



## GUIDELINES FOR THE MAINTENANCE AND CARE OF DENTAL IMPLANTS: A NEW PARADIGM

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### ABSTRACT

Dental implants are an ideal replacement for a lost root, following which they undergo a prosthetic reconstruction once the healing is completed. Oral hygiene status must be evaluated and should be at an acceptable level prior to implant surgery, maintained during the procedure and also following the surgery in order to achieve a successful osseointegration. This review article suggests guidelines for maintenance and care of dental implants. The initial assessment should begin by updating patient's medical and dental histories. The clinician should evaluate the implant on the condition of the soft tissues, plaque index, clinical probing depth, bleeding on probing, suppuration, presence of keratinized tissue, mobility, peri-implant radiography and occlusion. If the clinical signs indicate the presence of peri-implantitis, radiography of the site is a requisite to confirm the diagnosis and appropriate treatment measures should be followed.

**KEYWORDS** : implant maintenance, peri-implantitis, implant care

### INTRODUCTION

Although a high survival rate of osseointegrated dental implants is well documented, several studies have reported that successfully osseointegrated implants are susceptible to disease conditions that may lead to a loss of the implant<sup>1</sup>. The aim of this paper is to brief about the reasons of implant failure, types of implant associated diseases, diagnosis, treatment and maintenance of osseointegrated fixtures.

Per mucosal seal of the soft tissue to an implant surface is the key factor for the success of implants. Failure to achieve an adequate seal will cause bacteria and their by-products to have a direct entry into the bone surrounding the implant. Studies<sup>2</sup> have demonstrated that sites of pre-existing infection can act as reservoirs for the periopathogens and can spread to colonize the implant, especially in patients with aggressive periodontitis. Other high-risk patients are those with diabetes mellitus, cigarette smokers and patients with poor plaque control<sup>3</sup>.

Maintenance protocol should include regular evaluation of implants and their surrounding tissues and prostheses; occlusal examination; review and reinforcement of oral hygiene; removal of plaque and calculus; treatment of disease and timely repair of prostheses and institution of customized preventive measure<sup>4</sup>. Following the restoration of an implant, patient should be re-evaluated every 3 to 4 months at regular intervals during the first year. During this period peri-implant tissues should be assessed and the frequency of periodontal maintenance should be determined<sup>5</sup>.

#### Updating of Medical and Dental Histories

The implant assessment should begin by updating patient's medical and dental histories. This step ensures that all conditions and therapies undergone are known to the clinician, thereby helping to identify patients in high-risk categories.

#### 1) Clinical examination of Implant:

**a) Soft-Tissue Assessment:** Assessment of soft tissue should include inspecting for any visual signs of gingival inflammation such as redness, swelling, alterations of contour and consistency, aberrant gingival form or the presence of fistulas.<sup>6</sup>

**b) Plaque Index:** Implant-specific plaque indices have been described by Lindquist et al and Mombelli et al<sup>7</sup>. Few studies have shown that bacterial adhesion is influenced by the surface roughness of implant while others have demonstrated no correlation between implant surface and the initiation of peri-implantitis. Although there is conflicting evidence, caution is advised for rough surface implants exposed in the mouth because

of a potentially greater tendency for plaque accumulation.

**c) Clinical Probing Depth:** A successful implant allows the probe to penetrate approximately 3mm<sup>8</sup> except in the case of a deeply submerged implant where a rigid plastic probe is ideally used. The peri-implant sulcus is probed with a blunt, straight periodontal probe that allows the measurement of distance between the soft tissue margin and a reference point on the implant to evaluate hyperplasia or recession, bleeding and suppuration. Etter and colleagues<sup>10</sup> reported that the "healing of the epithelial attachment" will be accomplished five days after clinical probing. Increase in both clinical probing depth and bleeding on probing over time are usually coupled with loss of attachment and loss of bone and should be viewed as signs of peri-implant disease.<sup>9</sup>

**d) Bleeding on probing:** In 1994 Lang et al demonstrated that healthy peri-implant sites were characterized by the absence of bleeding (0%), whereas increased BOP (67% and 91%, resp.) were seen in both sites of peri-implantitis and peri-implant mucositis. Gerber and colleagues<sup>9</sup> demonstrated that a minimum of 0.15 N of threshold pressure is required to avoid false-positive readings for bleeding on probing around oral implants.

