Classification of Mucogingival Defects in Implantology and Proposed Corrective Approaches

Stefano Parma-Benfenati, MD, DDS, MScD
Carlo Tinti, MD, DDS
Marisa Roncati, RDH, DDS

The aim of this classification is to diagnose and grade four different types of soft tissue deficiency around loaded, osseointegrated implants according to increasing severity. The suggested soft tissue augmentation to increase the width of the peri-implant keratinized mucosa will improve the long-term stability of peri-implant tissues. Int J Periodontics Restorative Dent 2021;41:511–519. doi: 10.11607/prd.4791

Gingival recession in implantology is defined as the apical migration of the soft tissue margin, with implant-prosthetic surface exposure. Implant gingival margin instability may result from plaque-induced inflammation when implants are placed in thin alveolar ridges or buccally positioned. Other predisposing factors can be a buccal frenum, inadequate vestibular depth, and inappropriate cleansing techniques. It is important to diagnose gingival recession before bone is lost because the soft tissues are protecting the bone. In implantology, gingival recession treatment has become increasingly urgent, both for the clinician to prevent and/or limit further biologic damage and for the patient for esthetic purposes.

A long-term biologic soft tissue seal provides protection for the bone. The present authors suggest a classification related to the extent of the soft tissue deficiency addressing four levels of severity, ranging from mucositis to peri-implantitis (Table 1), with appropriate surgical resolutions for a combined number of 25 clinical cases treated by the authors (S.P.B. and C.T., with over 30 years of experience in periodontal surgery) in the last 13 years. The goal is to reach a diagnosis matching the soft tissue defect with or without an underlying bone lesion.

Increasing the width of the peri-implant keratinized mucosa

1Dental School University of Torino, Torino, Italy.
2Master of Prosthesis and Implantology, Alma Mater Studiorum, Bologna University, Bologna, Italy.

Correspondence to: Dr S. Parma-Benfenati, Corso Giovecca 155/A, 44121 Ferrara, Italy. Fax: +39 0532 210522. Email: info@studioparmabenfenati.it

improves the long-term stability of restored implants. A proper diagnosis is essential to arrive at an appropriate treatment modality. The severity of the defect should guide the surgeon to the appropriate bone reconstructive techniques.

Clinical Cases

Clinical Case 1

Class summary
This patient presented with Class 1 Soft Tissue Deficiency: inadequate soft tissue thickness, “gray show-through,” or gingival recession + bony dehiscence (only loss of buccal bone; Fig 1). The suggested treatment procedures include exclusively reconstructive mucogingival procedures, such as bilaminar techniques with a one-stage approach: (1) envelope flap + connective tissue graft (CTG); and (2) coronally advanced flap (CAF) + CTG.

Case summary
A 60-year-old patient presented with concern regarding the “gray show-through” visible from the particularly thin gingival tissue (Fig 2a). Two temporary crowns were inserted by the patient’s referring dentist prior to prosthetic finalization on the maxillary right central incisor and the maxillary left central implant. A minimal gingival margin recession was observed, with thin keratinized mucosa (Fig 2b).

The case was resolved exclusively with CAF in combination with a deepithelialized free gingival graft (d-FGG) of adequate size to simultaneously improve the quality and quantity of keratinized tissue (Fig 2c). An 8-year follow-up revealed clinical stability (Fig 2d).

Clinical Case 2

Class summary
This patient presented with Class 2 Soft Tissue Deficiency: gingival fenestration + bony dehiscence (only loss of buccal bone; Fig 3). The suggested treatment procedures include exclusively reconstructive mucogingival procedures, such as bilaminar techniques with a one-stage approach (lateral sliding flap + CTG); two-stage reconstructive mucogingival

Table 1 Soft Tissue Deficiency Classification

<table>
<thead>
<tr>
<th>Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 1</td>
<td>Inadequate soft tissue thickness, “gray show-through,” or gingival recession + bony dehiscence (only loss of buccal bone)</td>
</tr>
<tr>
<td>Class 2</td>
<td>Gingival fenestration + bony dehiscence (only loss of buccal bone)</td>
</tr>
<tr>
<td>Class 3</td>
<td>Gingival recession + bony dehiscence associated with mesial and/or distal infrabony defect</td>
</tr>
<tr>
<td>Class 4</td>
<td>Multiple recessions with bone loss between two or more implants</td>
</tr>
</tbody>
</table>

Fig 1 Schematic illustration of (a) gingival recession and (b) bony lesion.
procedures (free gingival autograft [FGG] and subsequent CAF following an adequate healing phase).

