ISSN Print: 2394-7489
ISSN Online: 2394-7497
IJADS 2021; 7(3): 146-153

www.oraljournal.com
Received: 04-05-2021
Accepted: 06-06-2021

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Soft tissue periodontal surgeries: A review

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DOI: https://doi.org/10.22271/oral.2021.v7.i3c.1292

Abstract
Most surgical procedure articles throughout the last three decades, especially those dealing with newer techniques, have included explanations of indications and contraindications, as well as the benefits and drawbacks of individual treatments. However, only a few authors have recently focused on periodontal surgical indications. In light of our current understanding of periodontal disease and therapy, this review will examine the indications for certain periodontal surgical procedures.

Keywords: flap, gingiva, periodontal surgery, recession

Introduction
A dazzling and exquisite smile work wonders for anyone's persona, and distinctive being. We aren't the sole folks to put a high premium on the smile. In fact, throughout history several civilizations have been working in the field of cosmetic and restorative dentistry. Although times have modified, attribute has not. Modern dentistry is full of better materials and technologies which provides minimum discomfort and maximum safety to the patient.
Surgery is defined as the act and art of performing manual operations to treat diseases or injuries [1]. Nearly all periodontal treatment, from hard or soft tissue curettage to osseous surgical treatments, fits under the umbrella of "periodontal surgery" if this wide definition is applied. The term "periodontal surgery" [2] is commonly used to refer to only particular surgical manipulations of periodontal soft tissues and bone, not to debridement and root planing. These latter operations, on the other hand, are likely to be the deciding factor in the surgical procedures' success or failure [3-10].
Mucogingival therapy is a phrase that refers to periodontal operations that involve the correction of deficiencies in the morphology, position, and/or amount of soft tissue and underlying bone support surrounding teeth and implants [11]. Friedman's 1957 [12] introduction of "mucogingival surgery" includes surgical treatments to retain gingival tissue, eliminate abnormal frenal or muscle attachments, and expand the depth of the vestibule. However, this word was frequently used to denote specific pocket removal techniques. As a result, in 1993, Miller [13], who was accepted by the international scientific community in 1996, coined the term "periodontal plastic surgery," which was defined as "surgical procedures performed to prevent or correct anatomic, developmental, traumatic, or disease-induced defects of the gingiva, alveolar mucosa, or bone" [14]. Gingival augmentation, root coverage, correction of mucosal defects at implants, crown lengthening, gingival preservation at ectopic tooth eruption, removal of aberrant frena, prevention of ridge collapse associated with tooth extraction, and augmentation of the edentulous ridge are all included in this definition.

Periodontal Pockets as an Indicator for Surgical Procedures
Historically, all periodontal therapy has been aimed at pocket removal, according to Ramfjord [15]. This traditional therapy goal's necessity is currently being questioned and contested [9]. The variables that influenced this re-evaluation of periodontal pockets, as well as the ways in which their state of activity influences the requirement for surgical operations, will be discussed.

Etiology of gingival recessions

There is little or no research on the developmental progression of gingival recession except for the classic study by Baker and Seymour (1976) [16]. They classified four distinct stages in the development of recession.

1. Normal or subclinical inflammation
2. Clinical inflammation and proliferation of epithelial rete pegs
3. Increased epithelial proliferation, resulting in the loss of the connective tissue core
4. Merging of the epithelium, resulting in separation and recession of the gingival tissues

The gingival border is clinically characterized as a scalloped line 1–2 mm coronal to the cemento–enamel junction that follows the outline of the cemento–enamel junction. Gingival recession is the exposure of the root surface to the oral cavity due to an apical movement of the gingival edge [17]. Gingival recession is most common on the buccal surfaces [18] and may be accompanied with wedge-shaped flaws in the cervical area of one or more teeth in individuals with good dental hygiene [19]. A pre-existing deficiency of alveolar buccal bone at the region is one etiological component that may be linked to gingival recession [20]. These alveolar bone deficits might be congenital (anatomical) or acquired (physiological or pathological) [21].

Anatomical factors

Anatomical factors that have been related to gingival recession include fenestration and dehiscence of the alveolar bone, abnormal tooth position in the arch, an aberrant path of eruption of the tooth and the shape of the individual tooth [10]. Localized gingival recession may be associated with the position of the teeth on the arch.

