Peri-implantitis: A Classification Update

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ABSTRACT

The cases of peri-implantitis are soaring rapidly in the current scenario. It is very important to have adequate knowledge about the etiology, pathogenesis, clinical features, radiological features, and treatment of peri-implantitis. In this context, the classification of the disease is of utmost importance for planning and execution of the treatment. Various classifications have been proposed over the years and with each classification, more information is being added and there is a lack of universal acceptance of a single classification. Clinical errors may be anticipated due to miscommunication and misguidance. Thus, it is important to sensitize the clinicians about different classification systems. This review attempts to compile and critically analyze existing classification systems of peri-implant diseases.

Keywords: Dental implants; diagnosis; peri-implantitis.

INTRODUCTION

Peri-implantitis is defined as a plaque-associated pathologic condition occurring in the tissue around dental implants, characterized by inflammation in the peri-implant mucosa and subsequent progressive loss of supporting bone.1 It is the most frequent complication of dental implants and occurs from 1% to 47% at implant level,2-9 based on various study designs and population sizes.10-12 It presents a public health issue.13-15

Peri-implantitis is associated with a history of chronic periodontitis, poor plaque control skills, and lack of regular maintenance care after implant therapy.16 The risk factors for peri-implantitis are patient-related, prosthesis-related, clinician-related and implant design, and site-related.17 Further investigations are necessary for the role of occlusal overload,18 genetic factors,19 rheumatoid arthritis with concomitant connective tissue disease,20 increased time of loading,21 and alcohol consumption.22

Peri-implantitis shows signs of inflammation, bleeding on probing and/or suppuration, increased probing depths and/or recession of the mucosal margin and radiographic bone loss compared to previous examinations.23

Diagnosis of peri-implantitis:24

- Evidence of visual inflammatory changes in the peri-implant soft tissues combined with bleeding on probing and/or suppuration.
- Increasing probing pocket depths as compared to measurements obtained at the placement of the supra-structure.
- Progressive bone loss in relation to the radiographic bone level assessment at 1 year following the delivery of the implant-supported prosthetics reconstruction.
- In the absence of initial radiographs and probing depths, radiographic evidence of bone level ≥3 mm and/or probing depths ≥6 mm in conjunction with profuse bleeding represents peri-implantitis.

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Citation
Classification of peri-implant diseases and conditions is essential for proper treatment planning, prognosis, and communication.  

Many classifications have been proposed and widely used. These are explained below:

1. **Spiekermann (1984)**
   
   The type of bone resorption pattern was used to describe the peri-implant defect into 5 categories.
   
   - Class I: Horizontal
   - Class II: Hay-shaped
   - Class III a: Funnel-shaped
   - Class III b: Gap-like
   - Class IV: Horizontal-circular form

   
   The classification has coupled the amount of horizontal bone loss with the type of bone defect.
   
   - Class 1: Slight horizontal bone loss with minimal peri-implant defects
   - Class 2: Moderate horizontal bone loss with isolated vertical defects
   - Class 3: Moderate to advanced horizontal bone loss with broad, circular bony defects.
   - Class 4: Advanced horizontal bone loss with broad, circumferential vertical defects, as well as loss of the oral and/or vestibular bony wall

3. **Sussman (1998)**
   
   Historically, the periapical implant lesion has been described into 2 types as retrograde peri-implantitis by Sussman in 1998. 
   
   - Type 1: Occurs when the insertion of the implant results in devitalization of the adjacent tooth either by direct contact or overheating of the surrounding bone

   - Type 2: Occurs when a periapical lesion from a nearby endodontically involved tooth encroaches upon the implant and contaminates it

   An updated classification was considered by adding classes 3 and 4 as additional causes of RPI were reported:
   
   - Class 3: A lesion that develops because of improper placement or angulation of the implant (ie, placed outside the envelope of bone). This can include implants that are placed too far labially or lingually/palatally.
   
   - Class 4: A lesion that develops despite proper placement in sound bone with adjacent vital teeth postoperatively, which may imply residual bacteria/viruses and/or necrotic bone/subclinical infection remaining at the site or placement into an infected or inflamed sinus causing either nonhealing of the apical region of the implant or contamination.