Case summary
A 32-year-old patient referred by her dentist was unsatisfied with the esthetic outcome resulting from a rather progressive gingival fenestration buccally at the maxillary right lateral implant site (Fig 4a). The patient had expressed a desire to preserve the two prosthetic restorations for financial reasons. The treating dentist noted a very small gingival fenestration, about 5 mm, from the gingival margin, slowly increasing in size. A 7-mm probing depth was detected on the buccal aspect (Fig 4a). The reconstructive approach, limited to the mucogingival bilaminar technique, utilized a lateral sliding flap and a subepithelial CTG (one-stage approach) following decontamination and detoxification phases of the exposed implant surface (Figs 4b to 4d).

Clinical Case 3

Class summary
This patient presented with Class 3 Soft Tissue Deficiency: gingival recession + bony dehiscence associated with mesial infrabony defect (loss
of buccal and mesial bone; Fig 5b). The suggested treatment procedures are the following, used at the clinician’s discretion and differing from case to case: (1) mucogingival reconstructive procedures: either a one-stage bilaminar technique + CTG or two-stage reconstructive mucogingival procedures; or (2) bony reconstructive procedures: one-stage guided bone regeneration (GBR) + CTG.

Case summary
A 31-year-old woman presented with a chief complaint of increasing recession and fenestration (Fig 5) at the site of a 4-year-old maxillary right lateral incisor implant-supported crown (Fig 6a). She reported that a concave morphology had always been present, but she started to be concerned after noticing additional gingival fenestration. Probing depths ranged from 6 mm, distobuccally and mesiobuccally, to 5 mm midbuccally. After crown removal, gingival perforation and collapsed keratinized mucosa were observed (Fig 6b).
The therapeutic choice was oriented toward a reconstructive mucogingival approach with a bilaminar technique because of esthetic and buccal bone loss.

A therapeutic alternative to this type of combined mucogingival and bone defect is the bony reconstructive procedure (one-stage GBR + CTG) if the interproximal bone defects are moderate to severe, and not as mild as in this particular case.

A surgical protocol of decontamination and detoxification of the exposed threads was meticulously implemented. Minor infrabony defects were detected lateral to the five exposed threads (Fig 6c). A wedge CTG from the retromolar tuberosity area was harvested and used as a “filling” material for the bone defect (Fig 6d). It was positioned and tightly adapted for intimate contact with the exposed threads and bony surfaces, entirely filling the lateral osseous defects and covering the most coronal exposed threads. An additional d-FGG of about 1.5 mm in thickness was used as a resorbable barrier.
membrane. The primary flap was coronally advanced to completely cover the grafts and the previously deepithelialized papillae 2 mm coronal to the cementoenamel junction (Figs 6e and 6f). The resulting gingival margins were in perfect harmony, with an increased thickness of the gingival tissue (Fig 6g).

Clinical Case 4

Class summary
This patient presented with bone Class 4 Soft Tissue Deficiency: multiple recessions with bone loss between two or more implants (Fig 7). The suggested treatment procedures mainly include bone reconstructive or resective techniques preceded by soft tissue augmentation. In esthetic areas, a regenerative approach is suggested to avoid esthetic damage: reconstructive bony procedure (surgical phase II) with a two-stage GBR approach. In nonesthetic areas, where exposure of the titanium components is not a major complication, resective surgery and apically positioned flaps are preferable, in order to reduce pocket depth and improve homecare access, combined with soft tissue augmentation.

Case summary
A 48-year-old woman with an unremarkable medical history presented with a peri-implantitis lesion on two machined implants serving as abutments of a three-unit screw- and cement-retained fixed implant/tooth restoration (Fig 8a). The two implants were positioned in native bone in the maxillary left sextant for 6 years. Five years after loading, progressive bone loss was reported, with increased probing depths ranging from 7 to 9 mm both buccally and interproximally, with bleeding despite regular maintenance care. The exposure of the most coronal implant threads, the extremely reduced amount of keratinized mucosa—which was slightly inflamed buccally and interproximally—and the presence of aberrant insertion of the frenula created a persistent brushing soreness. Moderate bone loss between the two implants was observed (Fig 8b). After decontamination, detoxification, and implantoplasty of the exposed implant surfaces, an FGG taken from the palatal lateral wall was steadily stabilized with periosteal compressive sutures (Fig 8c). The clinical parameters were within normal limits over the course of a 7-year follow-up period (Fig 8d).

