevicular fluid or saliva; individual patient response; and drug interactions with tricyclic antidepressants, non-selective β-adrenergic antagonists, certain general anesthetics, and cocaine. Therefore, recommendations have been made to either limit or avoid use of such epinephrine-impregnated retraction cords (Kellam et al. 1992; Pallasch 1998; Yagiela 1999). Fluid absorbency of retraction cords after soaking it in aluminum chloride solution does not lessen the cords ability to absorb fluid. Because aluminum chloride solution does aid in hemorrhage control, soaking cords before placement may be a useful adjunctive technique (Runyan et al. 1988). Potassium aluminum sulfate produced fewer gingival inflammatory changes than aluminum chloride, and 8% racemic epinephrine. Factors other than the chemical agent (e.g., physiologic differences in patients) may play a role in the amount of gingival inflammation induced (de Gennaro et al. 1982). Use of cord impregnated with aluminum chloride (5–10%) is referred to be the safest and most effective method of gingival retraction (Ramadan et al. 1972; Azzi et al. 1983). About 10% aluminum chloride solution acts as hemostatic agent and astringent. It has the ability to precipitate protein, constrict blood vessels, and extract fluid from tissues. It is highly soluble in water, freely soluble in alcohol, and soluble in glycerin. Aluminum chloride has no contraindications and minimal side effects and when used in low concentrations have only a mild effect on the gingiva, whereas concentrated solutions cause severe inflammation and necrosis (Shaw et al. 1980).

Mechanical aspect

Retraction cords

A gingival retraction cord resembles yarn. Pieces of cotton or polyester are braided together to create a specific diameter. Some brands of gingival retraction cord are pre-soaked in hemodent, a liquid used to stop minor bleeding of the gum tissue. Many dentists prefer to soak the gingival retraction cord in hemodent themselves, while others choose not to use hemodent to stop any bleeding from the gingival tissue.

Classification of Retraction Cords

a. Depending on the configuration: Knitted, braided, twisted.
b. Depending on surface finish: Waxed and unwaxed.
c. Depending on the chemical treatment: Impregnated and plain.
d. Depending on number strands: Single and double-string.
e. Depending on the thickness (color coded): Black-000, yellow-00 purple-0, blue-1, green-2, red-3
f. Depending on surface texture: Wet and dry.

To achieve a crevicular width of 0.2 mm cord should remain in the gingival crevice for an optimum time of 4 min before impression making (de Camargo et al. 1993). Investigation of the length of time for medicated displacement cord should remain in the gingival crevice before impression making. Initially, a silk cord (deknatel) was placed into the sulcus over which medicated cord was placed and not removed.
during the study. Hemodent on Ultrapak #1 were placed into the gingival sulcus for 2, 4, 6, and 8 min. Following cord removal, closure of the sulcus was recorded at intervals using a miniature video camera. Crevicular widths were measured at the midbuccal and transitional line angle areas. At both the midbuccal and transitional line angle areas, gingival crevices displaced for 2 min were significantly smaller at 20 s ($P < 0.5$) than crevices following displacement for 4, 6, and 8 min. No significant difference in crevicular width was found at any period after cord removal for crevices displaced for 4, 6, and 8 min (Bharav et al. 1997). Although the sulcular widths at the MB and TLA points were similar immediately after the cords were removed, the MB sulcus remained open longer. Anatomic and microstructural differences at the TLA and MB gingiva may be responsible for the different closure patterns of two areas. The gingiva at the interproximal area is not only thicker than the buccal area but also richer in collagen fibers. The transitional line angle is an area of intersection of the dentogingival and semicircular fibers, and the transgingival fibers originating from adjacent tooth. In addition, the thick alveolar bone, in this area, gives rise to thicker alveologingival fibers than in the midbuccal area. Cords untreated with drugs could be used safely for periods of 5–30 min and that cords treated with 8% epinephrine or 100% alum solution could be used safely for 5–10 min (James 1961). Consistency of the cord whether it is twined or knitted is more important than the type of medicament used. Knitted cord showed better performance and there was no difference between alum-treated cord and epinephrine (Jokstad 1999). Braided ULTRAPAC retraction cords (No. 00, No. 0, and No.1) with identical lengths (35 mm) were soaked for various time intervals (2 s; 1, 5, and 60 min; and 24 h) in the medicament solutions (epinephrine, aluminum chloride, and ferric sulfate) at room temperature. 20 min of soaking time was necessary for saturation of the cords before use, provided that air trapped within the cords was removed. In addition to the soaking time, the saturation of the cords with the solutions largely depended on the wetting of the cords (Csempesz et al. 2003). Cord induced the least clinical damage to the periodontal tissues, both in terms of recession and attachment loss when compared with electrosurgery, and rotary gingival curettage; however, all the methods induced some kind of minor damage. Apical migration of junctional epithelium was not seen in all the three techniques (Azzi et al. 1983). Retraction cords were placed with minimal overlap around each tooth after 10 min; the cord was removed and evaluated for amount of bleeding; No bleeding - score 0, bleeding controlled with air and water spray within 1 min - score 1, and bleeding not controlled in 1 min - score 2. Hemorrhage control with a cord saturated in hemodent was more effective than water-saturated or dry cords (Weir and Williams 1984) Two layers of cord should be placed into the crevice wherever feasible, one below the finish line of the preparation and one at the finish line. The instrument should slide along the tooth surface, over the chamfer or shoulder and into the crevice. The face of the blade should have dimensions of approximately 1.5 mm by 0.4 mm. The cord is left in place for approximately 5 min before making the impression. This time is adequate for action of the drug in the cord but short enough to avoid caustic injury (Fisher 1976). DL-adrenaline HCl-impregnated gingival retraction cord was the most toxic (to human gingival fibroblast) gingival retraction cord among aluminum sulfate (GingiAid), and non-drug impregnated cord (Gingi-Plain) (Liu et al. 2004). Chemically treated retraction cord used in conjunction with a modified acrylic resin temporary crown with a retraction collar is applicable for all teeth and is used before making final impressions (Lawrence 1964). Impregnated retraction cord showed poor results on gingival health when assessed histologically in respect to periodontium as compared with retraction pastes (Expasyl, Magic foam cord) (Phatale et al. 2010).