4. **Vanden Bogaerde (2004)**
   
   This classification considers peri-implant bone defects in the progression of the regenerative process.
   
   - (1) Closed defects: It is characterized by the maintenance of intact surrounding bone walls.
   - (2) Open defects: It is the one that lack one or more bone walls.

5. **Lang NP et al. (2004)**
   
   The classification has included clinical signs, radiographic features and treatment to describe various stages of peri-implantitis.
   
   - Pocket depth (PD) <3 mm, no plaque or bleeding: No therapy
   - Stage A PD <3 mm, plaque and/or bleeding on probing: Mechanical cleansing and polishing, oral hygienic maintenance instructions.
   - Stage B PD 4–5 mm, radiologically no bone loss: Mechanical cleansing and polishing, oral hygienic
maintenance instructions plus local anti-infective therapy (e.g. Chlorhexidine).

Stage C PD >5 mm, radiologically bone loss <2 mm: Mechanical cleansing and polishing, microbiological test, local and systemic antibiotic therapy.

Stage D PD >5 mm, radiologically bone loss >2 mm: Respective or regenerative surgery.

6. Schwarz et al. (2008)
The configuration of the bony defect as: 33

Class I defect: Intraosseous

Subdivisions:
Class Ia: Buccal dehiscence
Class Ib: Buccal dehiscence + semicircular bone resorption to the middle of the implant body
Class Ic: Buccal dehiscence + circular bone resorption under maintenance of the lingual compacta
Class Id: Buccal dehiscence + circular bone resorption under loss of the lingual compacta
Class Ie: Circular bone resorption under maintenance of the buccal and oral compacta

Class II defect: Supra-alveolar in the crestal implant insertion area

Classification of peri-implant diseases and advised treatment regimen was given by Renvert and Claffey 34 as shown in Table 1.

The peri-implantitis levels of severity assessed were: 35

1) Radiographic peri-implant bone loss ≥2.0 mm and BOP/suppuration at PD ≥4 or ≥6 mm
2) Radiographic peri-implant bone loss ≥3.0 mm and BOP/suppuration at PD ≥4 or ≥6 mm

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**Table 1: Classification of peri-implant diseases by Renvert and Claffey.**

<table>
<thead>
<tr>
<th>Classification</th>
<th>Signs of disease</th>
<th>Advised treatment regimen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Periimplant mucositis</td>
<td>Inflammation BOP PPD&lt;4 mm No bone loss</td>
<td>Nonsurgical instrumentation and disinfection with chlorhexidine</td>
</tr>
<tr>
<td>Peri-implantitis Grade 0</td>
<td>Failure of osseointegration Implant fracture Implant mobility&gt;1mm horizontal movability</td>
<td>Explant</td>
</tr>
<tr>
<td>Peri-implantitis Grade 1 (mild)</td>
<td>BOP+/- SUP PPD&lt;4 mm Bone loss&lt;2 mm Foreign body in peri-implant sulcus(commonly cement)</td>
<td>Removal of abutment Non-surgical instrumentation and disinfection</td>
</tr>
<tr>
<td>Peri-implantitis Grade 2 (moderate)</td>
<td>BOP+/- SUP PPD 4-6 mm Bone loss&lt;2 mm</td>
<td>Removal of abutment Non-surgical instrumentation and disinfection</td>
</tr>
<tr>
<td>Peri-implantitis Grade 3 (severe)</td>
<td>BOP+/- SUP PPD&gt;6 mm Bone loss&gt;2 mm</td>
<td>Removal of abutment Surgical access Instrumentation and disinfection Systemic antibiotics Resective/Regenerative surgery</td>
</tr>
</tbody>
</table>
9. Nogueira-Filho et al. (2011)

Peri-implant mucosal inflammation (PIMI) was described along with prognosis and treatment as shown in Table 2.


Peri-implantitis is classified into:

1. Early Peri-implantitis: PD≥4 mm, Bleeding and/or suppuration on probing, Bone loss <25% of the implant length.
2. Moderate Peri-implantitis: PD≥6 mm, Bleeding and/or suppuration on probing, Bone loss ranging from 25% to 50% of the implant length.
3. Advanced Peri-implantitis: PD≥8 mm, Bleeding and/or suppuration on probing, Bone loss >50% of the implant length.