Physiological factors

Orthodontic movement of teeth outside the labial or lingual alveolar plate can cause dehiscence [22] and act as a ‘locus minoris resistentiae' for gingival recession development. Gingival recession can look as a deep and narrow lesion, comparable to a ‘Stillman cleft,' making domiciliary oral hygiene difficult, and bacterial or viral infection can cause the establishment of a buccal probing pocket deep enough to reach the tooth's periapical environment [23].

Pathological Factors [24]

1. Tooth brushing
2. Improper flossing techniques
3. Perioral and intra oral piercing
4. Direct trauma associated with malocclusion
5. Partial denture/restorative therapy
6. Bacterial plaque
7. Herpes simplex virus

Indications for root coverage surgical procedures

The purpose of treating gingival recession problems is to improve aesthetics, reduce root hypersensitivity, and produce or augment keratinized tissue. Root abrasion/caries, as well as gingival margin inconsistency/disharmony, are indications for root covering operations [23, 24].

1. Esthetic reasons
2. Hypersensitivity
3. Keratinized tissue augmentation
4. Root abrasion/caries
5. Inconsistency/disharmony of gingival margin

Surgical procedures

Today, gingival reconstruction is a routine part of periodontal practice. The ability to cover unsightly exposed and sensitive roots and crown margins, to reconstruct lost ridges, and to enhance prosthetic reconstruction has undergone a rapid explosion.

Procedures necessary for cosmetic and gingival enhancement:

1. Free gingival graft (FGG)
2. Free connective tissue auto graft
3. Pedicle auto graft
   - Laterally (horizontally) positioned
   - Coronally positioned
   - Semilunar pedicle (Tarnow)
4. Subepithelial connective tissue graft (SCTG)
5. GTR
6. Pouch and tunnel technique

The ultimate goal of a root coverage procedure is complete coverage of the recession defect with a good appearance related to the adjacent soft tissues and minimal probing depth following healing. Surgical procedures used in the treatment of recession defects may basically be classified as follows [24].

Pedicle soft-tissue graft procedures

1. Rotational flap procedures (laterally sliding flap, double papilla flap, oblique rotated flap);
2. Advanced flap procedures (coronally repositioned flap, semilunar coronally repositioned flap);
3. Regenerative procedures (with barrier membrane or application of enamel matrix proteins)

Free soft-tissue graft procedures

1. Epithelialized graft;
2. Subepithelial connective tissue graft

Pedicle soft tissue graft procedure for single recession defects

Coronally advanced flap

The coronally advanced flap method is a popular way to conceal roots. The coronal displacement of the soft tissues on the exposed root surface is the basis for this treatment [25]. It is the preferred method for treating isolated gingival recession. It is technically easy, well tolerated by the patient [because to the limited surgical area and the lack of tissue removal far from the tooth with gingival recession (palate)] and delivers optimum cosmetic results. The presence of keratinized tissue apical to the root exposure, of an acceptable height (1 mm for shallow recessions and 2 mm for recessions 5 mm) [14] and thickness is essential to accomplish the coronally advanced flap. Norberg [26] was the first to describe the procedure, and Allen & Miller were the second to report on it [25]. It was recently updated with a trapezoidal flap design and a split–full–split-thickness flap elevation method.

Laterally repositioned (rotational) flap

When local anatomic problems make the coronally advanced flap unsuitable, the laterally relocated flap is recommended. It is not the technique of choice in patients with high aesthetic demands (because scar tissue forms in secondary intention healing at the donor site), but it is well tolerated by patients because it does not require tissue removal from a distant area (the palate) and has an excellent postoperative healing course. The majority of studies on the laterally moved flap procedure in the literature are relatively old. Several authors proposed several modifications to Grupe & Warren's original laterally

sliding flap described in 1956 [27] in order to reduce the risk of gingival recession at the donor site: Staffileno [28] proposed using a partial-thickness flap to cover the root exposure rather than a full-thickness flap. Grupe proposed a submarginal incision at the donor site to preserve the marginal integrity of the tooth close to the recession defect in 1966 [29]. Ruben *et al*. introduced the mixed-thickness flap in 1976 [30], which consisted of a full-thickness flap performed close to the recession defect to cover the root exposure, and a split-thickness flap created laterally to the full-thickness flap to cover the bone exposure occurring at the full-thickness flap's donor site.