Discussion
Periodontal systematic reviews5–10 have clearly indicated that bilaminar techniques are preferred to cover an exposed root surface. A limited number of articles have been published on peri-implant plastic surgery. In a systematic review, a more pronounced peri-implant soft tissue recession was observed at sites with inadequate amounts of keratinized tissue.11 Hence, the quality and quantity of keratinized mucosa
should be enhanced, above all correcting esthetic “damage” by masking the implant-prosthetic components.12–16

Increasingly demanding patient expectations require not only complete coverage of the exposed implant components, but also a perfect integration of the graft or flap to the adjacent tissues. Microbial biofilm removal, properly modified home care techniques, and prosthetic component replacement may be sufficient to restore gingival margin integrity. Conversely, if the recession becomes progressive, the clinician must select the most appropriate surgical technique. Well-established periodontal concepts cannot be simply translated into implant treatment. The absence of blood supply from the periodontal ligament penalizes the healing process. It is essential to create an “adequate” periosteal receiving bed and use a CTG harvested from the palate of about 1.5 mm, thick and well vascularized, to achieve successful outcomes. If minimal keratinized tissue is present, a free gingival autograft serves to create enough quantity of soft tissue as a single therapeutic modality or as a first surgical procedure in a two-stage approach. Following a healing period of approximately 4 to 6 months, the newly formed tissue is repositioned coronally, whether it is associated with a CTG or not.

Implants with a small number of exposed buccal threads usually require mucogingival plastic surgery using a bilaminar reconstructive technique without additional bone regenerative treatment.12,17 The amount of possible gingival coverage can be impacted by the gingival phenotype, the amount and quality of the residual keratinized mucosa, the extent of the gingival recession, and the integrity of adjacent interproximal bone.18 Moreover, the present authors agree with Zucchelli et al14 that soft tissue recession coverage may be favored by implant crown removal or a change of implant abutment, providing larger interdental connective tissue beds for the graft and for the surgical papillae of the flap.

In the present authors’ opinion, autogenous soft tissue grafts may still be preferred to other types of soft tissue replacement (eg, allogeneic or xenogeneic materials), for the undisputed advantage of retaining its own blood supply, thus minimizing the risk of graft necrosis.

In the presence of recessions or gingival fenestrations, bilaminar techniques are indicated for the treatment of peri-implant mucogingival defects to obtain a complete implant component coverage. Occasionally, there may be even a
slight bone defect at the dehiscence sides. The primary clinical objective is to treat dehiscence with a mucocingival approach, allowing the resulting “self-filling” to compensate for the neighboring bone defect.

A healthy, inflammation-free amount of keratinized tissue is absolutely crucial for soft tissue management prior to any therapeutic bone regenerative stages. Adequate width and thickness of keratinized mucosa appear to enhance proper home care and the long-term stability of peri-implant tissue. A mucocingival defect associated with a non-space-making osseous lesion can also be corrected with a different clinical approach. In the case of horizontal bone loss and in the absence of esthetic requests (or in the mandible), the simplest and most predictable treatment seems to be an apically positioned flap, whether associated with osseous resective surgery or not.

Conclusions

Implant soft and hard tissue reconstructive procedures may be indicated to correct/regenerate mucocingival defects. The selected approach is influenced by the surgical team's experience. The diagnosis is always only one, but the therapeutic options are several, considering the clinician's subjectivity in regard to each specific individual case, even with the lack of long-term scientific evidence. This classification will aid in the treatment plan and technique selection in the illustrated four main groups, presented in increasing order of severity. In the presence of peri-implant recessions or gingival fenestrations, with mild to moderate buccal bony dehiscence, the bilaminar techniques are indicated for a complete component coverage. In the event of severe buccal dehiscence or interproximal/inter-implant bone loss, an osseous reconstructive technique is most appropriate.

In the case of total absence of keratinized tissue at implant sites, a two-phase technique is recommended. The first surgical stage will create an adequate width of keratinized tissue, followed 4 to 6 months later by a bone phase to correct the defect.

Periodontal surgeries must always follow a thorough patient selection and defect diagnosis. Furthermore, treatment outcomes are affected by the experience of the surgical team.

Soft and hard tissue reconstructive technique selection, in conjunction with an enhanced home regimen and appropriate supportive periodontal therapy, may lead to longstanding healthier conditions and esthetic improvement.

Acknowledgments

The authors declare no conflicts of interest.

References


