Oral Health Maintenance of Dental Implants

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Continuing Education Units: 2 hours

This continuing education course is intended for hygienists and dental assistants. In recent years, the demand for dental implants has risen greatly. Not only have techniques improved, but the benefits that implants provide patients have increased as well. Dental implants can improve appearance, confidence, and self-esteem; preserve remaining teeth; improve a person’s ability to speak and masticate properly; and eliminate the need for full and partial dentures.

Overview
In recent years, the demand for dental implants has risen greatly. Not only have techniques improved, but the benefits that implants provide patients have increased as well. Dental implants can improve appearance, confidence, and self-esteem; preserve remaining teeth; improve a person’s ability to speak and masticate properly; and eliminate the need for full and partial dentures. Because dental implants represent a significant financial investment and require long-term maintenance by the patient for a healthy peri-implant environment, the direct impact of oral hygiene maintenance by the patient will determine long-term prognosis and success of the dental implant. ¹

Osseointegrated dental implants are being placed with increased frequency. It is estimated that approximately 800,000 implants are placed in the United States annually. ² Many of the current home care treatments for periodontal maintenance of natural teeth also can be used with dental implants, but a better understanding of oral health maintenance is crucial for the health and longevity of dental implants.

The mucoperiosteal-implant seal is the major factor in determining long-term prognosis. Indigenous oral bacteria attaching to implant surfaces can lead to the breakdown of the biological seal surrounding the dental implant. ³ Thus, long-term maintenance of a healthy peri-implant environment has a direct impact on long-term prognosis and success.
Today’s titanium implant procedures are performed using a low-speed drill and profuse irrigation. This keeps the bone temperature below the critical 117°F and permits formation of new bone cells around the implant (osseointegration). Research has shown that previous implantation procedures utilizing high-speed drills produce excessive heat. This heat creates osteolytic activity and leads to the eventual failure of the implant.

While the peri-implant disease process resembles that of periodontitis, treatment and maintenance are more complex. A build-up of dental plaque biofilm around implants has been correlated to increased alveolar bone loss. The tissues around dental implants react to bacteria similarly to the tissues around natural teeth. In fact, plaque develops more rapidly and in larger amounts around titanium implant abutments than around natural teeth. Therefore, close cooperation and teamwork among dental health care providers is essential to the success of implant procedures. Dental implant patients need to understand that good oral hygiene is a key element in the success of their dental implant.

**Learning Objectives**

Upon the completion of this course, the dental professional will be able to:

- Understand the importance of oral hygiene maintenance as it applies to the success rate for implants.
- Describe the different uses of auxiliary aids and antimicrobial rinses.
- Explain the correct usage of an oral irrigator around implants.
- List the components of a clinical assessment during recare visits.
- Discuss the usage of metal instruments on the implant surfaces.

**Course Contents**

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**Glossary**

- **antimicrobial** – destroying or preventing the development of microorganisms; also, an agent with such activity.
- **bacteremia** – introduction of bacteria to the bloodstream.
- **bacteriostasis** – inhibition of bacterial growth without destruction.
- **cytotoxic** – destructive to cells.
- **embrasure** – v-shaped space between the proximal surfaces of adjacent teeth.
- **fibroblast** – cell that develops connective tissue.
- **galvanic** – of or relating to direct-current electricity, especially when produced chemically; also having the effect of an electric shock.
- **junctional epithelium** – a cuff-like band of stratified squamous epithelium continuous with the sulcular epithelium encircling the tooth providing a seal at the base of the sulcus. Periodontal disease causes it to migrate from the cementoenamel junction (CEJ) along the root surface exposing the cementum.
- **osteolytic** – pertaining to the loss of bone.
- **osseointegration** – attachment of healthy bone to an implant.
- **pellicle** – thin coating of salivary materials that are deposited on tooth surfaces.
- **peri-** – prefix: around or surrounding (for example, “perioral” means “surrounding the mouth”).
- **pontic** – an artificial tooth.
- **radiolucent** – allowing radiation to pass through, presenting as a dark area on a radiograph.
**Substantivity** – a property of certain active ingredients that inhibits growth of bacteria on the skin and other body tissues.