**e) Suppuration:** Case reports have associated suppuration as an indicator of initiation or progression of peri-implantitis and its correlation has yet to be clearly identified<sup>11</sup>.

**f) Presence of Keratinized Tissue:** Studies show an association between lack of keratinized tissue and slight bone loss, greater accumulation of plaque, increased soft-tissue recession, increased bleeding on probing and greater gingival inflammation. However, few other studies reported no correlation between keratinized tissue width and implant survival and hence its intervention can only be determined on a case-by-case evaluation.

**g) Mobility:** A sudden increase in implant mobility would reflect a complete loss of osseointegration. Initial bone loss associated with peri-implantitis is observed to be marginal in the form of infrabony defects. Mobility should be assessed consistently, either manually or by automated methods such as Periotest dental measuring instrument (Siemens, Bensheim, Germany) or the Ostell instrument (Ostell, Gothenburg, Sweden)<sup>12</sup>. Mobility may be masked if only one implant in a multiunit splinted prosthesis is mobile. Hence, it has been recommended that fixed, multiunit, retrievable implant-retained prostheses be removed from time to time to assess mobility, gingival health and hygiene status.<sup>13</sup>

**h) Peri-implant radiography:** The distance from implant shoulder

to the alveolar bone crest is a reliable parameter to determine the standardization of radiographs. The stable landmark taken for the assessment of fixture is the implant shoulder in a one step implant system and the apical part of cylindrical implants in a two step submerged implants<sup>14</sup>. A mean bone loss of 1.5 mm is generally seen in the first year following the placement of implant-prosthesis after which a mean vertical bone loss of 0.1 mm occurs annually<sup>15</sup>.

**i) Evaluation of occlusion:**

Excessive occlusal forces results in problems such as abutment screw loosening, implant failure and prosthetic failure. Implant prosthesis should have a mild contact in centric occlusion and no contact during lateral movements<sup>16</sup>. Parafunctional habits should be documented and treated, as such excessive concentrated force can result in rapid and substantial peri-implant bone loss.

**II) Diagnosis:**

**a) Healthy** :if there are no clinical signs of inflammation then the patient's implants are classified as healthy

**b) Implant Mucositis:** Implant Mucositis is defined as a localized inflammatory lesion within the soft tissue, without progressive loss of bone, apart from the original 0.2–2.0 mm cratering that occurs shortly after abutment connection around some osseointegrated implants. Mucositis can be identified clinically by redness and the presence of bleeding with a gentle probing pressure < 0.15 N.

**c) Peri-implantitis :** Peri-implantitis is characterized by a localized inflammatory lesion that includes loss of bone around an osseointegrated implant. In cases of peri-implantitis, the mucosal lesion is frequently associated with pus or increased clinical depth of probing along with bleeding and loss of supporting marginal bone beyond the original bone loss.

**III) Treatment**

**A) Home Care:**

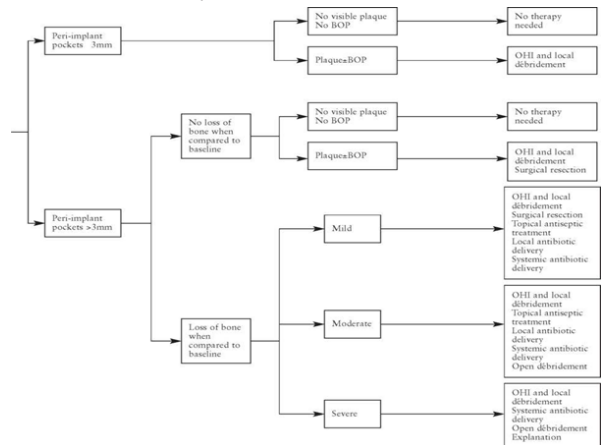
- 1. Manual tooth brushes-** A medium sized short head soft tooth brush with bristles made of synthetic material and of rounded ends are recommended as implants are more sensitive in terms of erosion through mechanical force. A modified bass technique of tooth brushing is to be followed<sup>17</sup>.
- 2. Mechanical tooth brushes-** Automated mechanical tooth brushes are superior to manual brushes as these devices may have rotary, reciprocating or sonic action<sup>17</sup> and aid in better plaque removal.
- 3. Dental floss -** Super-floss is an excellent aide for all types of implants. Gentle insertion and motion is advised to prevent trauma to the adjacent tissue. Woven flosses with threaders facilitate to cleanse larger embrassure spaces and under connector bars<sup>18</sup>. Yarns are a cost-effective alternative but are not used on rough surfaces or around restorations as there is the possibility of retention of fibers. They are available in different widths and are used in a "shoe-shine rag" fashion around the implant post.
- 4. Interproximal brushes-** These are available in various shapes and with interchangeable tips. These brushes have an exposed tip of metal wire that may scratch the titanium surface of the abutment if an excess pressure is exerted or if the brushes are worn. A plastic coated wire brush is recommended to avoid such scratches.