**TECHNIQUES OF GINGIVAL RETRACTION**

Gingival displacement can be accomplished using several different techniques. No clinical study has demonstrated the superiority of one technique over another, so the choice of which procedure to use depends on the presenting clinical situation and operator preference.

**Single-Cord Technique**

This technique is indicated when making impressions of one to three prepared teeth with healthy gingival tissues. It is the most commonly used method for gingival displacement.

**Double-Cord Technique**

This technique is routinely used when making impressions of multiple prepared teeth and when making impressions when tissue health is compromised.

**Infusion Technique of Gingival Displacement**

The infusion technique for gingival displacement uses a significantly different approach from single- or double-cord technique, it represents the action of the viscosstat solution and the use of the dentoinfsor with a rub-scrub action that enables the hemostatic solution to penetrate the open small capillaries and form coagulum plugs.
Every Other Tooth Technique

The undesirable outcome of unesthetic black triangles in the gingival embrasures can be prevented with this technique. This can be used with the single- or double-cord technique. Retraction cord is placed around the most distal prepared tooth. No cord is placed around the prepared tooth mesial to this tooth. Retraction procedures are completed on alternate teeth.

Merocel Retraction Strips

Merocel retraction strips were a predictable retraction material in conjunction with impressions procedures. Merocel reaction strips are a synthetic materials that are specifically chemically extracted from a biocompatible polymer (hydroxyxlate polyvinyl acetate) that creates a netlike strip without debris or free fragments. The material possesses beneficial physical properties such as effective absorption of intraoral fluids, free of fragments, chemically pure, and executing moderate pressure on gingival tissue without requiring local anesthesia, which ensures a gingival tissue displacement atraumatically (Ferrari et al. 1996).

SURGICAL

Rotary Curretage–Gingitage, Denttage, Troughing Technique

The purpose of which is to produce limited removal of epithelial tissue in the sulcus while a chamfer finish line is being created in tooth structure. Concept of using rotary curettage was described by Amsterdam in 1954 and further developed by Hansing and Ingraham. Gingitage involves simultaneous subgingival tooth preparation and intentional rotary diamond instrument curettage of the inner lining of the gingival sulcus. The definitive tissue removal allows room for the placement of retraction cord and insertion of impression materials. There was no significant difference between the cord displacement technique and the gingitage technique (Tupac and Neacy 1981). Recession of clinical magnitude was induced only by rotary gingival curettage when compared with retraction cord and electrosurgery. Apical migration of junctional epithelium was not seen in all the three techniques (Azzi et al. 1983). Rotary curettage was efficient and predictable technique for retraction, but it created recession on thin tissues than on thick (maxillary anterior fixed partial denture) palatal tissues (Kamansky et al. 1984).