**Preventive Maintenance - Patient Home Care**

The latest preventive maintenance steps for dental implants involve two distinct aspects: (1) patient home care and (2) clinical maintenance procedures.

**Patient Home Care**

No single device has been shown to remove plaque from all surfaces of an implant reconstruction. While there are numerous types of brushes, threading systems, flosses, and other oral hygiene devices on the market, the literature substantiates the need to minimize the number of devices prescribed for patient home care. Patient compliance, an essential aspect of any maintenance program, predominantly depends upon the relative simplicity of a procedure, the time required, and a minimum number of devices being employed.

Studies indicate that when multiple oral hygiene devices are prescribed, patients can become discouraged and as a result, may be less motivated. However, research shows additional plaque inhibition with a combination of toothbrushing, auxiliary aids, and antimicrobial mouthrinses. For this reason, it is important to consider appropriate combinations when making recommendations.¹

Various types of toothbrushes may be used to clean implant superstructures. Exposed facial and lingual areas of the implant, its fixed and/or removable prosthesis, and surrounding gingival tissues can be cleaned using a soft, multi-tufted nylon toothbrush. There are many different brush handle angles to choose from, the dental professional should assist the patient in choosing a handle that allows the patient to access all areas of the oral cavity. The modified Bass technique should be used, or a short, horizontal back-and-forth movement can be employed. The brush should be held at a 45-degree angle where the abutment post meets the gingival tissue (Figures 1 & 2).² Patient toothbrushing techniques often miss cleaning the most lingual aspect of the titanium abutment cylinders, so special attention to the lingual areas should be emphasized.¹⁰

**Preventive Maintenance - Manual and Power Toothbrushing**

Rotary, uni-tufted power brushes (Rotadent® by Zila, Inc) (Figure 3), oscillating-rotating brushes (Oral B® by Oral B (Figure 4) and sonic brushes (Sonicare® by Philips Oral Healthcare (Figure 5) do not damage polished implant surfaces and also can be safely used to clean the facial, lingual, and interproximal areas of the implant. Many power brushes are equipped with soft interchangeable bristle heads (flattened, rubber-cup-like, short and long pointed in shape). The short and long pointed tips are ideal for reaching proximal areas of the tooth,
those areas with wide embrasures, and those located beneath the pontic portion of a fixed bridge. The hollow cup should be used on the facial and lingual aspects of the implant and adjacent teeth. The brush tip should be dipped in a 0.12% solution of chlorhexidine gluconate (i.e., Zila Pharmaceuticals’ Peridex® or Colgate’s PerioGuard®), which shows a reduction in certain bacteria by 54 to 97 percent through six months use. The very fine bristles of the Rota-dent® simultaneously debride the implant surface and deliver the antimicrobial solution to the crevicular area. One oral hygiene implant study examined the Rota-dent® and the Proxabrush Interdental System® (manual interproximal cleaning aids from the Sunstar Americas Co) (Figure 6). Results demonstrated “virtually no change in surface appearance from the original machined implant and its surface irregularities.”

Preventive Maintenance - Auxiliary Aids, Antimicrobial Rinses, and Dentifrice

In certain situations, interproximal brushes with small brush heads such as a Sunstar Americas GUM® End-tuft (Figure 7) may be necessary to gain easier access. However, such devices must be plastic-coated because metal can damage or contaminate an implant’s titanium surface. An interdental brush (Figure 8), can be used to massage the gingival tissue around an implant to increase blood flow and enhance the tone of the surrounding gingiva. The patient should be instructed to insert the tip interdentally in an occlusal direction, pressing the side of the tip against the marginal gingiva and applying a gentle rotary motion.