**B) Professional maintenance**

- 1. Scaling and Root planing :** Professional maintenance includes removing both hard and soft deposits using plastic scalers. Some plastic instruments are extremely flexible and can be difficult to remove calculus from implant surfaces. Plastic instruments that are reinforced with graphite are more rigid and can be sharpened. Traditional stainless steel, titanium, gold-tipped instruments and ultrasonic tips seem to significantly scratch the surface of implant and can facilitate biofilm growth<sup>19,20</sup>. Recent studies have shown that newly developed plastic-covered<sup>21</sup> and novel metallic copper alloy

ultrasonic scaler tips have minimal damage on the titanium surface of implants.

- 2. Occlusal Adjustment:** Traumatic occlusion is a potential reason for the breakdown of bone around an implant<sup>22</sup> and cause bone resorption around implants with 180 µm of excess suprastructure height, even in the absence of inflammation in the peri-implant tissue<sup>23</sup>. During the evaluation of occlusion, shim stock should be held only with tightly clenched teeth so as to avoid excessive occlusal loading of implants. For fixed restorations, light centric contacts and eliminating noncentric interference is recommended.
- 3. Locally Applied Chemotherapeutics :** Mechanical debridement along with the application of chlorhexidine may be beneficial for patients with peri-implant mucositis so as to reduce plaque, inflammation and probing depth and to achieve clinical attachment level<sup>24</sup>. Arestin Atridox, PerioChip, or Dentomycin or a subgingival irrigation with an antiseptic agent such as peroxide, chlorhexidine with a plastic irrigation tip may aid to slow or reverse the inflammation<sup>25</sup>. A cannula with a nonmetallic rounded tip with side escape portals can be used and care should be taken while inserting it to the base of implant sulcus to prevent fluid distention into surrounding tissues and also to avoid gouging the surface<sup>26</sup>. Treatment of peri-implantitis is advocated using local administration of Arestin [minocycline hydrochloride microspheres 1 mg (Orapharma, Horsham, PA)]<sup>27</sup> and has led to slight improvements in clinical and microbiological parameters for up to 12 months.<sup>28</sup>
- 4. Laser therapy:** Erbium-doped yttrium aluminum garnet (Er:YAG) laser therapy or the application of air abrasives<sup>29</sup> or diode laser irradiation<sup>30</sup> has been suggested as methods to decontaminate the implant surface but only limited data is available that any of these methods improve clinical conditions in cases of peri-implantitis.
- 5. Surgical treatment :** Surgical interventions used to treat peri-implantitis include resection associated with implantoplasty<sup>31</sup> or regenerative therapy<sup>32</sup>. Surface decontamination is essential during the treatment of peri-implantitis, but alone will not lead to substantial re-osseointegration of a previously contaminated implant surface<sup>33</sup>.



**Table 1: Treatment protocol for peri-implant infection by Mombelli and Lang**

**CONCLUSION**

The long-term success of implants and a predictable replacement for natural teeth can be ensured through a regular assessment of patient's general and oral health, professional implant maintenance protocol and by advising the patient to follow diligent care at home. Clinicians must take care of identifying and treating implant mucositis lesions at an early stage, as this condition can often progress to peri-implantitis<sup>34</sup>.

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