

Mucogingival Conditions and Deformities Revisited. Review of their Current Classification and their Impact on Health and Function of Teeth

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ABSTRACT

Mucogingival conditions and Deformities involve defects in the morphology, position, quantity of soft tissue and bone that support teeth, edentulous sites and dental implants. They significantly affect the supporting tissue around teeth and implants, and can affect the esthetics, health and function of them. The goal of this article is to review Mucogingival conditions and Deformities and their impact on teeth.

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Introduction

Teeth are composed of enamel, dentin and pulp. Additional tissue around teeth that support it include gingival tissue, periodontal ligament (PDL), cementum and bone. These additional tissue types form the periodontal support around teeth and are also essential for their health and function.

With regards to periodontal tissues around teeth, when there is disease around tissue that support teeth, they present with periodontal disease. When periodontal disease is limited to gingival tissue but does not extend to attached tissue or bone this condition is called Gingivitis.

Plaque induced gingivitis occurs due to accumulation of plaque over a period of days to weeks without removal leading to loss of symbiosis between bacterial film and host immune response. When periodontal diseases extend beyond gingival tissue to cause damage to connective tissue attachment and bone this is called Periodontitis. Periodontitis occurs due to microbial associated host mediated inflammation resulting in the loss of periodontal attachment [1, 2].

Mucogingival conditions and deformities are defects in the morphology and position of soft tissue and bone support around teeth and dental implants [3]. They are not caused by bacterial plaque, but instead result from deficiency, or defects of periodontal tissue. Two of the most frequent conditions include Gingival

recession and lack of keratinized tissue [4]. The presence of Mucogingival conditions and deformities impact gingival health as well as esthetics of teeth, and addressing them when treatment is needed is essential to continuing to maintain health and esthetics around teeth.

Types of Muco-Gingival Conditions and Deformities:

Muco-gingival conditions and deformities include [4]:

- 1) Thin Periodontal Biotype
- 2) Gingival or Soft tissue recession
- 3) Lack of keratinized tissue
- 4) Decreased Vestibular depth
- 5) Aberrant frenum/muscle position
- 6) Gingival excess
 - a) Pseudo pockets
 - b) Inconsistent gingival margin
 - c) Excessive gingival display
 - d) Gingival enlargement
- 7) Aberrant Color

Periodontal Biotype:

Periodontal biotype includes gingival biotype (gingival thickness and keratinized tissue width), bone morphotype and tooth dimension [4]. These factors classify the anatomy of gingival tissue and affect the overall periodontal condition around a healthy tooth. Periodontal biotype can be defined as [4]:

1. Thin scalloped biotype which is associated with triangular crowns, interproximal contacts located more incisal, and narrow band of keratinized tissue, thin delicate gingiva and thin alveolar bone.

2. Thick flat biotype showing square shaped tooth crowns, large contact located more apically around a tooth, broad zone of keratinized tissue, thick fibrotic gingiva and thick alveolar bone.
3. Thick Scalloped biotype involving thick fibrotic gingiva, slender teeth, narrow zone of keratinized tissue and pronounced gingival scalloping.

The strongest parameter for biotype involves gingival thickness (GT) keratinized tissue width (KTW) and bone morphotype (BM) [4]. These conditions are associated with the development and progression of mucogingival defects especially gingival recession [4]. Sites that have thin scalloped biotype are more prone to gingival recession and other muco-gingival defects than sites with thick (phenotype) biotypes [4]. Additionally, sites with teeth with buccal location tend to have thin gingiva and buccal bone. The goal is to use gingival grafts to increase the thickness of periodontal biotype for teeth that have a thin periodontal phenotype, with no attached gingiva and that have buccal location in the mouth [4].

Gingival Recession

Gingival recession is the most prevalent mucogingival condition. It is defined as apical displacement of the gingival margin below the cemento-enamel junction (CEJ) [5].



Figure 1: Picture Showing Gingival Recession

Gingival recession can be localized or generalized and can be associated with one or more surfaces of a tooth. It can occur with or without interproximal attachment loss [5]. Gingival recession can also lead to tooth sensitivity, esthetic problems, carious, and non-carious cervical lesions of teeth [6].