Oral B Super Floss® (Figure 9), a wide band of ribbon with one end designed for use as a threading device, can be threaded around abutments and beneath frameworks. A sawing motion polishes the prosthesis and removed plaque biofilm. Super Floss®, or Postcare® (Sunstar Americas) (Figure 10), which is especially designed for implant care, can be used in conjunction with chlorhexidine gluconate.
The oral irrigator is a beneficial adjunct for removing supragingival soft debris around implants (Figures 12 & 13). However, caution must be exercised by the dental implant patient when using this device. Incorrect use and excessive water pressure can damage the junctional epithelium, leading to bacteremia. To prevent these problems, instruct patients to use the lowest water-pressure setting. Furthermore,

Used in the manner of a “shoe-shine rag” (i.e., in a side-to-side motion), the ribbon polishes the back and sides of the post from top to bottom. This cleansing action produces excellent results for plaque control around fixtures and abutment cylinders as well as the cervical aspect. In areas with smaller interfixtural dimension, traditional unwaxed floss may be used with a floss threader (Figure 11).
direct them to place the irrigator tip in the interproximal area horizontal to the implant and along its gingival margin to avoid subgingival spray. An oral rinse containing chlorhexidine gluconate or phenolic compounds (Listerine®, Johnson & Johnson) may be used as an irritant.

Microbial plaque plays a major role in both adult periodontitis and peri-implantitis. Similar microbial flora are found around the gingival crevices of both adult periodontal disease and failing implants. The regular use of chemotherapeutic agents such as antiseptic mouthrinses may be recommended to the dental implant patient to combat these concerns.

Chlorhexidine gluconate is a safe, nontoxic adjunct to other oral hygiene procedures in the maintenance of dental implants. An American Dental Association (ADA) accepted chlorhexidine gluconate mouthrinse can be very effective due to its substantivity (binding activity to the tissues in the oral cavity and on titanium abutment surfaces). Treating implant patients with chlorhexidine mouthrinses aids in fibroblast attachment to implant surfaces. The dental pellicle acts as a chemical reservoir source, releasing chlorhexidine over a prolonged period of time in concentrations sufficient to maintain bacteriostasis.

About 90 percent of the cultivable bacteria are inhibited for about five hours with a 0.12 percent concentration of chlorhexidine with a 30-second rinse. Chlorhexidine can be applied with a cotton swab when composite restorations are present. (Staining of composites often accompanies long-term use of chlorhexidine rinses.) Patients should be advised that chlorhexidine use also can diminish salt taste sensation. Peridex® and PerioGard® have no effect on the implant surface itself. It is probably safe to assume that other antimicrobial agents such as phenolic compounds (Listerine® and Crest Pro-Health®) also produce no surface alteration. As an oral rinse, application is recommended once daily with a chlorhexidine gluconate formulation or twice daily with most over-the-counter therapeutic rinses.

Auxiliary aids such as angled brushes, floss threaders, sulcular brushes, Stim-U-Dent® Interdental Cleaners (Johnson & Johnson), the Postcare® flossing aid, and irrigation devices are all alternative secondary mechanical plaque-control aids, but again, limiting the number of devices is important for patient compliance.

Disclosing solutions and tablets are a valuable aid in revealing the presence of plaque to the implant patient. Inspection of disclosed areas assists the patient in identifying areas of plaque retention and provides immediate feedback on the effectiveness of oral hygiene procedures.

Antimicrobial dentifrices containing fluoride (for abutment teeth) are another option to consider for home care. Those containing stannous fluoride (Crest Pro-Health®) or triclosan (Colgate Total®) provide antiplaque and antigingivitis benefits, unlike sodium fluoride products. Stannous fluoride also protects against sensitivity which is more common among periodontal patients.

Preventive Maintenance - Clinical Maintenance Procedures

The major difference between gingival attachment to a natural tooth and an implant is that the implant surface lacks cementum with connective tissue fiber inserts. Gingivitis most likely progresses to periodontitis around the implant due to the unreliability of the perimucosal seal and the lack of fiber barriers between the implant and the soft tissue of the sulcus. If the titanium oxide layer is disrupted during oral hygiene procedures, the soft tissues may be exposed to titanium metallic ions that can cause potentially cytotoxic reactions, compromising the implant. Therefore, special attention should be given to prevent trauma or infection to the sulcus.

