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Review Article

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GINGIVAL RETRACTION: ESSENTIAL FOR MAKING A GOOD IMPRESSION-A REVIEW - PART 2

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2. CHEMO-MECHANICAL TISSUE DISPLACEMENT

THE SINGLE CORD TECHNIQUE (Fig. 9)

The single cord approach should be applied when making an impression for a modest number of abutments with healthy tissues and no haemorrhage. The prepared margins are supragingival or juxta, or the depth of the sulcus is inadequate to attach a second cord apically at the finish line, making it the easiest procedure to use in these situations. One cord that has been presoaked in hemostatic medicine is put into the sulcus. The cord may be removed right before taking the final impression or it may be left in the sulcus to limit bleeding and tissue fluids if the finish line is completely visible, the cord is positioned below the finish line, and unprepared tooth structure is present occlusal to the cord. Excellent outcomes are possible when the soft tissue is displaced laterally and the finish line is clearly apparent. The final impression may be inaccurate and the impression material may even tear in those locations if the tissues collapse over the packed cord, obstructing the view of the prepared finish lines. Some clinicians[45,46,47] advise using a soft tissue laser or electrosurgery (ES) in these situations to remove the tissue that has collapsed and is obstructing access.

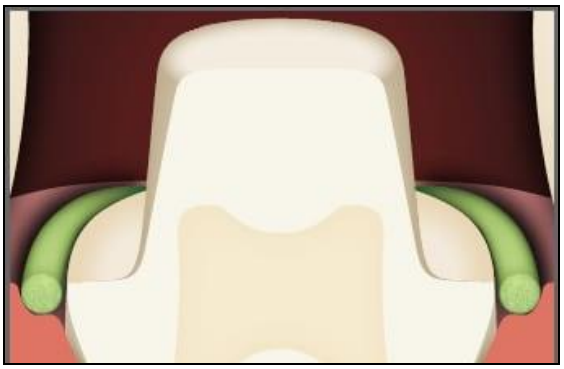

Fig. 9: Single Retraction Cord Technique.

THE DOUBLE CORD TECHNIQUE (Fig. 10)

The double cord approach is advised when creating an impression for one or more abutments. Despite the fact that it takes longer to insert a second cord and the gingival displacement brought on by two cords has the potential to result in additional gingival trauma, many practitioners have effectively adopted the approach in their offices. A survey of 1246 prosthodontists found that 48% of the respondents expose the marginal preparations for more than half of their impressions using a 2-cord approach.[48]

This approach is advantageous when the finish line is situated sufficiently below the gingival border to allow for the introduction of two cords into the sulcus. It also functions well when lateral tissue displacement is not maintained and the first chord is entirely encircled by soft tissue. To stop bleeding and seepage, a thin cord that has been presoaked with hemostatic medication is inserted at the base of the gingival sulcus. The finish line must be evident after this cord has been placed. A second, larger-diameter cord that has also been soaked in hemostatic agent is then placed into the sulcus on top of that. The thin cord is kept in position during impression taking in order to avoid gingival tissue collapse, control bleeding, and reduce ripping of the impression material.[49]

Desiccation makes the second chord adhere to the nearby soft tissue, and its removal is likely to cause bleeding. Similar to the previous point, when the area is dehydrated, the impression material is more likely to adhere to the initial chord with a smaller diameter, increasing the chance that it will tear when the impression is removed. The original chord with the smaller diameter should still be in the sulcus when the imprint is removed.

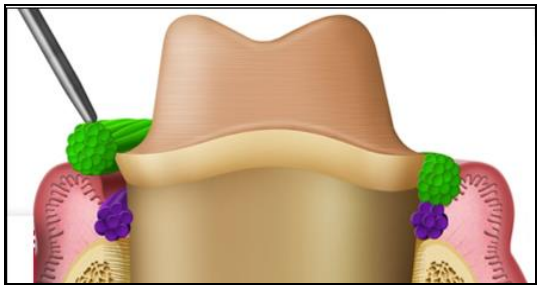

Fig. 10: Double Cord Technique.