Papillary reconstruction

All procedures are a modification of the Takei (1996) procedure and involve sulcular releasing incisions, coronal flap movement, and a connective tissue graft being placed interproximally. The surgical procedure presented here was published by Azzi and colleagues (Azzi modification) (1999), with slight modifications [31].

Procedure

1. The exposed roots are scaled and root planed for detoxification and, if necessary, flattened.
2. Biomechanical root surface preparation using tetracycline hydrochloride, citric acid (CA), or ethylenediaminetetraacetic acid (EDTA) is performed.
3. Intrasulcular incisions (360°) are made down to bone (15C scalpel blade).
4. The sulcular incisions are performed on the teeth approximating the tissue defect and extended to the next interproximal areas and teeth.
5. The intrasulcular incisions are made 360° about the teeth.
6. A horizontal incision is begun 3 to 5 mm beyond the mucogingival junction and extended laterally to just beyond the adjacent nonaffected interproximal areas.
7. A second horizontal fenestrating incision is made down to bone at the terminal end of the apical incision.
8. A full-thickness flap is now raised in an apicocoronal direction with a small periosteal elevator.
9. A small curetis now used intrasulcularly for final interproximal flap release.
10. An Orban knife is sometimes used to facilitate interproximal release of the crestalfibers.
11. A thick connective tissue graft is obtained from the tuberosity as a distal wedge or palate if thick enough.
12. The connective tissue graft is contoured and positioned and stabilized with a 3-0 or 4-0 chromic suture.
13. The flap is now replaced over the graft and coronally positioned and stabilized using a horizontal mattress suture (4-0 or 5-0, P-3, Vicryl) buccally and palatally. The suture is passed over the contact area, permitting coronal stabilization of the tissue.
14. The flap is sutured apically (4-0, 5-0 chromic sutures) to the apical mucosal tissue.

Regenerative procedures

Barrier membranes

Gingival recessions have been treated with guided tissue regeneration using resorbable and nonresorbable membranes. This treatment has been found to provide a reliable method for root coverage [32], especially in deep recessions, resulting in new connective tissue attachment and bone regeneration. The employment of the membrane approach, however, has resulted in a number of issues, including membrane exposure and contamination, technical challenges in positioning the barrier, and the potential for injury to newly created tissue as a result of membrane removal or absorption.

Enamel matrix derivate

Gingival recession [33] was treated using an enamel matrix derivative in conjunction with a coronally advanced flap, with the dual goals of improving root coverage and stimulating periodontal regeneration [34].

Free soft-graft procedures

Epithelialized graft

The most common surgical procedure for extending the width of connected gingiva is the free gingival transplant. A component of the graft on the denuded root surface does not receive enough blood, resulting in partial necrosis of the grafted tissue.

Subepithelial connective tissue graft (bilaminar technique)

The most predicted root coverage surgical treatments, according to recent literature [17], are bilaminar approaches. The covering flap provides an improved blood supply to the graft, which is the physiologic justification for these procedures. This will improve the graft's survival above the avascular root surface [35] and the cosmetic outcome by masking the white-scar look of the grated tissue partially or fully.

Connective tissue graft-harvesting procedures

Different connective tissue graft-harvesting strategies have been described in the literature with the goal of attaining primary intention palatal wound healing: the most prevalent are trap-door operations [36] and envelope techniques with single [37] or multiple [38] incisions.

Surgical procedures for multiple recession defects [24]

Gingival recession is rarely limited to a single tooth, and there are no studies comparing the prevalence of single versus multiple recession abnormalities; nonetheless, clinical practice suggests that multiple gingival recessions are more common. In the case of many abnormalities, the requirement to satisfy the patient's cosmetic needs must always be balanced against the desire to decrease the number of procedures and intraoral surgical sites. As a result, when numerous recessions impact adjacent teeth, they should be treated at the same time, and soft tissue removal from distant portions of the mouth (palate) should be avoided if at all possible.

Tunnel technique

The supraperiosteal envelope technique was introduced in 1994 as a root coverage tunnel operation. The interdental papillae are kept intact, which is a unique feature of this treatment. A connective tissue graft is inserted in the tunnel; it does not need to be entirely covered as long as the graft's dimensions are enough to assure graft survival [24].

