SPECIAL REPRINT, JIRD® CE Article No. 3, 2015

Inside this issue:

Clinical guidelines for the management of peri-implant health
Anita Daniels, RDH, Carl Drago, DDS, MS & Ronnie J. Goené, DMD

Recare protocol for implant-supported restorations: A chairside guide
EDUCATIONAL OBJECTIVES

The overall goal of this course is to provide the reader with guidelines for self-care and ongoing professional care that can prevent peri-implant mucositis from developing into peri-implantitis.

On completion of the course, participants will be able to:

1. Discuss the differences between maintenance of natural teeth and implant-supported restorations.
2. Identify key actions that should be accomplished on professional recare visits.
3. Describe the relationship between bacterial plaque accumulation and peri-implant mucositis.
4. Summarize the principles of effective implant self-care.

ABSTRACT

Long-term success and patient satisfaction with dental implant restorations depend on proper maintenance and daily follow-up care by the patient, as well as professional care at intervals to be determined clinically. Otherwise, biofilm formation may result in peri-implant mucositis, which is etiologically similar to gingivitis in the natural dentition and is reversible with appropriate care. This article outlines some of the requirements for optimal patient self-care, professional monitoring, and maintenance.
Clinical guidelines for the management of peri-implant health

Anita Daniels, RDH†, Carl Drago, DDS, MS†† & Ronnie J. Goené, DMD††

Long-term success and patient satisfaction with dental implant restorations depend on efficient self-care by the patient, as well as professional care at intervals to be determined clinically. Otherwise, biofilm formation may result in peri-implant mucositis (etiologically similar to gingivitis in the natural dentition) that in turn may progress to peri-implantitis (etiologically similar to periodontitis) and subsequent loss of implants. This article outlines some of the requirements for optimal self-performed and professional infection-control procedures to minimize the risk of peri-implant disease developing.

Key Words: implant maintenance, peri-implant mucositis, peri-implantitis, supportive therapy

Introduction

As more patients opt for dental implant treatment, dental professionals must understand how to properly monitor and maintain the health of peri-implant tissues.1 More than three million Americans are estimated to have dental implants, with half a million more being added each year.2 Although favorable long-term results of implant therapy have been reported extensively, the microbiological challenge in the oral cavity may result in pathological reactions in peri-implant tissues, similar to those that may occur around natural teeth.3

As with natural teeth, there is evidence of a cause-and-effect relationship between bacterial plaque accumulation and the inflammatory lesions that develop in peri-implant tissues, collectively termed peri-implant diseases.4 Peri-implant mucositis is analogous to gingivitis around natural teeth5 (Fig. 1). It has been determined to be reversible.

Estimates of the prevalence of peri-implant mucositis vary (Jepsen et al6 43%; Derks and Tomasi7 19-65%). Although there are histological differences between peri-implantitis and periodontitis around natural teeth, peri-implantitis corresponds clinically with periodontitis (Fig. 2). The extent and severity of peri-implantitis varies; in one report, 16-28% of subjects exhibited severe bone loss around implants.8 It has been assumed that peri-implant mucositis is the precursor to peri-implantitis, just as gingivitis typically precedes periodontitis. One cause of peri-implant mucositis and peri-implantitis is residual cement around cement-retained restorations (Fig. 3).9

Both peri-implant diseases are considered to be infectious diseases. Therefore, the goal of treatment procedures should be elimination of the infection.10 However, evidence...
regarding the most effective therapeutic intervention for peri-implantitis is contradictory, and treatment outcomes are unpredictable. Schwarz et al in 2014 reported that despite clinically important improvements, complete peri-implant disease resolution may not result from any of the treatment protocols investigated. Prevention of peri-implant disease is thus highly desirable. A stringent self-care program for optimal oral hygiene as well as a regular professional recare program to monitor and identify concerns at the earliest stage can help to prevent peri-implant mucositis from developing into peri-implantitis.

**Patient self-care**

Immediately after delivery of implant restorations, patients should be given clear information and instructions on how to carry out effective plaque-control procedures (Fig. 4). With single- or multiple-unit implant-supported restorations, routine conventional oral hygiene measures may be adequate. However, with complex prostheses such as those designed for edentulous jaws, special adjuncts such as power brushes, interdental devices e.g. interdental brushes with nylon-coated wire (Fig. 5), and/or oral irrigators may be necessary to assist patients in achieving optimal oral hygiene. Care should be exercised in selecting appropriate toothpastes; some may contain harsh polishing agents that can scratch certain types of implant restorations such as hybrid prostheses with acrylic-resin denture bases. Significantly lower levels of dental plaque and gingival inflammation have been documented for implant patients using a dentifrice containing triclosan/copolymer, as compared to those using a standard fluoride toothpaste.

**Professional monitoring**

Professional clinical examinations should be conducted at regular intervals. At a minimum, recare visits should occur annually, with supportive therapy given when indicated. The frequency of recare programs should be based on clinical evaluations and in accordance with recognized risk factors for peri-implant disease including plaque scores, smoking, a history of severe periodontitis, and metabolic disease. Typically, patients who present for implant
treatment due to trauma or congenitally missing teeth and do not exhibit adverse periodontal conditions on the surrounding natural teeth may be seen every six months. However, partially edentulous patients who have lost their teeth due to periodontal disease and thus are susceptible to periodontal breakdown should be seen more frequently—such as every three to four months. Clinical examinations should always include plaque scores and assessments of bleeding on probing and pocket depths.