At each recare visit, the dental professional should perform a clinical assessment of peri-implant soft tissues. Begin with a gentle probing. This is a controversial procedure because puncturing the fragile epithelial attachment is a concern. If probing is done at each maintenance appointment, it should be performed cautiously and always with a plastic probe. A plastic periodontal probe is extremely easy to read, will not contaminate the titanium surface, is gentle to tissue, and safe around dental implants.

Some clinical researchers suggest that periodontal probing be performed at infrequent
intervals at one site (same site each time) with light pressure. It is recommended that the periodontal probe be dipped in chlorhexidine between measurements to avoid contaminating a healthy site with microflora from a diseased site. Increased probing depths have been correlated with failing implants; 58 percent of failing implants are characterized by pocket depths greater than 6mm. During gentle probing, check for bleeding, tissue tone, color, size, consistency, and retractability. All of these findings may provide valuable information concerning the health of the implant, especially if changes over time are carefully monitored.

Note the presence of hard and soft deposits around abutments. Pathogenic bacteria such as gram-negative anaerobic bacteria, including *bacteroides* *forsythus*, *actinobacillus* *actinomycetemcomitans*, *porphyromonas gingivalis*, and *treponema denticola* have shown strong evidence regarding periodontal disease and failing implant sites. It is the dental professional’s responsibility to monitor plaque biofilm and calculus levels and provide adequate home care instructions. After the soft tissue has been examined, evaluate mobility of the implants, transmucosal abutments, and prosthetic superstructure. Seventy-eight percent of failing implants have excess mobility.

Possibly the most important evaluation tool regarding the implant patient is the dental radiograph. It is the most reliable of all the conventional periodontal indices for evaluating failing implants. A mobile implant may display a narrow, radiolucent space surrounding the implant-bone interface. Radiographs can assess bone height and density and show the functional relationship between prosthesis, implant, and abutment components. It is suggested that radiographs (excluding the panoramic baseline radiograph taken one week post-surgery) be taken every three months after initial placement of the implant. After the first year, radiographs should be taken once each year. The world renowned Brånemark Group found that an average marginal bone loss of 1.5mm occurred during the first year of prosthesis connection and an average of 0.1mm every year thereafter. Any bone loss exceeding these averages should raise concern.

**Debridement**

In addition to regular self-care procedures, a periodic professional oral prophylaxis is required to maintain a healthy oral environment. Professional dental prophylaxis is essential in every periodontal maintenance case. For dental implant plaque and calculus removal, only instruments that do not damage the implant surfaces may be used. Commercially pure titanium is soft, non-magnetic, and passive. These metallic surfaces develop a layer of titanium oxide that does not undergo any further breakdown under physiologic situations. Damage can lead to changes in the surface chemistry of the material, resulting in corrosion. Surface roughness and corrosion facilitate plaque retention, ultimately compromising the implant. It is therefore imperative that no maintenance procedure directly affect this titanium oxide surface layer.

Conventional metal curettes as well as sonic and ultrasonic scalers cause considerable changes to the implant surface. Only instruments made of plastic should be in contact with the implant. The current literature continues to support the use of plastic scalers rather than metal instruments for any procedure involving the implant surface, because metal instruments significantly alter the titanium surface with scratches.

The use of a dissimilar metal (such as stainless steel) on titanium may potentiate galvanic differences that lead to corrosion. The use of these dissimilar metals on implant surfaces have been studied *in vitro*, comparing the number of human gingival fibroblasts attaching to the surface of a commercially pure titanium-alloy curette. Results showed a significant reduction in the number of fibroblasts attaching to titanium implants that had been scaled with the stainless-steel curette when compared to the plastic and titanium scalers.

