Long-term predictability of dental implants and their associated restorations has been demonstrated. As the number of patients treated with dental implants continues to grow, dentists must accept the challenges of maintaining these sometimes complex restorations.

Proper monitoring and maintenance is essential to ensure the longevity of the dental implant and its associated restoration through a combination of appropriate professional care, evaluation, and effective patient oral hygiene. The value of using conventional periodontal parameters to assess peri-implant health has not been completely defined. Therefore, it is important that clinicians understand the similarities and distinctions between the dental implant and the natural tooth. Subsequently, by examining the similarities and differences between a natural tooth and a dental implant, basic guidelines can be provided for maintaining the long-term health of dental implants.

Direct anchorage of an implant to alveolar bone provides a foundation to support a dental prosthesis and transmits occlusal forces to the alveolar bone. This is the definition of osseointegration. Recently, the focus of implant dentistry has expanded from obtaining osseointegration, which is highly predictable, to include the long-term maintenance of health of the peri-implant hard and soft tissues. This can be achieved through appropriate professional care and patient cooperation via effective home care. Patients must accept the responsibility for implant maintenance, therefore the patient selection process should take into account the patient’s willingness to maintain the fixture and restoration. Diagnosis and treatment planning based on a risk-benefit analysis should be performed subsequent to a thorough medical, dental, head-and-neck, psychological, temporomandibular joint, and radiographic examination.

There is evidence that bacterial plaque not only leads to gingivitis and periodontitis, but also can induce the development of peri-implantitis. Thus, personal oral hygiene must begin at the time of dental implant placement and should include the use of various adjunctive aids to clean the altered morphology of the peri-implant region effectively.
before, during, and after implant placement. For example, interproximal brushes can penetrate up to 3 mm into a gingival sulcus or pocket and may effectively clean the peri-implant sulcus. In addition to mechanical plaque control, daily rinses using 0.1% chlorhexidine gluconate or Listerine (Pfizer) may provide additional benefits.

Effective oral hygiene around dental implants can be challenging to achieve over the long term, and the patient, dentist, and dental hygienist must exercise considerable effort to achieve the desired results. During the maintenance visit, the dental professional should concentrate on the peri-implant tissue margin, implant body, prosthetic abutment-to-implant collar connection, and the prosthesis. Clinical inspection for signs of inflammation (ie, bleeding on probing), exudate, mobility, and increased sulcus depth, and a radiographic evaluation of the peri-implant area still remain the standard approach to evaluating the status of endosseous dental implants. For example, successful and stable endosseous dental implants exhibit no mobility. But, if clinically perceptible mobility is detected, then subsequent to radiographic evaluation of the implant and its bony housing, the abutment retaining screw and/or prosthetic abutment-collar interface should be examined for looseness or breakage.

Therefore, different types of clinical assessment are used routinely, except for periodontal probing around peri-implant tissues that appear to be in a state of good health. The baseline data and data from subsequent maintenance visits should be recorded in the patient’s chart to properly assess the peri-implant status over time. Subsequent to a thorough intraoral examination, unless there is visual evidence of soft-tissue changes (ie, inflammation of peri-implant tissue with even slight attachment loss or mucoitis), routine probing of the peri-implant tissue should not be performed.

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Usually during the first year after the implant is restored, a 3-month maintenance schedule should be implemented, especially if the patient has lost teeth because of periodontal disease. However, if after 12 months the patient’s implants are stable and peri-implant tissues are healthy, then a 4- to 6-month maintenance regimen can be implemented.16 The clinician must be cognizant of each patient’s level of home care effectiveness, systemic health, and status of the peri-implant tissues when determining these intervals.

With dental implant patients, the dental professional must evaluate the prosthetic components for plaque, calculus, and the stability of the implant abutment. Radiographs of dental implants should be taken every 12 to 18 months during these maintenance visits.17 For dental implant restorations that are screw-retained, the clinician should remove the prosthesis at least once a year to more easily assess the status of the peri-implant hard and soft tissues, the existence of mobility of the prosthetic components or the implant fixture itself, and the patient’s level of home care.18 The presence of any signs of infection, radiographic evidence of peri-implant bone loss, and/or neuropathy may be indicative of an ailing or failing implant.19

IMPLANTS VERSUS NATURAL TEETH

It is essential that the clinician understands the relationship between the gingiva and the structure it attaches to, be it a natural tooth or an implant. (Figures 1 and 2) The fiber orientation of the gingival cuff around a natural tooth attaches perpendicular to the long axis of the tooth (Figure 3). This acts as a barrier when a periodontal probe is inserted into the sulcus. The probe tip advances apically until the tip contacts these fibers.