THE INFUSION TECHNIQUE (Fig. 11)

For this technique, a small tip dento-infusor that has been particularly created is filled with a ferric sulphate medicine. Ultradent Products Inc., South Jordan, Utah, provides the ferric sulphate medication in two concentrations: 15% and 20%. Due to the 20% substance's lower acidity and the addition of binders and coating agents, less of the smear layer from the dentine is removed. Besides that, this formulation's thickness improves application control.[50] Before taking an impression of the tooth, the medication is softly extruded while enclosing it inside the sulcus using the brush-ended tip (Figure 8). Firm pressure can be applied with the applicator tip for 2-4 seconds while the material is discharged to small, persistently bleeding regions. Once haemostasis has been accomplished, a knitted retraction cord can be introduced inside the gingival sulcus. The cord is cleaned and withdrawn, sulcus is then rinsed with water and the impression is taken. Patients should receive in-depth counselling before using ferric sulphate since it might cause tissues to discolour reversibly. The discolouration typically goes away in 24 to 48 hours.[50]

Fig. 11: Infusion Technique.

CORDLESS METHODS

When a retraction cable is introduced into the sulcus, there is evidence of some gingival tissue injury, according to histological investigations.[51,52] The amount of pressure used to insert the cord into the sulcus directly affects the extent of the damage.[53] The presence of the cord filaments may exacerbate gingival tissues that are already irritated or injured.[54] Studies show that using too much effort when inserting retraction cords increases the risk of attachment loss, gingival recession, and irreversible periodontal damage.[53]

Less tissue injury was seen while using a cordless retraction technique. Furthermore, if an epinephrine-impregnated cord is left in place for a period of time longer than is advised, tissue necrosis may result.[50,55] Local anaesthesia is frequently required since the cord packing approach causes discomfort and the possibility of bleeding.[52]

There are gels, pastes, and foams for the cordless approach. They don't damage delicate tissue, leave no residue, save time, and are easy to use. In a study comparing the pressure produced by corded and cordless retraction methods, it was discovered that the cordless method produced substantially less pressure (143 KPa) than retraction cords did (5396 KPa).[56] Unfortunately, hemostasis is not a feature found in the majority of products. Hence, they might not be appropriate in situations involving lacerated gingival tissue, severe bleeding, or deep sulcus.

MAGIC FOAM CORD (Fig. 12)

Once inserted into the gingival sulcus, this polyvinyl siloxane-based substance has the capacity to displace tissues by expanding. The assembly is employed along with a compression cap that the patient chews on, after which the degree of retraction is evaluated once the assembly is removed. After a successful retraction, the final impression is formed.[57]

Fig. 12: Magic Foam.

EXPASYL (Fig. 13)

It is a synthetic, highly viscous paste made of 80% kaolin, 10% aluminium chloride, water, and additives. The physical attributes and paste-like consistency that the kaolin imparts aid in physically shifting the gingival tissues. While limiting the bleeding, aluminium chloride's hemostatic properties are useful. The gingival tissues are not thought to be harmed by the pressure applied when the substance is injected into the sulcus. Expasyl is available in reusable, decontaminatable capsules. The substance is easier to put into the sulcus with the aid of the cannula tip. Although they are quicker to apply and do less harm to surrounding tissue,[52] there have been reports of tissue necrosis and sensitivity that have been associated with the high concentration of aluminium chloride.[51] Additionally, aluminium chloride may prevent polyether impression materials from setting, so it is important to carefully inspect the sulcus to make sure that no traces of the retraction material are left behind.

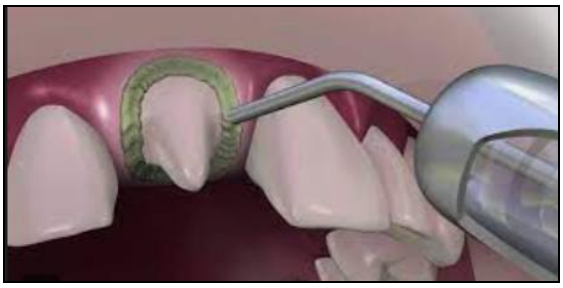

Fig. 13: Expasyl.

