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GINGIVAL RETRACTION: ESSENTIAL FOR MAKING A GOOD IMPRESSION-A REVIEW - PART 1

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INTRODUCTION

Because it is not practical nor desired to create patterns for fixed prostheses directly in the mouth, it is required to take an impression of the teeth and surrounding tissues in order to create a cast, which will be used to create the restoration in the lab. To create the cast, impression material is placed in the patient's mouth using a tray.[1] The gingival margin must be accessible and unobstructed during taking an impression in order for the impression material to have enough room to flow onto it. The gingival sulcus also needs to be sufficiently large.[2]

It's difficult to get a precise impression within the patient's mouth. Unquestionably, one of the most important factors in leaving a favourable impression is controlling moisture. Moisture of any kind will result in voids. The neighbouring gingival tissues need to be moved laterally in order to get access and give enough thickness for the imprint material when the preparation borders extend subgingivally. The gingival sulcus may need to be enlarged surgically, chemically, or mechanically to do this, but it must be done without endangering the periodontal health. Inappropriate handling of the impression material and tissue displacement might lead to permanent soft tissue injury.[1]

Complete control of the environment around the surgical site is required for any restorative operation. For the patient's comfort and safety, it is necessary to remove any water or saliva that has been introduced into the mouth cavity as a result of the equipment. This also enhances operator access and sight.[3]

SEARCH STRATEGY

Related articles on methods of gingival management prior to impression making of the fixed prosthesis were obtained by manually searching databases like Pub Med and Google Scholar from 1980 to 2023, which were then summarized and analyzed. The keywords used were – Fixed Partial Denture, Gingival Retraction, Gingival Displacement, Materials for Gingival Retraction and Tissue Management in Fixed Prosthesis.

FORCES INVOLVED IN RETRACTION OF GINGIVAL TISSUES

Deformation of gingival tissues during retraction and impression procedures involves four forces (Fig 1): retraction, relapse, displacement and collapse.[4] The purpose of gingival retraction is to create space for adequate thickness of impression material in the gingival sulcus region so that it can better withstand the tearing forces experienced during impression removal and to provide atraumatic access for the impression material beyond the abutment margin. [5] The gingival tissues are supported by the fiber-rich, highly structured periodontal complex that surrounds real teeth while they are retracted, preventing the tissues from collapsing when the retraction agents are removed before forming an impression.[6]

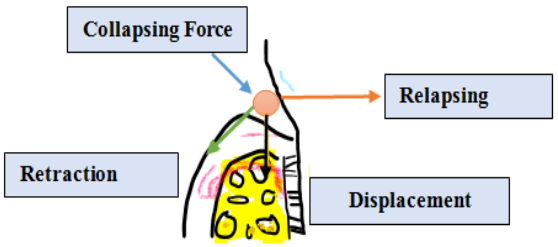

Fig. 1: Forces involved in retraction of gingival tissue.

ASSESSMENT OF PERIODONTAL STATUS BEFORE TISSUE RETRACTION

Before undertaking any gingival displacement procedures, it is crucial to evaluate the periodontal health of the affected tooth or teeth. Healthy, firm, non-bleeding tissues are necessary for a perfect intrasulcular environment.[7] Because the material being used is

hydrophobic, inflamed or damaged gingiva is more prone to bleeding, making it difficult to obtain maximum precision in the impression.[8] To assess the position of the alveolar crestal bone height and rule out any pathologic abnormality, the initial step in periodontal evaluation of teeth should involve a review of the periapical and/or bitewing radiographs. Unrecognized bone defects, such as angular bone loss or infrabony pockets, may increase bleeding during surgery and cause tissue instability later on as a result of the manipulation of the tissue in these areas. Hence, an important component of a pretreatment periodontal evaluation is a complete radiographic examination.[9]

TYPES OF GINGIVA

Table 1: Characteristics of gingival biotypes.

Thin Gingival Biotype	Thick Gingival Biotype
Tissue thickness <1.5 mm	Tissue thickness >2 mm
Highly scalloped gingival architecture	Less scalloped, flat gingival architecture
Thin, narrow inter-dental papilla	Thick, wide inter-dental papilla
Associated with narrow triangular teeth	Associated with wider square teeth
Underlying bone thin	Underlying bone thick
More prone to recession	More prone to pocket formation
Less resistant to trauma	More robust and resistant to trauma

It's crucial to know the kind of tissue being worked on before selecting a displacement technique. Ochsenbein and Ross published the first description of periodontal biotypes in 1969.[10,11] The thick, flat biotype and the thin, scalloped biotype are the two biotypes. These are the words that have been used to describe the interdental papilla's scalloping and tissue thickness in various people.