Ultrasonic instrumentation is contraindicated with dental implants. Ultrasonic scalers may severely disrupt the titanium dioxide surface, leading to a multitude of grooves and a roughened surface, which can lead to further plaque retention and compromise the implant. A study utilizing a modified ultrasonic instrument with a custom-designed delvin plastic tip showed
that the standard ultrasonic instrument caused considerable scratching and gouging to the titanium implant. Shallow scratches made with the metal ultrasonic could be polished smooth, but the deeper scratches could not. The modified ultrasonic instrument produced noticeable but minimal changes that when polished, did not appear to be microscopically different from the polished control. Therefore, the modified ultrasonic instrument may be a promising device for maintenance of the dental implant.\textsuperscript{21,27} No definite answer can be made concerning ultrasonic use for implants at this time.

Some controversy exists concerning the effect of air-polishing on implant surfaces. Most studies suggest that air polishers such as the Prophy-Jet\textsuperscript{®}, (Dentsply) create random pitting or undulating wave-type of surface irregularities on the titanium. These irregularities alter implant surfaces to varying degrees.\textsuperscript{28} As such, air polishing is probably not suitable for use on dental implants at this time.\textsuperscript{29}

After hard deposits have been removed, the prosthesis and abutments may be selectively polished with a rubber cup and non abrasive polishing paste.\textsuperscript{30} Rubber cup polishing alone appears to be the least abrasive treatment. Rubber cup polishing with a prophylaxis paste or tin-oxide can be used on a regular basis on all implant surfaces. After polishing, the abutments should be rinsed gently with water and an antimicrobial solution applied with a swab to the peri-implant tissues.

If an implant is displaying increased probing depths, bleeding, or any other indication of the onset of failure, a controlled drug delivery system, such as Arestin\textsuperscript{®} (OraPharma), can be applied. These systems contain a tetracycline loaded fiber that is designed to slowly release the antibiotic over a ten-day period. The fibers can be used in single or multiple sites and may provide additional benefits to conventional scaling and root planing.

A strict prophylaxis recare schedule should be established and maintained to monitor the oral health findings in dental implant patients. The patient is often seen for comprehensive oral hygiene instructions and soft-tissue examination within the first week after the prosthesis is placed. A follow-up visit should be scheduled for one month later. At this appointment, the clinician should review the adequacy of home care procedures and re-evaluate the health of the peri-implant tissues. After the one month follow-up, a three-month recare schedule is suggested for a one-year duration. Depending on patient home care and the individual’s periodontal status, the patient may then be placed on a six-month recare schedule after the first year. During the first two years, no more than six months should elapse between oral hygiene visits.

**Summary**

The dental professional’s role is to determine the dental implant patient’s individual and specific self care needs. Recommendations and instructions to patients are often determined by the prosthesis design, location and angulation of the implants, the length and the position of the transmucosal abutments, and patient habits such as smoking,\textsuperscript{32} oral health motivation, and manual dexterity.\textsuperscript{33} To ensure optimal peri-implant health, the patient must maintain daily biofilm removal and maintain regular professional care. The negation of early microbial accumulation on the dental implant surfaces and the elimination of at least 85 percent of plaque biofilm by the patient\textsuperscript{35} is crucial for long-term success.
Course Test Preview
To receive Continuing Education credit for this course, you must complete the online test. Please go to www.dentalcare.com and find this course in the Continuing Education section.

1. ___________ is the major factor in determining long-term prognosis of the dental implant.
   a. The mucoperiosteal-implant seal
   b. Using the high-speed handpiece during the procedure
   c. The frequency of professional recare visits
   d. Using power toothbrushes

2. The _____ speed drill is preferred because it produces _____ heat to keep the bone temperature at the critical _____.
   a. high ~ high ~ 171 degrees F
   b. low ~ low ~ 117 degrees F
   c. high ~ low ~ 107 degrees F
   d. low ~ high ~ 177 degrees F

3. Plaque develops more ________ and in ________ amounts around titanium implant abutments than around natural teeth.
   a. slowly ~ smaller
   b. rapidly ~ smaller
   c. rapidly ~ larger
   d. slowly ~ larger

4. ___________ have been shown to remove plaque from all surfaces of an implant.
   a. Brushes
   b. Floss
   c. Threading systems
   d. None of the above.