MEROCEL (Fig. 14)

It is a synthetic polymer that has been cut into 2 mm-wide strips and has a sponge-like texture. It is chemically derived from hydroxylated polyvinyl acetate, a biocompatible polymer. Once implanted, it begins to take up space in the gingival sulcus by swelling and absorbing sulcular fluid. After removal, it is possible to create an impression that shows the finish line.[54] Numerous ENT, gastric, and otoneurosurgical procedures can make use of it.[58] It has the benefit of being easily moulded and positioned. Also, the healing of the tissue displacement occurs within 24 hours, it is non-traumatic to the gingival tissues, and it is efficient at absorbing sulcular exudates.[57]

Fig. 14: Merocel.

GINGITRAC™ (Fig. 15)

It is a substance that completely envelops the tooth when used in conjunction with foam cylinders. These cylinders come in two sizes: large and ordinary. During the procedure, a polyvinyl siloxane paste is applied to the gingival sulcus. Before applying the foamic cylinder filled with further retraction paste to the tooth, the patient is instructed to bite down for three to five minutes to allow the substance to harden. The assembly is then disassembled so that the degree of retraction may be seen. The impression might be regarded as final if the retraction is acceptable; otherwise, the operation must be repeated. This relatively simple treatment causes less damage to the gingival tissue. When using this product, avoid using latex gloves; exercise caution.

RETRACTION CAPSULE

Astringent retraction paste-containing capsules are supplied with a composite capsule dispenser. The long, slender, soft-edged tip of the capsule allows for direct injection of the high viscosity astringent paste, which contains 15% aluminium chloride, into the gingival sulcus. Also, the delivery nozzle contains an orientation ring with white markings that coordinates with the periodontal probe's size and location and prevents excessive impingement in the gingival sulcus. (Figure 11). [57]

Fig. 15: Gingitrac.

3. SURGICAL TISSUE DISPLACEMENT (ELECTROSURGERY) (Fig. 16)

Mechanochemical tissue displacement has been employed alone or in combination with electrosurgery, commonly known as troughing or tissue dilatation.[58,59,60,61] The major goals are to stop bleeding, expose the gingival boundaries, and minimise hyperplastic tissues.[58,60,62] It is also used to widen the gingival sulcus without reducing the height of the gingival border in order to get the impression material to the planned finish line and record some tooth structure next to it. Also, it makes it easier to remove the impression once the material has dried without damaging the marginal material. ES seeks to cause tissue displacement by removing multiple layers of cells from the gingival sulcus' inner lining.[59]

Careful patient selection and a critical evaluation of the medical history are required when ES is planned. Although the latest generation of these devices are protected by electric filters and shunting systems designed to detect and reroute incorrect current flow away from them, the use of ES in patients with pacemakers and implanted cardioverter defibrillators is

strongly contraindicated.[63,64] The electromagnetic interference caused by pacemakers can have catastrophic consequences for individuals who rely on them.[63] Moreover, ES should be used with caution in areas where aesthetics are important because healing is unpredictable after the removal of the gingival tissue. Several electrode scalpels are available for use with a fully rectified, undamped high-frequency alternating current.[58,59] By employing various frequencies and waveforms, Maness and colleagues[65] compared the degree of tissue change caused by various electrosurgical equipment. They observed that compared to other types of machines, full-wave rectification machines with high frequency and a continuous output waveform produced less tissue damage. For tissue displacement, a 0.5-mm diameter electrode used in continual motion is most effective.[66] Concern has been raised about how ES will affect the pulp when the electrodes come into contact with a metallic repair. Several papers claim that extended electrical contact with metallic restorations will harm the pulpal and periodontal tissues.[67,68,69] Moreover, the incorrect selection and application of an electrode may cause tissue necrosis, gingival recession, and/or loss of cellular definition. When applied correctly, ES has no detrimental effects on the healing of wounds.[70,71,72,73]