Electrosurgery or Surgical Diathermy

Electrosurgery unit is a high frequency oscillator or radiotransmitter that uses either vacuum tube or a transistor to deliver a high-frequency electrical current at least 1.0MHz. Electrosurgery is used in restorative dentistry to (1) elongate the clinical crown, (2) create a subgingival sulcus, and (3) reduce excessive height of hypertrophic tissue from edentulous areas. A U-shaped loop electrode is used as the working electrode with the active (cutting), current. The loop is held approximately at a 15° angle to the surface of the tooth and is pointed rootward. An acute angle in the tissue results, and very little of the marginal gingiva is removed. For a wider sulcus, a less acute angle is necessary, but more of the marginal gingiva will be removed (Anthony 1964). Combination of electrosurgery of marginal gingival tissues and retraction by placing the cord in the gingival sulcus allows making of accurate impressions of multiple prepared teeth with advantages of ample working time, ease of operation and impression free from capillary seepage (Lampert 1970). Electrosurgery (0.6 ± 0.2 mm) showed more recession values than copper band (0.1 ± 0.1 mm) and cord (0.2 ± 0.1 mm) (Ruel et al. 1980). The electrosurgical method showed more tissue loss at each time interval, more subject variabiliy, clinically indiscernable tissue appearance at the time intervals tested, and provided for a greater bulk of impression material at the margin than when compared with our method (DeVitre et al. 1985). Regrowth of gingival tissue around abutment teeth after electrosurgical procedures showed an average reduction of gingival crest height of 0.23 mm after 6 months. Almost 70% of regrowth occurred 1 month after insertion of the final restoration. Pain was often associated with the electrosurgical procedure in third molar regions and in the palatal areas of maxillary anterior teeth. Periodontal packs were not helpful in controlling post-electrosurgical discomfort and do not aid healing (Coelho et al. 1975).

RETRACTION PASTES[43-50]

Expasyl Retraction Paste

Expasyl, an alternative to dental retraction cord, is a viscous paste used for all procedures requiring gingival retraction including impressions, seating of restorations, fitting rubber dams, and restoring Class 2, 3, and 5 cavities. Unlike cord, little or no pressure to apply expasyl, which greatly minimizes the risk of rupturing the epithelial attachment and enhances patient comfort. Expasyl is extruded directly into the sulcus where it holds its rigidity to create space between the tooth and the tissue, much like retraction cord. Bleeding and crevicular seepage are controlled through the presence of aluminum chloride, which also shrinks epithelial tissue further expanding the sulcus. Expasyl utilizes a mechanical and chemical component for sulcus opening and hemostasis. It is comprised of three materials: Kaolin, water, and aluminum chloride. Expasyl contains white clay (kaolin) to ensure the consistency of the paste and
its mechanical action while aluminum chloride enhances the hemostatic action. Application of an air-water spray will remove the material from the sulcus. The Expasy past is injected into the sulcus, exerting a stable, non-damaging pressure of 0.1 N/mm. It is important to note that the approximate measurement of biologic width is 3 mm. When expasy is left in place for 1 min, the pressure is sufficient to obtain a sulcus opening of 0.5 mm for two min. Depending on the clinical situation and number of teeth, 4–10 preparations can be performed with a single capsule (Smeltzer 2003; Nazarian 2007). Increase in sulcus width with all three retraction materials, injection type gingival retraction material (Korlex-GR), ultrapak a medicated retraction cord, and expasy an injection type retraction material with regards to pain during retraction, the medicated retraction cord was more painful than injection types and also medicated cord significantly produced more gingival recession when compared to other two retraction materials (Yang 2005). Gingival retraction was greater in cord group pre-saturated with aluminum chloride than expasy retraction paste group, whereas inflammation and recession were greater in cord group than paste group (Kazemi 2009). Retraction paste (magic foam cord, expasy) showed better results on gingival health as compared to impregnated retraction cord when assessed histologically in respect to periodontium (Phatale et al. 2010).

**Magic Foam Cord**

While gingival retraction cord is commonly used, magic foam cord is an easy, efficient but expensive way for taking precise impression. Magic foam cord, is actually a polymeric material, which has to be introduced into the gingival sulcus and allowed to set under pressure. During setting, the material slightly expands, pushing the gingiva, producing excellent lateral displacement and good vertical displacement. Along with the material, circular foams that are contoured to the shape of gingival sulcus are supplied in three sizes to accommodate different teeth. The patient is asked to bite and keep the pressure on for 3 min. Retraction paste (magic foam cord, expasy) showed better results on gingival health as compared to impregnated retraction cord when assessed histologically in respect to periodontium (Phatale et al. 2010).

**CONCLUSION**

There is no consensus cited in the literature regarding criteria for the evaluation of clinical efficacy with gingival retraction materials. The dentist prefers to perform gingival retraction before preparation of tooth. The choice of technique and material depends on operator’s judgment of the clinical situation apart from availability and cost of the materials.

**REFERENCES**