Classification and definitions of peri-implant health and diseases

Peri-implant mucosa

* Definition: healthy soft tissues surrounding an implant
* Composition: a layer of connective tissue covered by either a keratinized or non-keratinized epithelium
* In healthy mucosa: small clusters of inflammatory cells can be found in the connective tissue lateral to the barrier epithelium
* Average height: 3-4mm
* Length of epithelium: approximately 2mm long
* Factors determining dimensions (height and thickness) of peri-implant mucosa
  + Dept of implant placement
  + Soft-tissue phenotype
* Most of the endosseous part of the implant (~60%) is in contact with bone marrow, vascular structures, and fibrous tissue
* Peri-implant health is characterized by the absence of erythema, bleeding on probing (BoP), swelling, and suppuration (source: Araüjo and Lindhe 2018)

Peri-implant mucositis

* Definition: an inflammatory lesion in the soft tissues surrounding an implant in the absence of supporting bone loss or continuing marginal bone loss (source: Heitz-Mayfield and Salvi 2018)
* Cause: biofilms which disrupt the host/parasite equilibrium at the implant-mucosa interface resulting in an inflammatory lesion in the supracrestal soft-tissue compartment (source: Heitz-Mayfield and Salvi 2018)
* Main clinical characteristic: BoP on gentle probing

Peri-implantitis

* Definition: a biofilm-associated pathological condition occurring in the tissues around an osseointegrated implant
* Characteristic: BoP and/or suppuration and subsequent progressive los of supporting bone (source: Schwarz and coworkers 2018)
* Contributing factor of peri-implantitis development: formation of a biofilm on the surface of an implant

Examination for diagnosis and case definitions of peri-implant diseases

Assessment of soft-tissue conditions

* Detection of presence of soft-tissue inflammation, include
  + Visual inspection to identify erythema, edema or presence of a draining sinus
  + Digital palpation to detect presence of suppuration
  + Probing of the peri-implant sulcus to detect bleeding or suppuration on probing (source: Berglundh and coworkers 2018a)
    - Method: use a metal or plastic periodontal probe to perform peri-implant probing, recommended to use a light probing force of ~0.25Ncm, assess and record 4-6 sites of probing depths per implant in order to identify changes in probing depths over time
    - Possible challenge: there might be no access for probing for multiple sites per implant due to the position of the implant in relation to the prosthesis contours; Solution: where access for probing at an implant is lacking the prosthesis should be removed, if possible, in order to assess the peri-implant soft-tissue status (source: Serino and coworkers 2013)

Assessment of marginal bone levels

* Take intraoral radiograph (periapical or bitewing) when signs of inflammation are observed during a clinical examination
  + Purpose: assess peri-implant marginal bone levels
  + Method: it is recommended to use a paralleling device to allow correct positioning of the radiographic film or sensor
    - Reason: allows measurements to be made from a fixed reference point, such as the most coronal aspect of the endosseous portion of the implant, to the first bone to implant contact
* Panoramic radiographs (OPG) are not recommended for assessment of peri-implant marginal bone levels
  + Reason: unfavorable projection geometry leading to magnification errors and superimposed structures
* Make comparison between the peri-implant marginal bone levels from previous radiographs, preferable taken at the time of restoring the implant
  + Purpose: to determine if peri-implant bone loss has occurred
  + If previous radiographs are not available, the clinician should make effort to obtain precious radiographic records where possible
  + Errors
    - There will be a measurement error of ~0.5mm when comparing marginal bone levels on radiograph
    - Different angulations in a series of radiographs leads to a potential for increased measurement error (source: Walton and Layton 2018)
* Benefits of using radiographs to assess marginal bone levels
  + Assess fit of components of the implant-supported prosthesis
  + Identify presence of submucosal luting cement remnants if a radiopaque cement has been used

Case definition of peri-implant health

* Requirements that should be fulfilled in a case of peri-implant health (source: Berglundh and coworkers 2018a)
  + Absence of clinical signs of inflammation
    - Absence of clinical signs of inflammation, indicated by and reflected through BoP, rather than probing depth per se that indicated peri-implant health
  + Absence of bleeding and/or suppuration on gentle probing
  + No increase in probing depth compared to previous examination
    - Probing depth measurement will depend on the height of the mucosal sulcus at the location of the implant
    - A range of probing depths may be compatible with peri-implant health, depending on the depth of implant placement and thickness of the soft tissue
  + Absence of bone loss beyond crestal bone level changes wrestling from initial bone remodeling
* Peri-implant tissue health may also be present around implants with variable levels of bone support

Case definition of peri-implant mucositis

* Requirements that should be fulfilled in a case of peri-implant mucositis (source: Berglundh and coworkers 2018a)
  + Presence of bleeding and/or suppuration on gentle probing with or without increased probing depths compared to previous examinations