This orientation is not observed around implants. With an implant, the gingival fiber orientation is parallel to the long axis of the implant (Figure 4). When a periodontal probe is inserted into the sulcus around an implant, the probe tip advances, passing between the fibers of the gingival cuff until the crestal bone prevents it from advancing.

The peri-implant mucosal seal may be a less effective barrier to bacterial plaque than the periodontal attachment around a natural tooth.20 There is less vasculature in the gingival tissue surrounding dental implants compared to natural teeth. This reduced vasculature, concomitant with parallel orientation of the collagen fibers adjacent to the body of the implant, makes dental implants more vulnerable to bacterial insult.21

During maintenance appointments, peri-implant periodontal probing should be performed only where signs of infection are present (ie, exudate, swelling, bleeding on probing, inflamed peri-implant soft tissue, and/or radiographic evidence of peri-implant bone loss). Lamert suggests that routine periodontal probing of dental implants should not be performed, because this procedure could damage the weak epithelial attachment around the implant, possibly creating a pathway for the ingress of periodontal pathogens.22

Commerically available plastic probes should be used when investigating the crevicular depth around dental implants. The probing depth around dental implants may be related closely to the thickness and type of mucoosa surrounding the implant. A healthy peri-implant sulcus has been reported to range from 1.3 to 3.8 mm, which is greater than the depths reported for natural teeth.23

The best indicator for evaluating an unhealthy site would be probing data gathered longitudinally.24

For all of these reasons, personal home care and consistent professional maintenance have proven to be critical to the success and longevity of endosseous dental implants. This is especially true in an environment with adjacent natural teeth, which if affected by periodontal disease could act as a reservoir for pathogenic bacteria and seed the peri-implant sulcus.25 The physical characteristics of the peri-implant soft tissues should be the focus of oral hygiene instruction. The absence of keratinized tissue in this critical area has not been unequivocally documented to indicate that peri-implant tissues are more vulnerable to the ingress of pathogenic bacteria. However, the ability of the patient to maintain good home care around dental implants is facilitated by the presence of keratinized tissue surrounding them. Thus, if a patient has no keratinized tissue around an implant, and a pull from a frenum or a chronic peri-implant mucositis exists, then placement of a soft-tissue autogenous or allogeneic connective tissue graft is recommended to facilitate proper mechanical oral hygiene.26

Specific clinical criteria associated with dental implants that should be monitored for an indication of early implant failure have not been clearly defined. Currently, the presence of fixture mobility is the best indicator of implant failure.27 Differing from natural teeth, healthy dental implants exhibit no mobility because of the absence of a periodontal ligament. Therefore, healthy implants should appear nonmobile even in the presence of peri-implant bone loss, if an adequate amount of supporting alveolar bone still exists.28

When monitoring the health of the peri-implant soft tissues, the practitioner should be looking for changes in soft-tissue color, contour, and consistency. The presence of a fistulous tract is a serious clinical sign and could indicate the presence of serious pathologic or implant fracture.29

BLEEDING ON PROBING

There is controversy in the literature as to the accuracy and significance of bleeding on probing around dental implants.30 Presently, the literature suggests that detection of bleeding on probing can be used as an early indicator of peri-implant disease or concurrently with other signs of implant failure, ie, bone loss. However, as previously mentioned, routine probing is not recommended.31

RADIOGRAPHIC EVALUATION

Radiographic assessment is one of the most useful means of evaluating the status of an
endosseous dental implant. Invasion of biologic width, predictable remodeling, or so-called “saucerization” is associated with an average marginal bone loss of 1.5 mm during the first year following prosthetic rehabilitation. This is followed by an average of 0.2 mm of vertical bone loss in each subsequent year. Thus, progressive bone loss around a dental implant that exceeds these averages may be indicative of an ailing or failing implant. Lastly, during radiographic evaluation, no evidence of a peri-implant radiolucency (a radiolucent area between the implant and surrounding bone) should be found, because such a rarefaction usually indicates infection or failure to osseointegrate.

PROFESSIONAL CLEANING INSTRUMENTATION

Instruments made of metal, such as stainless steel, should not be used to probe or scale dental implants. The reason is that the metal can scratch or contaminate the implant surface, or cause a galvanic reaction at the implant-abutment interface.

Hand scalers for cleaning dental implants can be plastic, Teflon, gold-plated, or made of wood (Figures 5 and 6). When using gold-plated curettes, the manufacturer recommends not sharpening these instruments, as the gold surface could be chipped, exposing the harder metal underneath the coating. Stainless steel scaling instruments may abrade the implant surface, stripping off any surface coatings such as hydroxyapatite (HA), as the instrument’s hardness is greater than the titanium alloy from which the implant is fabricated (Figure 7).