5. Studies indicate that when multiple oral hygiene devices are prescribed, at one time, the patient _________.
   a. may become discouraged and less motivated
   b. may become more motivated and encouraged
   c. compliance is not an essential aspect
   d. to date, no studies have been documented

6. The _________________ technique is the preferred toothbrushing method for dental implants.
   a. Fones
   b. Horizontal scrub
   c. Modified Bass
   d. Charter’s

7. Oral hygiene auxiliary devices, including scalers and periodontal probes, should be
   ___________.
   a. metal to remove all debris from implant
   b. made from same material as the implant
   c. plastic coated
   d. titanium
8. The oral irrigator may be utilized on dental implants, but caution must be taken, as incorrect use or excessive water pressure can lead to damage of the junctional epithelium and cause
   a. bacteremia
   b. bacteriostasis
   c. osteolytic
   d. osseointegration

9. The mouthrinse containing ____________ aids in the fibroblast attachment to implant surfaces.
   a. chlorhexidine gluconate
   b. phenolic compound
   c. plant alkaloids
   d. tetracycline

10. Gingivitis around dental implants probably progresses to periodontitis due to ____________.
    a. unreliability of the perimucosal seal
    b. the lack of fiber barrier between the implant and the soft issue of the sulcus
    c. lack of patient knowledge
    d. A and B

11. During periodontal probing, the clinician should check for ____________.
    a. bleeding of tissue
    b. tissue tone
    c. color and size of tissue
    d. consistency and retractibility of tissue
    e. All of the above.

12. The most important evaluation tool and the most reliable method to determine implant failure is ____________.
    a. mobility
    b. radiographs
    c. probing depths
    d. tissue tone

13. Ultrasonic instrumentation should ____________ be used with dental implants.
    a. never
    b. usually
    c. always
    d. rarely

14. If an implant is displaying increased probing depths, bleeding, or other indications of the onset of failure, you should ____________.
    a. have the patient step up home care maintenance to three times a day
    b. remove the implant before more damage is done
    c. apply a controlled drug delivery system
    d. see the patient on a weekly basis until condition is under control
15. A strict prophylaxis recare schedule should be established and maintained to monitor oral health findings in implant patients, and no more than _______ month(s) should elapse between oral hygiene/recare visits.
   a. one
   b. three
   c. twelve
   d. six

16. An increase of dental implants has risen greatly due to __________.
   a. improved techniques
   b. the benefits that implants provide
   c. patient’s understanding and demand
   d. All of the above.

17. A key element in the success of a dental implant is __________.
   a. consultation with the patient’s physician
   b. oral hygiene
   c. the age of the patient
   d. None of the above.

18. Treatment of both adult periodontitis and peri-implantitis may begin with effective microbial plaque removal and __________.
   a. surgical removal of any inflamed tissue
   b. in-office prophylaxis
   c. chemotherapeutic mouthrinses
   d. systemic medication

19. A 30 second rinse of 0.12 percent concentration of chlorhexidine can inhibit _____ percent of the cultivable bacteria for approximately _____ hours.
   a. 90 ~ 5
   b. 80 ~ 4
   c. 70 ~ 3
   d. 60 ~ 2

20. To ensure optimal peri-implant health, the dental professional must determine the patient’s individual and specific self care needs, such as _______.
   a. habits such as smoking
   b. oral health motivation
   c. manual dexterity
   d. All of the above.
References

About the Authors

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Dr. Connie Myers Kracher is Chair and Associate Professor of the Department of Dental Education and Director of the Dental Assisting Program at Indiana University - Purdue University Fort Wayne (IPFW). Connie is finishing her dissertation for her PhD in Global Leadership, with a minor in Corporate Management at Lynn University in Boca Raton, Florida. She holds a Master of Science in Dentistry from the Indiana University School of Dentistry in Oral Biology with a minor in Diagnostic Sciences, and a Bachelor of Science in Health Occupations Education. In addition to her CDA, she holds a Certificate in Expanded Restorative Procedures (EFDA). Dr. Kracher is a frequent contributor to the Dental Assistant Journal and is author of several ADAA courses.

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