Allograft

The allograft serves as a scaffold for vascular endothelial cells and fibroblasts to repopulate the connective tissue matrix while also encouraging epithelial cells to migrate from surrounding tissue boundaries. The allograft healing process is comparable to that of autogenous transplants [24].

Root conditioning

Chemical root-surface conditioning with a range of chemicals has been introduced to detoxify, cleanse, and demineralize the root surface, revealing the collagenous matrix of dentin and cementum and eliminating the smear layer. Citric and phosphoric acids, ethylenediaminetetraacetic acid, and tetracycline hydrochloride have all been utilised for chemical root-surface conditioning [24].

Low-Level Laser

Low-level laser treatment, commonly known as "Soft Laser Therapy," has been employed in the medical system for more than three decades. Master and his colleagues were the ones who originally brought it up. Low-level lasers are red or infrared light with a short wavelength that has a low absorption power in water and can penetrate soft and hard tissues to a depth of 3mm-15mm. Low-level laser has been proven in in-vivo and in-vitro investigations to be capable of speeding up the repair process due to its non-heating actions, which result in the stimulation of fibroblast reproduction. Low-level laser, on the other hand, has been proposed as a treatment for post-operative pain reduction; the related possible mechanisms in pain reduction include nerve cell membrane stability, enhanced cell resurrection systems, increased ATP generation, and so on [39].

Periodontal microsurgery

The area of periodontics has just lately been introduced to microsurgical principles. Despite the fact that the surgical operating microscope has undoubtedly aided medicine, periodontists have only recently explored whether the microscope has a place in periodontics practice. In 1978, Apotheker and Jako were the first to bring the microscope to dentistry. Carr released a paper in 1992 describing how to use the surgical microscope during endodontic treatments. Shanelec and Tibbetts presented a continuing education session on periodontal microsurgery at the American Academy of Periodontology's annual meeting in 1993 [40]. This leads to:

1. Surgical skills are delivered with more accuracy, resulting in more accurate incisions with smaller instrumentation, less trauma, and faster postoperative recovery.
2. Tissue repositioning with smaller needles and sutures for a more precise result
3. A better view of the root surfaces allows for more precise calculus removal and increased root smoothness.

Healing after root coverage procedures

Periodontal plastic surgery's main purpose is to conceal roots exposed by gingival recession. Covering denuded roots is now a predictable and successful process with usually excellent aesthetic effects. The nature of the attachment between the grafted tissue and the root surface, on the other hand, remains unclear. The technique's possible flaw is that it may leave a pocket where the recession has been covered. It would be ideal to have a true fresh connective tissue attachment rather than a lengthy junctional epithelium [24].

Treatment

Presurgical treatment phase

Initial therapy consists of oral hygiene instruction, scaling and ‘root’ planing [41] Debridement reduced inflammation, allowing accurate evaluation of the extent of altered passive eruption, in the absence of pseudo pockets. The presurgical treatment phase should precede any surgical treatment.

Surgical treatment phase

In periodontal health, the width of keratinized gingiva, the position of the gingival margins, the location of the buccal alveolar crest, the location of the mucogingival junction and the likelihood of concomitant restorative therapy are all factors that collectively determine the crown-lengthening treatment approach. Garber & Salama [42] suggested that there are only two treatment options for cases of altered passive eruption: first, a simple gingivectomy to expose the hidden anatomy in cases of altered passive eruption type 1A; and, second, an apically repositioned full-thickness flap, with or without osseous respective surgery, in other cases of altered passive eruption.

Gingivectomy

Gingivectomy is the excisional removal of gingival tissue for pocket reduction or elimination. The technique has, as its main advantages, simplicity, and ease of mastery [43].

Indications

1. Suprabony pockets
2. An adequate zone of keratinized tissue
3. Pockets greater than 3 mm
4. When bone loss is horizontal and no need exists for osseous surgery
5. Gingival enlargements
6. Areas of limited access
7. Unesthetic or asymmetric gingival topography
8. For exposure of soft tissue impaction to enhance eruption
9. To facilitate restorative dentistry
10. To establish physiologic and gingival contours post–acute necrotizing ulcerative gingivitis and flap procedures

Presurgical phase

Under anesthesia, the pockets are probed to check their depth and to ensure that they do not extend beyond the mucogingival junction.

A pocket marker or periodontal probe is used to outline the base of the pockets with a series of small bleeding points. Once the bleeding points have been established, they form a dotted line that outlines the incision.