The distance between the midfacial gingival crest's location and the height of the interproximal papilla is minimum to moderate in the thick, flat biotype (one-half or less of the incisocervical crown dimension). The masticatory mucosa is more abundant and of higher quality, and the gingiva is thicker and more fibrotic. The gingival margin is typically seen on the enamel, and there is a deeper probing depth. The cementoenamel junction (CEJ) and the bony crest are separated by about 2 mm. Moreover, there is typically no bony dehiscence or fenestration and the underlying bone has minimal scalloping.

The gingiva of the thin, scalloped biotype is thin and delicate, there is little attached gingiva, and the tissue quality is subpar. The gingival edge is frequently not on the enamel and the probing depth is minimal. It is situated at the CEJ, or in cases of pretreatment recession, on the root surface.[12] There is an increased distance (approximately 4 mm) between the CEJ and the bone. Bony fenestrations and/or dehiscences are frequently present, and the underlying bone is scalloped. One characteristic of the thin biotype is that the interproximal papilla's height and the midfacial gingival crest's location differ significantly (a dimension that can equal more than one-half of the incisocervical crown dimension). One of the features of the thin biotype is that there is a substantial difference between the location of the midfacial gingival crest and the height of the interproximal papilla (a dimension that can equal more than one-half of the incisocervical crown dimension). Thin biotypes present with an acute "gingival angle", which is formed by lines connecting the most apical location of facial gingiva and the most coronal tip of interdental papillae. It is more difficult to have interdental papilla that fills the spaces around teeth and implants.[13]

METHODS OF GINGIVAL RETRACTION

According to Benson et al[14], gingival retraction measures fall into one of four major categories: (1) simple mechanical methods, (2) chemo-mechanical methods, (3) electrosurgical methods, and (4) rotary gingival curettage.

The chemomechanical approach is the most popular among the four groups.[15] The mechanical component of this technique entails inserting a string into the gingival sulcus to physically move the tissues. The chemical component entails treating the string with one or more substances that will cause temporary tissue contraction and should also reduce the bleeding and fluid seepage that frequently occur during subgingival margin preparation.[16]

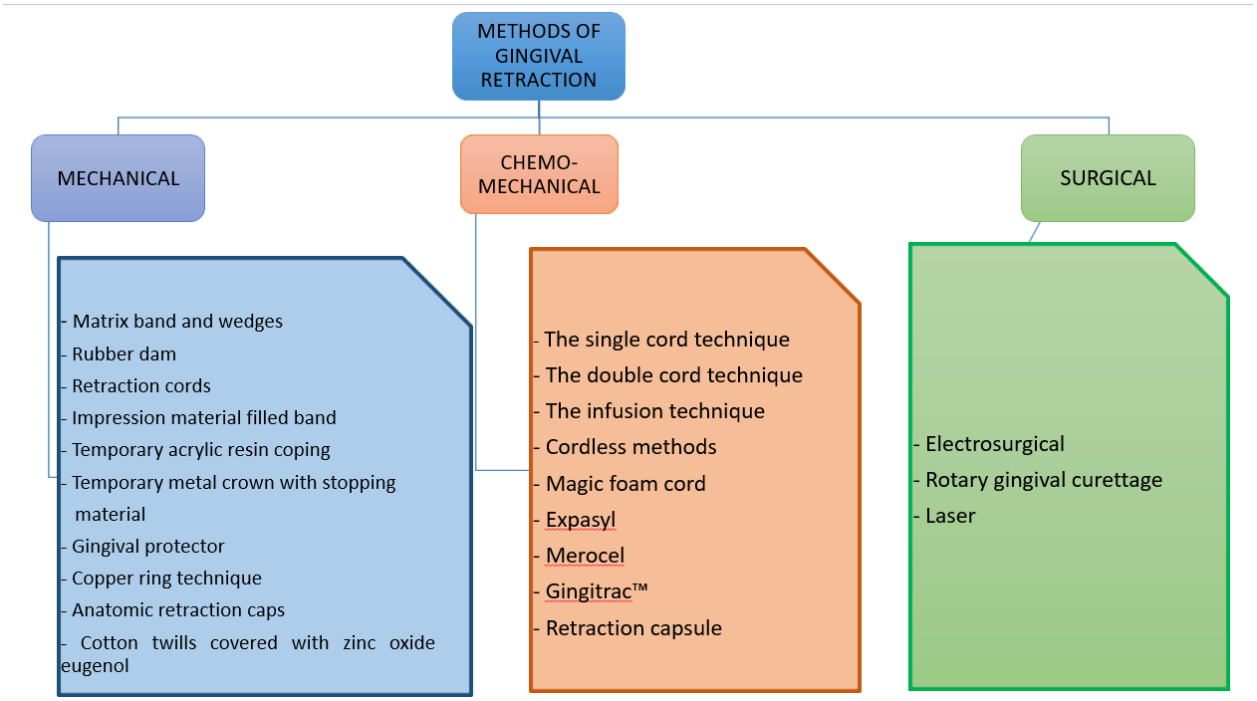

Fig. 2: Methods of Gingival Retraction.