According to studies, there is no obvious difference in the pace of wound healing between an ES and a surgical scalpel.[71,72,73] However, injury to the deep tissue layers, like - cementum or bone, and slowed healing were reported when used for a deep gingival excision.[62,73,74] When the electrode was applied repeatedly to the same area, it seriously harmed the tissue.[62,68] As a result, it is highly recommended to use ES only on free gingival tissue. Most studies agree that soft tissues restore their natural appearance between 7 and 10 days[60,62,70,72], without a discernible loss of gingival height.[62,68] Patients may have some discomfort and a minor reduction in gingival margin (0.5-1.0 mm) postoperatively after using ES.[66,70] The maxillary anterior sextant's palatal region and third molar area are the most painful parts.[66] It is advised to use over-the-counter painkillers because the pain's intensity can range from mild to severe.

Fig. 16: Electrosurgery.

4. ROTARY GINGIVAL CURETTAGE (Fig. 17)

For tissue displacement, some doctors advise rotary gingival curettage (RGC) as an alternative to ES. It is essential to have an attached gingiva that is uninflamed, has marginal gingiva of sufficient breadth, and is strongly keratinized when adopting this method.[75] Similar to ES, RGC also removes some of the connective tissue that lies beneath the inner gingival sulcus epithelium. [66,76] The results are uncertain after repair. However, neither on a clinical nor histological level did RGC show any meaningful changes in tissue response in comparison to ES.[77,78] The entire tissue healing process was finished after 10 days. Yet, a another study found that rotary instrument curettage is more likely than ES to cause gingival recession (gingival recession extent was greatest with rotary instrument, minimal with ES, none with retraction cord).[79] The authors of this article do not advise removing tissue with gingival curettage in any place where shifting the gingival position might have an unfavourable aesthetic impact.

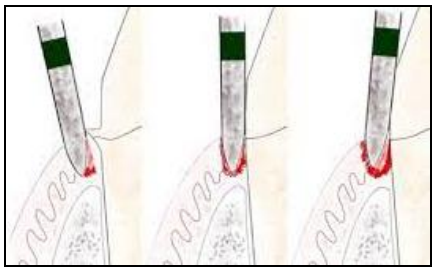

Fig. 17: Rotary Gingival Curettage.

LASER TISSUE SCULPTING FOR TISSUE DISPLACEMENT (Fig. 18)

It has been presented to surgeons as an alternative surgical approach for tissue displacement. "Light Amplification by Stimulated Emission of Radiation" is what the term "Laser" stands for. It is a device that creates a strong, high-energy monochromatic beam of coherent light that, when it enters soft tissue, transforms into thermal energy (heat). As a result, the targeted tissue is evaporated or diminished, bringing about a regulated coagulation that improves hemostasis. Diode lasers are most often utilised for tissue displacement. Diode lasers are most often utilised for tissue displacement due to their short wavelength (near infrared spectrum). Other types of lasers that can be used for tissue displacement include erbium-doped yttrium aluminium garnet (YAG) and neodynium-doped yttrium aluminium garnet (Nd:YAG) lasers. In some cases, a laser can be utilised selectively without the need for anaesthesia, with little or no postoperative pain. They cause less bleeding and gingival recession while shifting gingival tissues.[80,81] Abdel Gabbar and Aboulazm examined the tissue displacement techniques using mechanochemical versus laser technology.[81]

They saw that the laser facilitated painless, quick gingival repair with less bleeding and swelling. In a recent study, Gherlone and colleagues[82] assessed the effectiveness of the double-cord technique, the diode laser, and the Nd:YAG laser for treating gingival displacement in fixed prosthodontics. They found that lasers outperform more traditional techniques for establishing hemostasis. Their operating costs are higher, though. They also came to the conclusion that diode

lasers achieved better hemostasis than Nd:YAG and double-cord methods. Despite the possibility for using lasers in dentistry, Christensen[83] pointed out that the fastest way to remove soft tissue is with an ES or surgical scalpel rather than a laser

Fig. 18: Laser Tissue Sculpting.

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