Incisions

Periodontal knives (e.g., Kirkland knives) are used for incisions on the facial and lingual surfaces and those distal to the terminal tooth in the arch. Orban periodontal knives are used for supplemental interdental incisions, if necessary.

The incision is started apical to the points marking the course of the pockets and is directed coronally to a point between the base of the pocket and the crest of the bone. It should be as close as possible to the bone without exposing it to remove the soft tissue coronal to the bone. Exposure of bone is undesirable. If it occurs, healing usually presents no problem if the area is adequately covered by the periodontal pack.

Discontinuous or continuous incisions beveled at approximately 45 degrees to the tooth surface and should recreate, as far as possible, the normal festooned pattern of the gingiva. Failure to bevel leaves a broad, fibrous plateau that takes more time than is ordinarily required to develop a physiologic contour. In the interim, plaque and food accumulation may lead to recurrence of pockets.

Gingivoplasty

Gingivoplasty is a reshaping of the gingiva to create physiologic gingival contours, with the sole purpose of recontouring the gingiva in the absence of pockets.

Gingivoplasty may be done with a periodontal knife, a scalpel, rotary coarse diamond stones, or electrodes. It consists of procedures that resemble those performed in festooning artificial dentures; namely, tapering the gingival margin, creating a scalloped marginal outline, thinning the attached gingiva, and creating vertical interdental grooves and shaping the interdental papillae to provide sluiceways for the passage of food.

Crown lengthening and restorative procedures in the esthetic zone

Crown lengthening is one of the most common surgical procedures in periodontal practice.

The main indications of crown-lengthening surgical procedure include:

- Treatment of subgingival caries,
- Crown or root fractures,
- Altered passive eruption,
- Ervical root resorption and
- Short clinical abutment.

The rationale of crown lengthening is to re-establish the biologic width (e.g. the natural distance between the base of the gingival sulcus and the height of the alveolar bone) in a more apical position to avoid a violation that may result in bone resorption, gingival recession, inflammation or hypertrophy.

While crown-lengthening procedures in posterior areas have been investigated in detail, crown lengthening performed for esthetic reasons in anterior areas is still a matter of debate. Here is the focus on the description of the surgical phase in the esthetic crown-lengthening procedure by answering the following questions: what is the ideal surgical flap design? How much supporting bone should be removed? How should the position of the flap margin relate to the alveolar bone at surgical closure? And how should the healing phase be managed in relation to the timing and the position of the provisional restoration with respect to the gingival margin?

Soft and hard tissue management

Flap design (vestibular aspect)

The flap is designed by creating submarginal parabolic incisions, starting from the angular lines of the adjacent teeth and crossing at the level of the interdental papillae, thereby reproducing the natural scalloping of a patient's gingival margin. Correct placement of the primary incision is based on the probing depth and on the amount of keratinized tissue available [44, 45]. In a patient with an 'adequate' dimension of keratinized tissue, the distance of the primary incision from the gingival margin is proportional to the differences in probing depth of the adjacent teeth. If the amount of keratinized tissue is 'inadequate', the primary incision should be intrasulcular.

The literature describes full-thickness [45, 46], split-thickness [47] and split-full-split-thickness approaches [43, 48, 49]. The rationale of the split-thickness elevation is to preserve the periostium in order to minimize postsurgical bone resorption and to facilitate the apical suturing of the flap. The split-full-split-thickness approach merges the positive aspects of both techniques: the papillae area is elevated split-thickness in order to obtain a precise postsurgical adaptation, while, apically, a full-thickness elevation is made in order to gain access to the bone and to preserve the periosteum, which would otherwise be lost during osteoplasty, at the inner aspect of the flap. Once an adequate amount of bone has been exposed, a split-thickness dissection can be performed to facilitate the apical anchorage of the flap in the desired position.