1. MECHANICAL METHODS

One of the earliest methods for gingival displacement to be developed was mechanical. These methods entail manually pulling back and shifting soft tissues to create room for the impression material to enter the subgingival preparation's recess. When placing direct composite restorations or cementing deep subgingival indirect restorations, they also promote hemostasis and manage crevicular fluid. These resources can be utilised independently or in combination with other techniques.

Mechanical methods include the following:

MATRIX BANDS AND WEDGES

Matrix bands can offer gingival retraction and isolation in situations involving subgingival restorations. Inter-proximally positioned wedges can physically depress the gingiva for retraction and shield it while the tooth is being prepared. [17]

RUBBER DAM (Fig. 3)

The use of rubber dam is not only an asset in the preparation of the tooth, but also when the impression is made.[18,19-21] A clean, dry atmosphere is ideal for creating good impressions of the prepared teeth. In conjunction with specialised clamps (such as Ferrier 212, Schultz, Brinker's clamp B5, B6), heavy, extra heavy, and special heavy rubber dams help to retract and protect the gingival tissues during the preparation of the tooth as well as provide isolation for the placement of a subsequent restoration. Wax is needed for this method in order to block the clamp and limit its movement. The dam is flipped over to help isolate the gingival tissues. Rubber dams cannot be utilised to create entire arch imprints, but they can be used for straightforward preparations that need little subgingival extension.

Fig. 3: Rubber dam.

Sulfide present in rubber dam can retard the setting of polyvinyl siloxane elastomeric impression and hence cannot be used with rubber dam.

RETRACTION CORDS (Fig. 4)

They are thought to be the most often used technique for gingival tissue displacement. There have been suggestions for placing various threads or fibres, either wet or dry, in the gingival sulcus. These materials include cotton cord, untreated surgical silk, unwaxed floss and plain cotton thread.[18,19,21-34] In addition to being knitted, twisted, or braided, they can also be classified as impregnated (if they already contain medication or a hemostatic agent) or non-impregnated depending on the fabrication. There are numerous different cord combinations and thicknesses. The clinician is free to use any arrangement they like because there is no standard size for any particular type of cord. However, they are intended to be utilised in a variety of clinical contexts and gingival sulcus depths, are color-coded, and vary in diameter (typically signified by the digits 000, 00, and 0-3). These may be given to you from

a clicker or container, or they could be pre-cut (to fit the size of teeth).[35] To guarantee that the retraction does not result in haemorrhage or laceration of the gingival attachment, the string or cord is gently packed into the fissure using a blunt-ended device.[18,22,24,27,33,36] To facilitate the placement and retention in the crevice, elastic retraction rings have also been developed.

Fig. 4: Retraction Cord.

Ideal properties of retraction cords include[37]

1. Non toxic and biocompatible;
2. Absorbs crevicular fluids, blood and medicaments;
3. Ease of application and retreival;
4. The colour of the cord should be contrasting with the surrounding tissue;
5. Doesn't damage supporting tissues.

Braided cords have a tight weave, making them simple to insert into the gingival sulcus without worrying about fraying. They have good absorption when combined with medications. When pressure is applied along another section, they are forced out of the sulcus from one place. [38] The interlocking loops of knitted cables make them quite common. The rope can be passively bent and shaped by interlocking loops while being inserted into the gingival sulcus. Once the adjacent segment is being pushed inside the sulcus, this design inhibits movement of the cord. This type of cord is compensated for by being slightly thicker in size because it compresses while being installed.[38] They unravel when used with serrated tools, so while packing them, a smoother, non-serrated tool should be utilised.[35] Twisted cords are rarely utilised in favour of braided and knitted cords because they unravel and fray when placed in the sulcus.[39]

SPECIAL CORDS (Fig. 5)

A small wire in the centre of the retraction cable serves as the Stay-put component (Figure 4). Once it has been inserted inside the gingival sulcus, this rope keeps its shape. It is offered in both plain and pre-impregnated forms. It can be pre-shaped, and due to its flexibility, it is simpler to insert into the sulcus. Pre-impregnated cord contains aluminium chloride, lowering the likelihood of cardiovascular problems. They come in four sizes (0–3) according to width and can also be used with compression caps. These caps come in both standard and anatomical shapes. Anatomical caps have semi-circular surfaces on their facial and lingual surfaces, allowing for placement on nearby teeth for retraction. After attaching the cord, the compression cap is placed over the tooth, and the patient bites down on it. This further retracts the sulcus.[38]

Fig. 5: Special Cord.