GBR=Guided Bone Regeneration, OHI=Oral Hygiene Instruction, ISD=Implant Surface debridement, SIT=Supportive Implant Treatment


The classification system for peri-implant disease in association with natural teeth was termed peri-implant soft tissue (PIST). It gave a better view to the clinicians about the etiology of the disease. The classification is shown in Table 3.

Table 2: Peri-implant mucosal inflammation (PIMI).

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Prognosis</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>No PIMI (Healthy)</td>
<td>Favourable</td>
<td>OHI</td>
</tr>
<tr>
<td>No bleeding/No bone loss</td>
<td></td>
<td>SIT</td>
</tr>
<tr>
<td>Mild PIMI (Mucositis)</td>
<td>Favourable</td>
<td>OHI+ISD</td>
</tr>
<tr>
<td>Bleeding/No bone loss</td>
<td></td>
<td>SIT</td>
</tr>
<tr>
<td>Moderate/Severe PIMI (Peri-implantitis)</td>
<td>Unfavourable</td>
<td>OHI+ISD or GBR</td>
</tr>
<tr>
<td>Bleeding, bone loss</td>
<td></td>
<td>SIT</td>
</tr>
<tr>
<td>Systemic PIMI (Peri-implantitis)</td>
<td>Unfavourable</td>
<td>OHI+ISD or Implant(s) removal New Implant(s)</td>
</tr>
<tr>
<td>Bleeding, bone loss, systemic condition</td>
<td></td>
<td>SIT</td>
</tr>
<tr>
<td>Advanced PIMI (Peri-implantitis)</td>
<td>Hopeless</td>
<td>Implant(s) removal New Implant(s)</td>
</tr>
<tr>
<td>Infection and/or occlusal trauma, mobility</td>
<td></td>
<td>SIT</td>
</tr>
</tbody>
</table>

Table 3: Peri-implant soft tissue (PIST).

<table>
<thead>
<tr>
<th>Classification</th>
<th>Definition/Origin</th>
<th>1st step of treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primarily: periodontitis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P-1</td>
<td>Secondarily: apical periodontitis</td>
<td>Pulp vitality test rct+/-surgical intervention</td>
</tr>
<tr>
<td>P-2</td>
<td>Secondarily: marginal periodontitis</td>
<td>Non-surgical+/-surgical debridement of involved areas</td>
</tr>
<tr>
<td>P-3</td>
<td>Secondarily: marginal and periapical periodontitis</td>
<td>Combination</td>
</tr>
<tr>
<td>Primarily: peri-implantitis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I-1</td>
<td>Secondarily: apical peri-implantitis</td>
<td>Pulp vitality test rct surgical intervention of involved implant+/tooth</td>
</tr>
<tr>
<td>I-2</td>
<td>Secondarily: marginal peri-implantitis</td>
<td>Non-surgical+/-surgical debridement of involved areas</td>
</tr>
<tr>
<td>I-3</td>
<td>Secondarily: marginal and periapical periodontitis</td>
<td>Combination</td>
</tr>
</tbody>
</table>
12. **Zhang L et al. (2014)**

The peri-implant bone defects (PIBDs) were classified on the basis of their panoramic radiographic shapes in patients with lower implant-supported overdentures.\(^\text{39}\)

Type 1: Saucer-shaped; Bone pocket characterized by a concave bottom (classified as type 4, if the undercut was below the alveolar bone crest).

Type 2: Wedge-shaped; Bone pocket characterized by a straight or convex wall.

Type 3: Flat or no pocket; No pocket present or angle between flat alveolar crest and implant surface ≥90°.

Type 4: Undercut; Bone pocket characterized by a concave bottom, with obvious undercutting, that is, with an undercut >0.5 mm and proportion of undercut >50%.

Type 5: Slit-like; Bone pocket is narrow and deep, with a width of ≤0.5 mm and a depth equaling twice the width or more, or an undercut >0.5 mm and proportion of undercut <50%.