Flap design (palatal aspect)

The palatal flap is raised using the thinned palatal flap approach [50]. As the palatal flap cannot be moved apically, the position of the primary incision must anticipate the future configuration of the crestal bone and depends on the amount of crown lengthening required and on the palatal vault anatomy In the presence of a deep palatal vault, the soft-tissue thickness has to be taken into consideration, with thicker soft tissues necessitating a greater amount of tissue removal with the secondary palatal flap and more pronounced apical repositioning of the flap. Hence, if the deep palatal vault has thick soft tissue, the primary incision should be less para-marginal than if the deep palatal vault has thin tissues. Otherwise, there is a risk of incomplete coverage of the palatal bone. In order to avoid excessive exposure of palatal bone, great care must be taken not to make the incision too far from the gingival margin, especially in the case of a shallow vault or a deep palatal vault with thick soft tissue. After vestibular and palatal flap reflection, the soft tissue delimited with the primary incisions is removed using manual and ultrasonic devices.

Ostectomy

Ostectomy consists of the removal of supporting bone (bone connected to the root surface with periodontal ligament), and the amount of bone resected is determined by the extent of the crown lengthening required. Many authors have proposed a range of values (3 mm to > 5 mm) for the amount of tooth structure to be exposed during crown-lengthening procedures.

Osteoplasty

Osteoplasty consists of the removal of non-supporting bone and aims to thin the vestibular and lingual/ palatal aspects of alveolar bone and to eliminate any osseous ledges or exostosis. It includes techniques of vertical grooving and radicular blending aimed at establishing physiologic osseous morphology and root prominence [44]. The amount of bone required to be removed has not been quantified in the literature, and whether osteoplasty is needed requires a subjective clinical judgment. However, bone reduction could be considered as complete when the flap can be precisely adapted over the underlying bone.

Flap suturing and positioning

The flap is sutured with vertical mattress sutures anchored to the periosteum with the rationale of obtaining a tight adaption of the flap to the underlying tissues at the desired apical position.

Roll Flap Technique

This technique was introduced by Abrams in 1980 [51] to correct small or moderate Seibert's Class I defects. The surgical procedure involves a connective tissue pedicle flap that originates from the de-epithelialization of the palatal tissue close to the edentulous area. Two parallel incisions are made from the occlusal edentulous area toward the palate and connected with a horizontal incision. A split-thickness palatal

flap is then elevated. In the defect area a pouch is prepared with a split dissection of the supraperiosteal connective tissue. The palatal flap is 'rolled' into the pouch area and then sutured.

A further modification of the donor-site preparation was described in a case report by Sclar in 2003. In this vascularized interposition periosteal-connective tissue graft technique, a pedicle connective tissue graft is prepared at the ipsilateral palatal area of the defect, then mobilized and rotated into the pouch prepared at the recipient site. In a more recent randomized controlled clinical trial, the vascularized interposition periosteal-connective tissue graft technique was compared with a free subepithelial connective tissue graft.

Interpositional (inlay) graft procedures

Inlay graft procedures are used to correct Class I and small or moderate Class II and Class III defects. In 1979, Meltzer [52] described a procedure in which a pouch was prepared in the defect area and a free graft derived from the palatal or maxillary tuberosity was harvested. The graft obtained was partially de-epithelialized and the exposed connective tissue was inserted in the pouch area like a wedge (inlay graft).

Thus, the epithelialized part of the graft remained outside the pouch and sutured at the level of the epithelial surface of the surrounding tissues.

Combination onlay–inlay grafts

This technique was introduced by Seibert & Louis [53] in 1996 for the treatment of Class III defects. In this case report, the authors suggested a combination of onlay and inlay graft procedures to obtain simultaneous tissue augmentation in the horizontal and vertical dimensions. The donor site was prepared with a full-thickness coronal dissection and a partial thickness apical dissection. The graft was thus composed of two parts: the coronal part, which was epithelialized; and the apical part, which was formed of connective tissue only. On the defect area, the crestal surface was de-epithelialized with a beveled incision and the apical surface was prepared with a partial-thickness dissection with two vertical-releasing incisions extended apically, without involving the adjacent papillae, in order to create a pouch area.

The onlay section (epithelialized area) of the graft is sutured on the crestal surface of the defect, while the inlay section (connective tissue) is inserted and secured in the vestibular pouch area. The objectives were to use a single procedure to achieve simultaneously apicocoronal and buccolingual augmentation to have a smaller open wound in the donor site and less patient discomfort, and to guarantee better revascularization of the onlay section aided by the submerged connective tissue section of the graft.