Potential factors that can affect recession include aging, anatomic problems in alveolar bone such as fenestrations and dehiscence, abnormal facial location of teeth, thin gingival phenotype, and teeth with triangular, narrow shape [6].

Iatrogenic factors that result in recession include faulty orthodontic therapy resulting in teeth being moved beyond the labial or lingual plate, which impacts gingival tissue around the tooth causing recession [6]. Pathologic causes of recession include periodontal disease and periodontal therapy, which can result in a reduced periodontium from attachment loss [6].

Another factor affecting gingival recession involves trauma, which can occur in the form of toothbrush abrasion, aberrant frenal attachment, occlusal injury, injury during restorative therapy, tobacco use, and excessive or overly aggressive tooth brushing [6].

The current classification for types of gingival recession was implemented by the World Periodontal Workshop on Periodontal and Peri-implant diseases in 2017 and involves the Cairo

Classification which takes attachment loss into consideration. According to the classification [4]:

- 1) Recession Type 1(RT1): Gingival recession with no interproximal attachment loss.
- 2) Recession Type 2(RT2): Gingival recession with interproximal attachment loss, amount of interproximal attachment loss is less than buccal attachment loss.
- 3) Recession Type 3(RT3): Gingival recession with interproximal attachment loss with amount of interproximal attachment loss greater than buccal attachment loss.



Figure 2: Picture showing types of recession classification according to Cairo Classification

The previous classification involved the Miller classification, the drawback for the classification is that it did not incorporate lingual recession, and included the following classification [7]:

Class I: Marginal tissue recession that does not extend to the muco-gingival junction.

Class II: Marginal recession that extends to or beyond the mucogingival junction, with no periodontal attachment loss in interdental area.

Class III: Marginal tissue recession that extends to or beyond the MGJ with periodontal attachment loss in the interdental area or mal-positioning of the teeth.

Class IV: Marginal tissue recession that extends to or beyond the MGJ with severe soft tissue loss in the interdental area and or severe mal-positioning of teeth.

The Cairo classification is treatment oriented with the goal of predicting the success of the root coverage procedures [4, 8]. Cairo RT1 is comparable to Miller Class I and Class II recession and 100% coverage is usually attainable [4]. Cairo RT2 is comparable to Miller Class III recession defect and usually 100% coverage could be attainable when combination of grafting procedures are utilized [4]. Cairo RT3 is comparable to Miller Class IV recession classification and 100% coverage is usually not attainable [4].

Toothbrush abrasion is a type of non-carious cervical lesion caused by frictional forces on a tooth during tooth brushing resulting in loss of dentin and cementum. A major factor impacting abrasion has to do with applying excessive forces during tooth brushing [9]. Non-carious cervical lesions can be able to reduce the chances of root coverage by causing modification to the root surface and creating steps (concavity) in dentin [4]. By altering the morphology of the root surface, the root concavities limit the biologic limits

for root coverage during grafting procedures [10].

The 2017 World workshop on Periodontics and Peri-implant Diseases and conditions reviewed the classification system by Pini Prato et al, which classified dental surface defects as [11]:

Class A Step (-): Detectable CEJ with no step

Class A Step (+): Detectable CEJ with step

Class B Step (-): Undetectable CEJ with no step

Class B Step (+): Undetectable CEJ with step

The lack of detection of CEJ and presence of concavities impacts the root coverage procedure making achieving root coverage more difficult [4, 11].