Kazemi in 2015 classified peri-implantitis into four classes.\(^\text{40}\)

Peri-Implantitis Type 1: Inflammation of the gum tissue with no loss of bone or gum tissue. The gum tissue may appear red, is painful to touch, and may bleed during brushing or flossing.

Peri-Implantitis Type 2: Inflammation, along with loss of bone on one side of the implant, with normal gum tissue level. Depending on the amount of the bone loss, it can be further categorized as:

Type 2a: Bone loss 1-4 mm

Type 2b: Bone loss greater than 4 mm

Peri-Implantitis Type 3: Advancement of inflammation with loss of bone on one side of the implant and receding gum tissue.

Type 3a: Bone loss 1-4 mm

Type 3b: Bone loss greater than 4 mm

Peri-Implantitis Type 4: Severe inflammation with bone loss on more than one side or all around the implant.

Type 4a: Normal gum tissue level

Type 4b: Loss of gum tissue


This is combined (peri-implant mucositis and peri-implantitis) classification.\(^\text{41}\)

Proposed classification for peri-implant mucositis:

Stage A: Probing Pocket Depth ≤4 mm and Bleeding on probing and/or suppuration, with no signs of loss of supporting bone following initial bone remodelling during healing

Stage B: Probing Pocket Depth >4 mm and Bleeding on probing and/or suppuration, with no signs of

### Separately

<table>
<thead>
<tr>
<th>S-1</th>
<th>Apical lesions</th>
<th>For involved tooth: RCT, follow-up, peri-apical surgery For implant: follow-up, surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-2</td>
<td>Marginal lesions</td>
<td>Non-surgical+/−surgical debridement of involved areas</td>
</tr>
<tr>
<td>S-3</td>
<td>Apical and marginal lesions</td>
<td>Combination</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Traumatic lesions</th>
</tr>
</thead>
<tbody>
<tr>
<td>T0</td>
</tr>
<tr>
<td>T-1</td>
</tr>
</tbody>
</table>
loss of supporting bone following initial bone remodelling during healing

Proposed classification for peri-implantitis:

Stage I: Bleeding on probing and/or suppuration and bone loss ≤3 mm beyond biological bone remodelling

Stage II: Bleeding on probing and/or suppuration and bone loss >3 mm and <5 mm beyond biological bone remodelling

Stage III: Bleeding on probing and/or suppuration and bone loss ≥5 mm beyond biological bone remodelling

Stage IV: Bleeding on probing and/or suppuration and bone loss≥50% of the implant length* beyond biological bone remodelling

*Depending on implant length, if peri-implantitis can be classified as simultaneously corresponding to more than one stage, the most advanced should be chosen.

15. Decker et al. (2015)

They grouped peri-implantitis according to the prognosis as shown in table 4. The prognosis was done by the recommended clinical intervention and probability of achieving implant stability.


Shah et al. classified retrograde implantitis into 3 classes. It is defined as a clinically symptomatic periapical lesion that develops within the first few after implant insertion while the coronal portion of the implant sustains a normal bone to the implant interface.

Class I: Mild; Extends < 25% of the implant length from implant apex.

Class II: Moderate; Extends 25–50% of the implant length from implant apex.

Class III: Severe; >50% of the implant length from implant apex.

17. Ramanauskaite and Juodzbalys 2016

The classification was done on the basis of Radiographic bone level evaluation (mesial and distal): Slight peri-implantitis PBL: 0.5 - 1 mm Moderate peri-implantitis PBL: 1.1 - 1.5 mm Severe peri-implantitis PBL: ≥ 1.5 mm Amount of bone loss (ABL) = 1.5 + 0.2 × years of implant in function Pathological bone loss (PBL) = present amount of bone loss – ABL


This classification uses mnemonics B (Bleeding, Bone loss), M (Mobility), P (Probing depth, Proposed treatment, and Prognosis). Thus, the name BMP

Table 4: Decker’s classification of peri-implantitis.

