

## Gingival Displacement Techniques in Fixed prosthodontics: A Review

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### **Abstract**

Numerous advancements have been made in the procedures for making fixed prosthodontic impressions over the past few decades. Gingival retraction is the temporary displacement of the gingival tissue away from a tooth that helps to register the prepared abutments and finish lines accurately. It permits completion of the preparation, cementation of the restorations and helps the operator to make complete impression of the preparation. This article discusses the current methods that are applied for displacement of gingival tissues and analyse their merits and demerits. The choice of method of retraction depends on the clinical situation and accessibility.

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### **I. Introduction:**

For esthetic or functional reasons, restoration margins are frequently located within the gingival sulcus; they have the tendency to increase the potential for periodontal problems. Appropriate, reversible gingival displacement and tissue management are required, which help in making the final impression so it accurately records the prepared finish line and some unprepared tooth structure apical to the finish line. Gingival retraction is the temporary displacement of the gingival tissue away from a tooth.

The goal of management of gingival tissues and gingival esthetics is to maintain the normal appearance of healthy gingiva. Achieving this goal requires optimal health of gingival tissues before treatment and minimal trauma during treatment. Gingival retraction must atraumatically allow access for the impression material beyond the abutment margin and create space in order to provide sufficient thickness of impression material in gingival sulcus region so that it can better withstand the tearing forces experienced during removal of impressions.

### **OBJECTIVES OF GINGIVAL RETRACTION:**

1. To expose the prepared finish line
2. To control the gingival crevicular fluid
3. To evaluate the depth and uniformity of the finish line
4. For accurate impression making
5. To obtain accurate fit which will reduce the marginal leakage

### **TECHNIQUES OF GINGIVAL RETRACTION:**

Procedures for soft-tissue management and isolation are classified into three main approaches: Mechanical, chemical or surgical. The chemo-mechanical method of gingival displacement is the most widely used.

#### **Mechanical retraction (retraction cord)**

Pressure packing of retraction cord into the gingival sulcus provides sufficient gingival retraction. Different types of cords have been advocated for tissue displacement which includes twisted cords, braided cords and knitted cords. A clinical study aimed at comparing the performance of 3 types of displacement cords found that the braided cords were ranked better than the twisted ones<sup>1</sup>. Cords are usually pressure-packed into the sulcus using special instruments like the Fischer cord packing instrument or plastic-filling instrument. Application of inappropriate amount of force while placing retraction cords can also contribute toward gingival inflammation and shrinkage of marginal tissues.

#### **Advantage**

- Inexpensive

#### **Disadvantages**

- Rapid collapse of sulcus after removal

- Trauma to epithelial attachment
- No hemostasis
- Time- consuming
- Risk of sulcus contamination
- Painful

### **Chemicomechanical retraction**

It is the most popular method of gingival displacement in fixed prosthodontics. Gingival retraction cord soaked in a chemical agent will provide better displacement of the gingival tissue when compared to a plain retraction cord.

Some of the commonly employed medicaments include:

1. 8% racemic epinephrine
2. Aluminum chloride
3. Alum (aluminum potassium sulfate)
4. Aluminum sulfate
5. Ferric sulphate

Although epinephrine provides effective vasoconstriction and hemostasis<sup>2</sup> 33% of its application is accompanied by significant local and systemic side effects. Epinephrine is known to cause adverse cardiovascular problems and/or other symptoms such as anxiety, increased respiratory rate, tachycardia. Several studies compared the effectiveness of epinephrine to other medicaments available for gingival displacement. In a study conducted by Jokstad<sup>1</sup>, he concluded that no clinical benefit could be seen between an epinephrine or an AC containing cord. Similarly Weir and Williams<sup>3</sup> found that epinephrine did not generate superior displacement to AC. In another study, it was concluded that no practical difference was found between potassium aluminum sulfate, epinephrine, and AC<sup>4</sup>.