Other commonly used devices and materials contraindicated for use with dental implants are sonic and ultrasonic scaling units, air powder abrasive units, and flour or pumice for polishing. Ultrasonic, piezo-electric, or sonic scaler tips may mar the implant’s surface, leading to microroughness and plaque accumulation. The stainless steel tip may also lead to gouging of the implant’s polished collar (Figure 8). However, some clinicians suggest the use of a sonic instrument with a plastic sleeve over the tip for scaling dental implants. Air powder polishing units may also damage the implant surface and should not be used for implants (Figure 9). Even the use of baking soda powder in these units may strip the surface coating from the implant. Additionally, the air pressure from these units may detach the soft-tissue connection with the coronal portion of the implant, leading to emphysema. Titanium or titanium alloy surfaces of dental implants can be polished using a rubber cup with a nonabrasive polishing paste or a gauze strip with tin oxide.

Not only is the hygiene armamentarium important, but so are the home care techniques used to maintain endosseous dental implants. Pa...
Patients should be taught the modified bass technique of brushing using a medium-sized head, soft-bristled toothbrush. Patients should be instructed in the proper use of interdental brushes. The plastic-coated wire brush is the only type of interdental brush to be used with dental implants, since these brushes will not scratch the implant surface (Figure 10).

Recently, automated or electric toothbrushes have been advocated for daily home care. These devices may be rotary, circular, or sonic in design. The key to their effectiveness is proper instruction in their use, and then diligent daily use by the patient.

As with natural dentition, adjunctive cleaning aids such as flossing are still valuable. An implant patient's home care regimen should be individually tailored according to each patient's needs. These needs are based on the location and angulation of the dental implants, the position and length of transmucosal abutments, the type of prosthesis, the dexterity of the patient, and the rate of plaque and calculus accumulation.

Another popular category of cleansing device is the oral irrigator, used with or without an antimicrobial solution. Studies have suggested that the addition of certain antimicrobials to the lavage during ultrasonic instrumentation or administration by subgingival irrigation following scaling and root planing therapy alone.42,43 However, oral rinses with antimicrobial properties, such as Listerine or chlorhexidine, have been advocated for use in patients with implants.44-46

SUMMARY
When dental implants were first introduced, the emphasis for long-term success was on the surgical phase of treatment. Subsequently, the emphasis changed from a focus on the surgical technique to proper fixture placement, which would be dictated by the prosthetic and aesthetic needs of each patient. In more recent years, implant maintenance and effective patient home care have been emphasized as two critical factors needed for long-term success of dental implants.

Acknowledgment
The authors would like to thank Dr. Emma Galvan for her editorial assistance with this article.

References

After reading this article, the individual will learn:

• the importance of professional and home hygiene care for dental implant patients, and
• professional and home hygiene care techniques for dental implant patients.

**Continuing Education Test No. 75.2**

To submit Continuing Education answers, use the answer sheet on page xx. On the answer sheet, identify the article (this one is Test 75.2), place an X in the box corresponding to the answer you believe is correct, detach the answer sheet from the magazine, and mail to Dentistry Today Department of Continuing Education.

The following 8 questions were derived from the article "Oral Hygiene and Maintenance of Dental Implants by Lee H. Silverstein, DDS, MS, and Gregorl M. Kurtzman, DDS, on pages 70 through 75."

### Learning Objectives

1. Routine probing of implants ____.  
   a. is not recommended in the absence of the signs of inflammation or implant mobility  
   b. should be performed at each recall appointment  
   c. is weaker around implants  
   d. all of the above

2. Radiographic monitoring of implant bone levels should be performed ____.  
   a. every 12 to 18 months  
   b. 3 months following restoration of the implant  
   c. at every hygiene appointment  
   d. every 18 to 24 months

3. Peri-implantitis has been associated with ____.  
   a. bacterial plaque  
   b. mobility of the implant  
   c. gingival inflammation  
   d. all of the above

4. Bone loss of 1.5 mm during the first year following placement of the implant is ____.  
   a. considered a sign of peri-implantitis  
   b. normal  
   c. a sign of occlusal overload of the implant  
   d. both a and c

5. A stainless steel scaler may ____.  
   a. remove surface treatment (ie, HA) from the implant surface  
   b. scratch the titanium surface  
   c. assist in removing calculus from the sulcus  
   d. a and b

6. Presence of a fistula may indicate ____.  
   a. fracture of the implant  
   b. pathologic process associated with the implant  
   c. A fistula cannot be associated with the implant because the implant is not a biological device.  
   d. a and b

7. With regard to implants, electric toothbrushes ____.  
   a. should not be used, as they may loosen fixation screws  
   b. may damage the implant surface  
   c. are a good adjunct to home care  
   d. are not as effective as a manual toothbrush

8. The peri-mucosal seal around implants versus natural teeth ____.  
   a. is similar  
   b. weaker around natural teeth  
   c. weaker around implants  
   d. varies from patient to patient