Pouch procedures and connective tissue grafts

Pouch procedures were developed to treat Class I ridge deformities. The surgical procedure involves the use of a connective tissue graft, which originates from the palatal area or from the maxillary tuberosity, to increase the thickness of the buccal surface [54, 55]. In the defect area a pouch is prepared with a split dissection of the supraperiosteal connective tissue and the connective tissue graft is sutured to the periosteum. The flap is sutured in its original position and covers the connective tissue graft completely.

Depigmentation

Gingival depigmentation has been carried out using many procedures, treatments employing mechanical, surgical, chemical, electrosurgical and cryosurgical techniques.

- **Mechanical**

A rotary abrasive is used for depigmentation. After local anaesthesia infiltration a high speed hand piece with an acrylic rotary abrasive is used to remove the pigmented layer. Pressure is applied with sterile gauze soaked in local anaesthetic agent to control haemorrhage during the procedure. After removing the entire pigmented epithelium along with a thin layer of connective tissue with the acrylic rotary abrasive, the exposed surface is irrigated with saline. While using the rotary tool, minimal pressure is applied with feather light brushing strokes and without holding it in one place. The surgical area is covered with a periodontal dressing. Post-surgical and Analgesics are prescribed.

- **Surgical (scalpel technique**)

  Everything is same as mechanical treatment, except that instead of rotary abrasive a bard Parker handle with a No. 15 blade is used to remove the pigmented layer.

- **LASER technique**

Laser ablation, including CO_2 (10,600 nm), neodymium-doped yttrium aluminum garnet laser (1,064 nm), erbium-doped yttrium aluminium garnet laser (2,780 nm), and diode laser (820 nm) has been used for gingival depigmentation. The diode laser can be delivered through a flexible quartz fiber optic handpiece and has a wavelength of 819 to 940 nm. The power output, which is generally 2 to 10 W, can be delivered in pulsed or continuous mode. After removal of the overlying epithelial tissue, power setting is increased to 2 W to attain rapid ablation for removing the pigments present deep beneath the basement membrane and minimize the haemorrhage from the connective tissue. During the procedure, any tissue tags left out after laser ablation is wiped with sterile gauze soaked in saline every 3-5 min and thorough inspection is done to confirm no pigmented areas remains left out. The surgical area is then covered with a periodontal dressing.

- **Cryotherapy**

Cryotherapy is a controlled and targeted destruction of diseased tissue by the application of cold temperature substance. The commonly used cryogens include: Liquid nitrogen, nitrous oxide, solidified CO2 (dry ice), chlorodifluoromethane, tetrafluoroethane, dimethyl ether and propane.

During depigmentation these agents can be delivered to an appropriate-sized cryoprobe attached to the cryogun and deepithelization is done.

- **Electrosurgical**

The medical practice or technique of cauterization is a medical term describing the burning of part of a body to remove or close off a part of it in a process called cautery, which destroys some tissue, in an attempt to mitigate damage, remove an undesired growth, or minimize other potential medical harmful possibilities such as infections, when antibiotics are not available.

Electrocauterization is the process of destroying tissue using heat conduction from a metal probe heated by electric current. A controlled cauterization of epithelium and a part of connective tissue is done during electrosurgical depigmentation.

- **Chemical**

Many chemical reactions can destroy tissue, common agents includes Silver nitrate, trichloroacetic acid, cantharidin etc., these chemicals can leach into neighbouring tissue and cauterize outside of the intended boundaries so chemical depigmentation are not practiced now a days.

Conclusions

Reconstructive plastic surgery procedures aimed at restoration of the alveolar ridge to its former dimensions are increasingly prescribed, particularly in the anterior region where esthetic issues are concerned.

The following conclusions can be drawn from the data available in the literature

- Soft-tissue augmentation procedures are mainly indicated for procedures used for replacement of one or two missing teeth.
- Pouch procedures are the preferred choice for soft-tissue augmentation, especially in areas of high esthetic demand, because primary-intention wound healing can be achieved, thus maintaining the color and surface characteristics of the existing tissues. Moreover, new surgical pouch-like approaches allow the treatment of Seibert's Class II or Class III defects.
- Roll techniques could be applied for shallow buccolingual soft-tissue augmentation, in order to avoid palatal graft harvesting and to minimize donor-site morbidity and improve recovery of patients from surgery.
- Onlay, inlay and combination grafts are less frequently used for soft-tissue augmentation because of the poor esthetic results (especially concerning texture and color variation from the grafted and the adjacent areas) and the high resorption rate of the exposed graft.

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