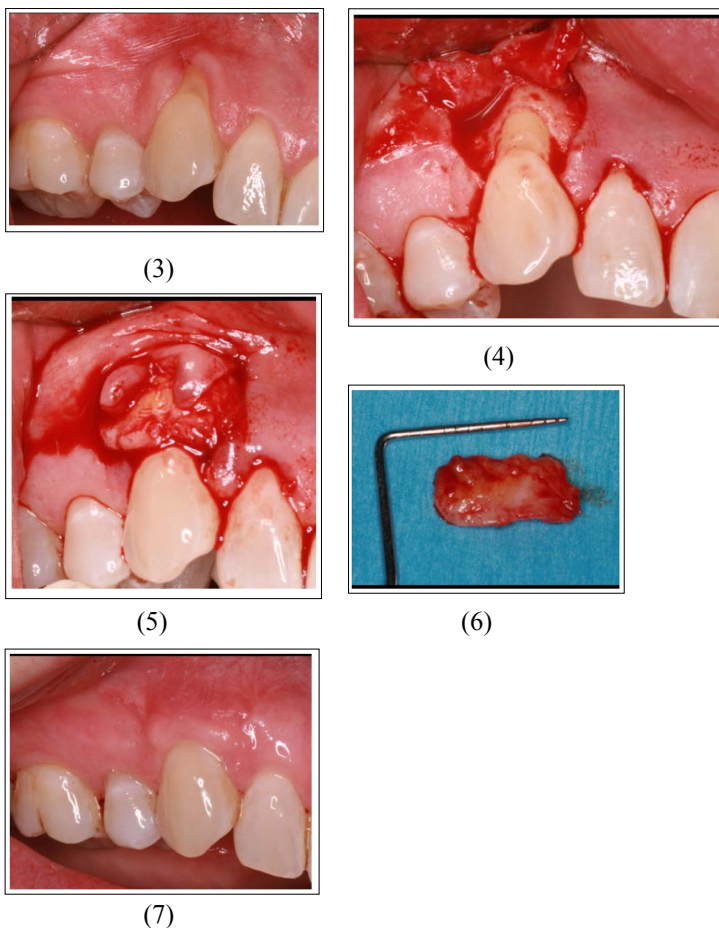
Lack of Keratinized Gingiva

Another prevalent muco-gingival condition is lack of keratinized tissue. While findings of the 2017 Consensus reports on attached gingival tissue have noted that not having minimal attached tissue would not result in attachment loss, for patients with poor oral hygiene, having adequate keratinized tissue is essential to preventing further attachment loss [4].

Lack of keratinized gingiva has also been noted to be a predisposing factor in causation of gingival recession and inflammation. Additionally, when it occurs in esthetic areas of the mouth usually in combination with recession, or in patients who are highly esthetic conscious and would like to address it, it should be addressed with the appropriate root coverage procedures.

In treating gingival recession, Chambrone and Tatakis advocate the use of root coverage procedures, which are also impactful in accomplishing not just root coverage but also allowing regain in attached gingiva [12]. From looking at results from multiple studies, they concluded that the best results for gain in recession depth coverage, clinical attachment level gain (CAL), and gain in keratinized tissue occurred for Subepithelial connective tissue grafts, coronally advanced flaps with acellular dermal matrix graft, enamel matrix derivative and collagen matrix [12].

Sub-epithelial connective tissue grafts had the highest gains in root coverage and increase in keratinized tissue not just for Miller Class I and II cases but also for Class III and IV cases and as a result are considered a gold standard for root coverage procedures [12].



Figures 3,4,5,6,7: Showing Connective tissue graft procedure

Decreased Vestibular Depth and Aberrant Frenal Attachment

Other mucogingival conditions include decreased vestibular depth and aberrant frenum attachment.



Figure 8: Showing Shortened Vestibule in Anterior Edentulous site and Tendency for Plaque Accumulation as a result

The vestibule is measured from the gingival margin to the bottom of the muco-gingival fold [13]. The vestibule can be shortened in depth due to gingival traction from muscular or fibrous frenal attachments resulting often in lack of keratinized tissue in the vestibule [14]. The presence of both shallow vestibule and lack of keratinized gingival tissue can favor plaque accumulation and food impaction due to restricted access for oral hygiene [3, 13]. Recommendation to address shortened vestibules is to perform a vestibuloplasty deepening the vestibule with or without increasing keratinized tissue with a gingival graft [14].

Aberrant frenal attachments involve ectopic location of frenal attachments, which are thin folds of mucous membrane containing muscle fibers of the Orbicularis oris muscle [15].