One of the popular hemostatic agents is Aluminium Chloride. Studies showed that a 5% to 10% AC solution along with a displacement cord is safe and effective.<sup>5</sup> However, if used with concentrations higher than 10%, AC can cause irritation and damage to the gingival tissue. In order to prevent irritation of the gingival tissue buffered AC was introduced. Reiman<sup>6</sup> found that AC is least irritating with no permanent damage to gingival tissue when the solution is left in the sulcus for up to but not exceeding 15 minutes.

Ferric Sulfate (FS) another popular hemostatic agent at high concentration is highly acidic and an irritant to the gingival tissues. Due to its high iron content, FS can cause a brown-to-black staining of the gingival tissues. The amount of time needed for cords to remain in the sulcus has been evaluated by several authors and was found to range from 1 minute to 30 minutes. Fischer<sup>7</sup> recommended the use of a cord impregnated with ferric sulphate for 1 minute to provide the amount of displacement required. Baharav and colleagues<sup>8</sup> tested a 2-cord technique for tissue displacement and concluded that the cords need to stay in the sulcus for 4 minutes before impression-making to produce sufficient crevicular width expansion. Benson and colleagues<sup>9</sup> found that 10 to 20 minutes of gingival displacement will allow the clinician enough time (30 minutes) to make multiple impressions. When FS is used as a hemostatic agent, Machado and Guedes<sup>10</sup> found it to affect the accuracy of surface detail reproduction of PVS. Thus, it is important to rinse and remove all remnants of the FS from the sulcus before impression making.

A cord impregnated with Alum can be safely left in the sulcus for as long as 20 minutes without any adverse effects.<sup>9</sup> In a 100% concentration Alum was shown to be only slightly less effective in shrinking the gingival tissues than epinephrine with less inflammatory changes in the gingival tissue.<sup>4</sup>

### **Surgical retraction**

Rotary curettage:

Rotary curettage is performed on healthy tissue wherein portion of sulcular epithelium is excised. The criteria to be met are-no bleeding on probing, less than 3 mm sulcular depth with presence of appropriate keratinised gingival tissue. The choice of bur is torpedo-shaped diamond point. Bleeding is checked by utilizing a hemostatic agent-soaked cord.

Electrosurgical method:

With the assistance of an electrode, surgical excision is affected. Sometimes, it is also termed "surgical diathermy." This method is suggested in clinical situations having inflamed, proliferated gingiva around finish margins of tooth preparation, not indicated in patients on cardiac pacemakers.



Advantages offered by this technique is minimal or no bleeding; the major disadvantage is that it has a learning curve and is technique sensitive. There are chances of damage to soft tissue in the hands of a novice or careless user.

Lasers:

Properties of laser mainly depend on their wavelength and waveform characteristics. Diode lasers are commonly used for gingival retraction around natural teeth, as they result in less bleeding and gingival recession.

- Neodymium: yttrium-aluminum-garnet (Nd:YAG) lasers
- Erbium: yttrium-aluminum-garnet (Er:YAG) lasers
- CO<sub>2</sub> lasers

#### **Advantages**

- Excellent hemostasis: carbon dioxide laser
- Reduced tissue shrinkage
- Relatively painless
- Sterilizes sulcus

#### **Disadvantages**

- Er:YAG laser is not as good at hemostasis as CO<sub>2</sub> laser
- CO<sub>2</sub> laser provides no tactile feedback, leading to risk of damage to junctional epithelium.

#### **RECENT ADVANCES IN GINGIVAL RETRACTION**

**Stay Put**<sup>3</sup> combines the advantages of braided displacement cord with the adaptability of a fine metal filament. Both impregnated and non-impregnated options are available for clinical use. Hemostatic agent, aluminum Chloride is used for impregnated Stay Put. Non-impregnated stay put cord may be impregnated with a suitable hemostatic agent as desired. Main advantages include quick hemostasis, can be pre-shaped, adaptable and pliable, good contrast to gingiva, and no risk of cardiovascular problem.