<table>
<thead>
<tr>
<th>Prognosis</th>
<th>Favourable</th>
<th>Questionable</th>
<th>Unfavourable</th>
<th>Hopeless</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristics</td>
<td>No bone loss PD≥ 4mm BOP/Suppuration No mobility</td>
<td>Bone loss≤ 1/4 implant PD≥ 4mm BOP/Suppuration No mobility</td>
<td>Bone loss ¼-1/2 implant PD≥ 6mm BOP/Suppuration No mobility</td>
<td>Bone loss&gt;1/2 implant PD≥ 8mm BOP/Suppuration Mobility</td>
</tr>
<tr>
<td>Diagnosis</td>
<td>Periimplant mucositis Early periimplantitis Moderate periimplantitis Advanced periimplantitis</td>
<td>None</td>
<td>Extraction Redevelop site</td>
<td>Extraction</td>
</tr>
<tr>
<td>Recommendation</td>
<td>Nonsurgical therapy</td>
<td>Nonsurgical therapy</td>
<td>Surgical treatment</td>
<td>Extraction</td>
</tr>
</tbody>
</table>
classification of implant defects was given. The classification is given in Table 5.

19. Sarmiento et al. (2016)

It was proposed by Sarmiento, Norton, and Fiorellini in 2016.\(^5\) It was based on the etiology of peri-implantitis which is listed as follows:

- a) Peri-implantitis induced by pathogenic bacteria/biofilm
- b) Peri-implantitis induced by exogenous irritants
- c) Peri-implantitis induced by iatrogenic factors
- d) Peri-implantitis induced by extrinsic pathology
- e) Peri-implantitis induced by the absence of keratinized tissue (AKT)

20. Canullo et al. (2016)

They proposed a classification based on the etiology associated with distinguishing predictive profiles.\(^5\) The three subtypes are

1. Plaque-induced
2. Prosthetically triggered
3. Surgically


They described implant quality scales based on clinical conditions and management as shown in Table 6.\(^6\)

22. AAP (2017)

In 2017, the world workshop planned and conducted jointly by the American Academy of Periodontology and the European Federation of Periodontology presented a consensus report (of workgroup 4) in which classification of Peri-Implant Diseases and Conditions was done:\(^7\)

<table>
<thead>
<tr>
<th>STAGE</th>
<th>Bleeding on Probing</th>
<th>Probing Depth</th>
<th>Bone loss (%) of implant length</th>
<th>Mobility</th>
<th>Proposed Treatment &amp; Prognosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAGE 1</td>
<td>_</td>
<td>2–3 mm</td>
<td>10–25%</td>
<td>No mobility</td>
<td>No treatment</td>
</tr>
<tr>
<td>STAGE 2</td>
<td>+</td>
<td>4–6 mm</td>
<td>25–50%</td>
<td>Grade 1</td>
<td>vertical defect &lt;2–4 mm- GBR, osteoplasty</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Vertical</td>
<td></td>
<td>Horizontal Defect &lt; half of implant height – APF, GBR, osteoplasty</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Vertical + Horizontal combination</td>
<td></td>
<td>Combination Defect: Bone augmentation and GBR. Prognosis is fair.</td>
</tr>
<tr>
<td>STAGE 3 Horizontal</td>
<td>+</td>
<td>6–8 mm</td>
<td>&gt;50%</td>
<td>Grade 2</td>
<td>vertical defect 2–4 mm-GBR, ABWG</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Vertical</td>
<td></td>
<td>Defect &gt; half of implant height – GBR and Augmentation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Vertical + Horizontal combination</td>
<td></td>
<td>Combination Defect: Implant removal. Questionable Prognosis</td>
</tr>
<tr>
<td>STAGE 4</td>
<td>+</td>
<td>&gt;8 mm</td>
<td>&gt;50%</td>
<td>Grade 3</td>
<td>Implant removal Poor prognosis</td>
</tr>
</tbody>
</table>

APF- Apically positioned flap, GBR- Guided bone regeneration, ABWG- Autogenous bone wedge grafting.
Table 6: Implant quality scale.\textsuperscript{46}