IMPRESSION MATERIAL-FILLED BAND (Fig. 6)

This method involves shaping, fitting, and festooning a band to the prepared tooth.[31,40] In order to create a sufficient impression, the impression material displaces the gingiva as it is mechanically transported to the preparation's finish line. The modelling compound, gutta-percha, or autopolymerized acrylic resin can be used with or in place of rubber foundation and other elastomeric impression materials in this technique.[21,33,35,41]

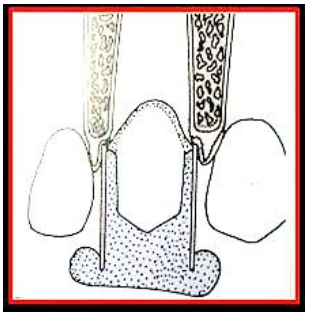

Fig. 6: Impression material-filled band.

TEMPORARY ACRYLIC RESIN COPING

Another method that has been explored involves creating a temporary acrylic resin coping.[40,41,42] An adhesive is used when the inside of the coping is alleviated by about 1 mm. The temporary restoration is then reseated after being filled with an elastomeric impression substance. When the imprint material is mechanically pressed into the sulcus, the tissue is displaced. The coping is then completely covered by an arch impression, and it becomes an essential component of that impression. Another method of forcing the material apically uses wax rather than an acrylic resin coping.

TEMPORARY METAL CROWN WITH STOPPING MATERIAL

Another mechanical method entails coating a temporary metal crown with extra thermoplastic stopping material and adjusting it to the tooth's end line. The extra stopping is then shaped and smoothed with a heated instrument where it extends into the crevice after the crown has been fitted on the prepared tooth. When the following visit

comes around, the final impression is taken while the crown is still in place.

GINGIVAL PROTECTOR (Fig. 7): Another mechanical technique comprises fitting a temporary metal crown to the tooth's end line after coating it with extra thermoplastic stopping material. When the crown has been placed on the prepared tooth, the excess stopping is shaped and smoothed with a hot device where it reaches into the crevice. The final impression is made while the crown is still on on the subsequent visit.[43]

Fig. 7: Gingival protector.

COPPER RING TECHNIQUE (Fig. 8)

This technique involves festooning the gingival borders in accordance with the gingival contours using a copper band or ring. When the copper band is filled with modelling compound or elastomeric impression material and positioned on the prepared tooth along the line of insertion, it is effective for taking impressions of indirect restorations with subgingival margins. The tissue is physically shifted, and it remains physically displaced after the copper band is taken off, allowing the second impression to capture the subgingival tooth anatomy. This technique may cause harm to the gingival tissues if there are undercuts since it is challenging to remove the assembly once it has been fixed.[44]

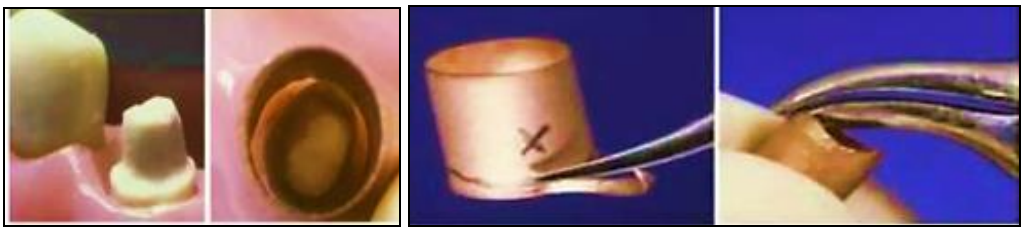

Fig. 8: Copper Ring Technique.

ANATOMIC RETRACTION CAPS

The retraction caps work on the same principles as copper bands, with the exception that they are pre-shaped for simple placement between neighbouring teeth, and the patient chews on it after it is in place. Physical pressure stops bleeding and allows the final impression by opening the sulcus.

COTTON TWILLS COVERED WITH ZINC OXIDE EUGENOL

The final mechanical method discussed here uses slow-setting zinc oxide-eugenol cement and fine sterile cotton twills.[19] The most conservative method in terms of tissue tolerance, it operates by applying moderate pressure. Cotton floss-sized twills are rolled in a creamy zinc oxide-eugenol cement mixture before being inserted in the sulcus and topped with a cement with a quicker setting time. According to Schultz et al., the substance should be kept for at least 48 hours but shouldn't be left in place for more than 5 to 7 days.[19]

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