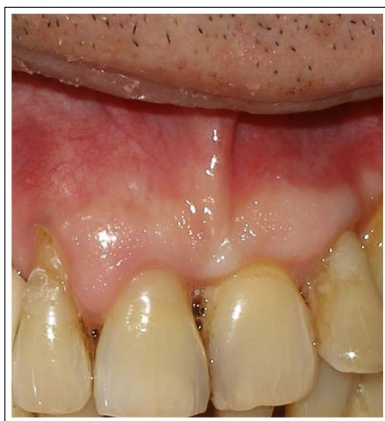


Figure 9: Showing Aberrant Frenal attachment

Frenal attachments can be classified based on their location as [15]:

1. Mucosal: with frenum attached to the mucogingival junction.
2. Gingival: with frenum attached to the attached gingiva.
3. Papillary: with frenum extending to the interdental papilla.
4. Papilla penetrating: with frenum extending across the alveolar process to attach to the palatine papilla.

Frenal attachments are a concern if tension from lip movement pulls the gingiva away from teeth or if it prevents closure of diastema between teeth [15]. Frenal attachments that attach to the marginal gingiva can distend the sulcus increasing plaque accumulation, and can also increase recession as well as lead to relapse after root coverage procedures [15].

Treatment of ectopic Frenal attachments involve removal of the frenum. This can be done with three techniques involving a simple excision, a Z plasty procedure and Localized vestibuloplasty with secondary epithelization [15].

Gingival Excess

Mucogingival deformities can also present as an excess of gingival tissue. The excess of tissue is either caused by overgrowth involving enlargement of gingival tissue, or excessive gingival display resulting from altered passive eruption, which leads to pseudo-pocketing, uneven gingival margins, and excessive gingival display.

Passive eruption occurs when epithelial attachment migrates apically from the CEJ around a tooth. It starts after the tooth has been actively erupted into the mouth [16]. Altered passive eruption occurs when there is a delay in passive eruption resulting in the gingival margin located at the cervical concavity of the tooth crown and not apical to the CEJ [16]. Altered passive eruption can be diagnosed if distance from the gingival margin to the CEJ is more than 3mm [16]. Based on the classification of the type of altered passive eruption an extent of the gingival display, therapy can range from Gingivectomy to Crown lengthening with or without ostectomy [16].

Pseudo pockets occur due to gingival enlargement and sulcus deepening without affecting periodontal tissue, this is in contrast with true pockets, which occurs due to sulcus deepening as a result of loss of underlying periodontal tissue [17]. Usually treatment for pseudo-pockets depend on the cause and extent, and can range from Gingivectomy to Flap surgery.

Gingival enlargement can be localized or generalized and can be caused by changes in cell size, cell multiplication, gingival vasculature and increase in extracellular matrix [18]. Gingival enlargement can be plaque induced or related to genetics or systemic conditions (such as hormones or drug induced as well as from systemic conditions like leukemia). Systemic causes of gingival enlargement include hormonal causes such as pregnancy, puberty, and use of oral contraceptives, as well as related to use of certain drugs such as calcium channel blockers, immunosuppressants, and anticonvulsants as well as systemic diseases such as Leukemia [18].

The ability to correctly treat gingival enlargement is related to the ability to accurately diagnosis its cause and ability to take measures to correct the cause as well as treating the enlarged tissue.

Pigmented Tissue

The last type of Muco-gingival Conditions involves pigmentation of gingival tissue. Gingival tissue is usually highly pigmented, and reasons for pigmentation of gingiva can be due to physiologic factors such as racial melanin pigmentation, or can be a manifestation of systemic illness and can range from manifestations of illnesses such as Addison's disease to Malignant Neoplasms [19]. Types of pathologic gingival pigmentation can include Addison's disease and Albright's syndrome, Heavy metal accumulation such as mercury and silver deposits, Kaposi sarcoma, post inflammatory pigmentation, amalgam tattoos and Smoking [19].



Figure 10: Showing Melanosis pigmentation



Figure 11: Showing white lesion on gingival tissue that might need to be biopsied

Because pigmented lesions can signal potential systemic illness when their etiology is unknown, they should be biopsied if pathology is suspected. If the etiology is due to physiologic factors such as melanosis, the discoloration can be left alone or removed using scalpels or lasers for a more esthetic appearance for patients that want removal for esthetic reasons.

Conclusion

Mucogingival deformities and conditions affect the supporting tissues around teeth, and the ability to accurately diagnosis them and treat them when necessary is essential for the health and esthetics of teeth and dental implants.

Conflict of Interest: Nil

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