<table>
<thead>
<tr>
<th>Implant Quality Scales</th>
<th>Clinical Conditions</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Success (optimal health)</strong></td>
<td>No pain or tenderness upon function</td>
<td>Normal maintenance</td>
</tr>
<tr>
<td>Osseointegration/ Stage 0 osseoseparation</td>
<td>0 mobility</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;2 mm radiographic bone loss from initial surgery</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PD &lt;4 mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No suppuration</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No BOP</td>
<td></td>
</tr>
<tr>
<td><strong>Survival (satisfactory health)</strong></td>
<td>No pain</td>
<td>Frequent SPT</td>
</tr>
<tr>
<td>Stage I osseoseparation</td>
<td>0 mobility</td>
<td>Nonsurgical debridement (hand, machine, air powder, lasers, etc)</td>
</tr>
<tr>
<td>Peri-mucositis</td>
<td>&lt;2 mm radiographic bone loss from initial surgery</td>
<td>Patient self-administered care</td>
</tr>
<tr>
<td></td>
<td>Perimucosal inflammation</td>
<td>Adjunct local and systemic antimicrobials</td>
</tr>
<tr>
<td></td>
<td>PD ±4 mm (bleeding and/or suppuration on probing)</td>
<td>Soft tissue and/or prosthetic corrections if required</td>
</tr>
<tr>
<td><strong>Survival (potentially compromised)</strong></td>
<td>No pain</td>
<td></td>
</tr>
<tr>
<td>Stage II osseoseparation</td>
<td>0 mobility</td>
<td></td>
</tr>
<tr>
<td>Early peri-implantitis</td>
<td>2-4 mm radiographic bone loss from initial surgery</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PD ±4 mm (bleeding and/or suppuration on probing)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Perimucosal inflammation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bone loss &lt;25% of the implant length</td>
<td></td>
</tr>
<tr>
<td><strong>Survival (compromised health)</strong></td>
<td>Variable pain</td>
<td>Treatment as above plus surgical reentry and revision</td>
</tr>
<tr>
<td>Stage III osseoseparation</td>
<td>0 mobility</td>
<td>Laser</td>
</tr>
<tr>
<td>Moderate peri-implantitis</td>
<td>Perimucosal inflammation</td>
<td>Implant surface decontamination</td>
</tr>
<tr>
<td></td>
<td>PD ≥6 mm (bleeding and/or suppuration on probing)</td>
<td>Regeneration</td>
</tr>
<tr>
<td></td>
<td>Bone loss 25% to 50% of the implant length</td>
<td></td>
</tr>
<tr>
<td><strong>Failure (clinical failure)</strong></td>
<td>Perimucosal inflammation</td>
<td>Surgical reentry and revision</td>
</tr>
<tr>
<td>Stage IV osseoseparation</td>
<td>Pain upon function</td>
<td>Lasers</td>
</tr>
<tr>
<td>Advanced peri-implantitis</td>
<td>PD &gt;8 mm (bleeding and/or suppuration on probing)</td>
<td>Removal of implant</td>
</tr>
<tr>
<td></td>
<td>Bone loss &gt;50% of the implant length</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mobility</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Uncontrolled diabetes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maybe no longer in mouth</td>
<td></td>
</tr>
<tr>
<td><strong>Others (such as retrograde peri-implantitis)</strong></td>
<td>Variable perimucosal inflammation</td>
<td>Surgical reentry and revision or removal of implant</td>
</tr>
<tr>
<td></td>
<td>Radiographically: periapical lesion around implant</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Clinical pain, tenderness, fistula formation or swelling</td>
<td></td>
</tr>
</tbody>
</table>

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23. **Tallarico et al. (2018)**

They categorized diagnostic criteria for the estimation of the implant pathologic bone loss around an implant in function as DC1-6. In DC-4, the progression of pathologic bone loss was described as chronic and acute.

**Chronic (slow to moderate progression of the disease):**

- Localized (peri-implantitis to 1 implant)
- Focalized (peri-implantitis localized in 1 sextant/quadrant)
- Generalized (peri-implantitis>2implants in different quadrants)

**Acute (rapid peri-implant bone destruction):**

- Localized (peri-implantitis to 1 implant)
- Focalized (peri-implantitis localized in 1 sextant/quadrant)
- Generalized (peri-implantitis>2implants in different quadrants)

**Implant success index (ISI)**

Besides the above, Implant success index (ISI) was introduced by Abrishami in 2014.