**Expasyl (Kerr)**<sup>11</sup> is an aluminum chloride (AlCl<sub>3</sub>) based paste like material syringed into the sulcus acting both as a chemical hemostatic agent and mechanical retraction material. It creates and maintains space in the sulcus due to optimal characteristics of its viscosity which is mainly due to its kaolin component. It achieves hemostasis due to aluminium chloride. Time taken for retraction is 2minutes and sulcus widening achieved is 0.5mm. The composition has basic three ingredients: kaolin, water and aluminum chloride. Expasyl is a biocompatible material which presents with advantages of having excellent retraction with longer shelf life. Minimal pressure required to displace the tissues. It does not pose hazard of rupturing epithelial attachment.

**Magic Form**<sup>12</sup> It is a PVS paste that works by generating hydrogen and expanding in the sulcus and can also be used in conjunction with a compression cap to enhance the displacement effects of the material. Hemostasis must be achieved before applying the paste and the compression cap.

Apply Magic FoamCord around the preparation by syringing. Place compression cap over preparation. And the patient is asked to bite down for 3 -5 minutes. Due to the counter pressure of the compression cap, the expansion of the Magic FoamCord occurs in the sulcus. After proper setting, remove the compression cap and Magic FoamCord in one piece. But it has several disadvantages which include limited clinical indications, no hemostasis provided, comparatively expensive to retraction cord. It is found to be less effective on subgingival margins.

**Gingitrac (Centrix)**<sup>13</sup> is a gingival-retraction paste system that uses a preloaded syringe to apply the paste around the margins. The paste contains aluminum sulfate as astringent, and if necessary, a hemostatic agent can also be applied prior to its use. For single tooth use, a cap is used to apply pressure for up to 5 min after application of paste. Initially the cap is filled with the paste, and then placed over the tooth and paste is syringed around the margins. For multiple tooth preparations, a plastic tray is first used with a firm-paste matrix over which the Gingitrac paste is syringed prior to positioning of the tray over the arch and held in position for 3-5 min.



For both single and multiple tooth preparations, gingival retraction is achieved through the application of pressure. The paste is removed prior to impression-taking. It works gently with no tissue trauma to provide more accurate impressions. The convenient single-dose tips are much easier to handle than a bulky automix gun and are cost effective.

**Merocel<sup>14</sup>** retraction strips are synthetic material that is specifically chemically extracted from a polymer hydroxylate polyvinyl acetate.



Gingival retraction is carried out by using 2mm thick Merocel strip. They are easily shaped and adaptable to the sulcus. When placed in the sulcus, the material swells by absorption of oral fluids and effectively expands the gingival tissue away from the finish line.

**Racegel (Septodont)<sup>15</sup>** is a gel designed to make gingival preparation procedure easier and more comfortable for the patients while ensuring the quality and precision of the impressions. The gel contains 25% aluminium chloride, oxyguinol and excipients. The aluminium chloride is proven for its astringent properties. The bright orange color makes it easy to visualise during application. The gel helps to prepare the sulcus prior to impression making and can be used with or without gingival displacement cords. Due to its consistency, it is easily rinsed away, leaving no residual material or discoloration of the surrounding tissue. Racegel is supplied in a thin syringe with pre-bent tips for better application of the gel even in inaccessible areas.

**Tissue Goo<sup>16</sup>** is a gel containing 25% aluminium sulphate that provides adequate hemostasis during tissue management processes without compromising the health of the gingival tissue. It can also act as lubricant while placement of the retraction cord and provide ideal tissue retraction. Tissue Goo does not impede with the set of impression material.

## II. Conclusion:

Gingival retraction holds an indispensable place during soft tissue management before an impression is made. Several problems that can arise from poor marginal fit of fixed dental prosthesis can be prevented if the margins of the prepared tooth are recorded accurately. The choice of technique and material depends on the operator's judgement of the clinical situation apart from availability and cost of the materials.

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