**CRITICAL APPRAISAL OF DIFFERENT CLASSIFICATIONS**

The first attempt to classify defects in implant bone was done by Spiekerman in 1984, who described the type of bone loss around implant according to the shape of the defect. The classification failed to give a quantitative value to the amount of bone loss. This was followed by the classification given by Jovanovic, which mainly addressed the horizontal bone loss and a combination pattern was addressed.

Implant periapical lesions were classified as inactive and infected by Reiser and Nevins in 1995. The first attempt to classify retrograde peri-implantitis was done by Sussman. In 2006, Diago et al. described retrograde peri-implantitis as acute non-suppurated, acute suppurated, or chronic according to its evolution. Shah et al. in 2016 gave a simpler classification of retrograde peri-implantitis.

Vanden Bogaerde described the bone defects as closed and open. It is the simplest classification but it lacks important information due to its broad approach. In the same year, Lang et al. gave a complete classification by including clinical, radiographic features and also guiding the treatment. It was the first classification that gave definite values for the definition of the stages and was not objective. Peri-implant pocket depth was included along with radiographic features and treatment. It was the first classification that gave a complete narration of the disease involved. But the radiographic bone loss was only differentiated as ≤2 mm and >2 mm. The severity of all the cases with radiographic bone loss >2 mm was grouped in one class, which cannot be justified.

In 2008, Schwarz et al. classified peri-implant bone loss as intraosseous and supraalveolar. Special consideration was given to dehiscence on the buccal aspect. Renvert and Claffey in their 2012 classification included implant fracture and mobility in their classification. Implant mobility >1mm horizontal movability was given the treatment of explantation. The degree of mobility was not considered. Koldsland et al. in 2010 grouped peri-implantitis under two categories. All the cases with radiographic bone loss ≥3mm were placed in one category. This classification also failed to address the severity of peri-implantitis as in Lang’s classification. Moreover, the classification was more primitive compared to Lang’s classification which was given half a decade earlier. In 2011, Nogueira F et al. described Peri-implant mucosal inflammation (PIMI) along with prognosis, treatment, and supportive implant treatment. But, the classification lacked the important parameter of diagnosis: the peri-implant pocket depth.
It was only in 2012 that Froum and Rosen addressed another important aspect: the severity of radiographic bone loss. Kazkhodazadeh and Amid in 2013 gave a classification system for peri-implant disease in association with natural teeth. Zhang et al. classified the peri-implant defects according to shape in the orthopantamograms. This system did not provide any quantitative and definite value and was more objective. Classifications were also given by Kazemi; Suzuki, Hsiao, and Misch; Ata-Ali et al. and Decker et al. included prognosis and Ramanaukaite and Juodzbalys evaluated peri-implantitis based on only radiographic bone level evaluation (mesial and distal).

The most detailed classification was given by Passi et al. in which all the important parameters required for the diagnosis of peri-implantitis were addressed. This was the first time that the grade of implant mobility was considered. Sarmento et al. and Canullo et al. in 2016 gave separate classifications based on the etiology of peri-implantitis.

Tallarico et al. defined terms such as acute, chronic, localized, fociized, and generalized in terms of peri-implantitis.

Most of the classifications proposed have different criteria for the definition of peri-implantitis. According to the AAP classification, peri-implantitis is described as radiographic evidence of bone level ≥3 mm and/or probing depths ≥6 mm in conjunction with profuse bleeding (in the absence of initial radiographs and probing depths). Thus, any system which has defined periimplantitis with pocket depth less than 6 mm or radiographic evidence of bone loss less than 3 mm cannot be incorporated as periimplantitis in actual sense by the AAP criteria. This necessitates the need for the introduction of a new classification system of peri-implantitis.

SUMMARY
Various classification systems have been introduced to classify peri-implantitis. Mere diagnosis of peri-implantitis is not enough as the cases of periimplantitis is rapidly increasing. It is the duty of the clinician to be aware of the classification systems and incorporate the most appropriate system in their routine classification.

Conflict of interest: None.