Clinical evaluation of the prosthesis

Using two mirror handles, the implant-supported prosthesis should be tested for any signs of lateral movement (Fig. 6). Any such movement may indicate screw loosening, loss of cement, or loss of integration. For cement-retained restorations, the security of the cement seal should be evaluated by attempting to elevate or dislodge the restoration/prosthesis with an instrument. For screw-retained prostheses, no movement or salivary percolation (bubbles) should be detected when a push/pull force is applied to the prosthesis with gloved fingers or instruments. Occlusal restorations for screw-retained prostheses need to be evaluated for mobility and/or loss of occlusal seal integrity at the recare appointment. If the restoration is loose or worn, it should be removed and replaced with a new restoration (Fig. 7).

Analysis of oral hygiene

Since supra-mucosal plaque formation is considered a risk factor for developing peri-implant disease, the patient’s oral hygiene should also be evaluated. Initially, the formation of biofilm and lack of its daily removal may result in peri-implant mucositis. Oral hygiene instructions should be reinforced, and the oral healthcare provider should make recommendations for any modifications to the recare program that could improve the patient’s ability to obtain optimal self-care.
Occasionally it may be prudent for the health-care provider to observe a patient performing oral hygiene procedures. Salvi and Ramseier\textsuperscript{14} state that professional and patient-administered mechanical plaque control alone should be considered the standard of care in the management of peri-implant mucositis. Active treatment of peri-implant mucositis is a prerequisite for the prevention of peri-implantitis.

Detection of pathology
The detection of bleeding and/or suppuration in the peri-implant mucosa requires probing the peri-implant pocket, preferably with a standardized pressure probe. The presence or absence of bleeding is the most relevant question to be answered. Clinical responses to probing include no bleeding (healthy peri-implant tissue), bleeding on probing with no increase in pocket measurements (peri-implant mucositis), or bleeding on probing with increased pocket probing depths (>2mm) as compared to previous probing depths (peri-implantitis). Clinical findings should always be noted with reference to the baseline data recorded on the day of prosthesis insertion, as well as subsequent recare visits.

Probing
Probing to monitor pocket depth/attachment loss is a routine part of monitoring the health of soft tissue around natural teeth.\textsuperscript{15} However, pocket depths measured around dental implants differ from those around teeth. Implants lack a layer of cementum covering the surface, and thus a connective tissue attachment similar to that around natural teeth does not exist.\textsuperscript{15} What does exist is a soft-tissue cuff in which collagen fiber bundles are present that are predominantly circumferentially oriented around the implant restoration. Also present are collagen fibers originating from the bone surfaces and oriented vertically and parallel to the implant surface (Fig. 8).\textsuperscript{16}
The consequence of this different orientation of the supracrestal connective tissue fibers is that the attachment around teeth is solid, whereas around implants it is fragile. This means that when using the same amount of pressure, differences will be found when probing pocket depths around implants and natural teeth. Around teeth, the probe will most likely stop at the depth of the epithelial attachment (the first supracrestal fibers). Around implants, the probe will most likely stop at the implant restorative platform or crestal bone. For this reason, a plastic standardized pressure probe is strongly recommended for use with implants (Fig. 9). It has been demonstrated that the point of a plastic standardized pressure probe ends approximately at the apical level of the epithelial attachment around a dental implant. A plastic probe also provides easier access because it can bend.

Unlike evaluation of the health of the gingival tissues around natural teeth, evaluation of the peri-implant soft tissues is not based primarily on pocket-depth assessment. A 6mm pocket (sulcular depth) might be present around an implant that was placed subcrestally in order to achieve optimal aesthetics. Abutment height therefore is influenced by peri-implant pocket depth (Fig. 10).

Radiographs
Radiographs should be taken at the time of prosthesis delivery to provide a baseline for future bone-level evaluations (Fig. 11). If at any follow-up clinical evaluation, pocket depths have increased by more than 2mm when compared to the baseline, or if there are visible signs or symptoms of disease, additional radiographs are indicated. To enable accurate comparisons, radiographs should be taken in a consistent fashion, i.e. using a paralleling technique and in reproducible positions. One convenient method to evaluate the consistency of radiographs is to make sure the implant threads are equally visible on both sides of the implant. This indicates that the film/sensor was parallel to the implant’s long axis.
Supportive Therapy

In the absence of bleeding on probing, there is no need for any treatment other than reinforcing satisfactory oral health habits (Fig. 12). If bleeding or suppuration is noted upon gentle probing, this may indicate the presence of biofilm and/or calculus that should be carefully removed with specifically designed instruments. Hard deposits can be removed with plastic scalers and/or curets that are safe for use around titanium implant abutments, implants, and/or aesthetic restorative materials.

Stainless steel instruments should be avoided as they may scratch or gouge abutments, creating reservoirs that can harbor bacteria. In most cases, a light exploratory stroke is all that is required to remove the deposits (Fig. 13). Hard deposits can also be removed safely with ultrasonic devices with modified PEEK (polyether ether ketone) fiber tips. It was recently demonstrated that safe and efficient removal of soft deposits for long-term implant maintenance can also be achieved with an air-polishing device with glycine or erythritol-based powders (e.g. the Air-Flow Method®, E.M.S. Electro Medical Systems S.A., Nyon, Switzerland). This specific device was shown to effectively remove both supra- and submucosal biofilms without damaging implant or abutment surfaces.

Polishing should not be performed using one prophylaxis paste for all tooth surfaces and aesthetic restorations. Selective polishing has been shown to be essential; the only polish that should be used on dental implant components and aesthetic restorative materials is one that will not damage the surfaces. When in doubt as to the type of restorative materials present, a non-abrasive cleaning agent such as ProCare® Powder (Young Dental, Earth City, Missouri) should be used.

If bleeding on probing occurs in combination with probing pocket depths that have increased by more...
than 2mm from the previous recare appointment measurements, this indicates that peri-implantitis has developed. In this instance, radiographs should be taken to evaluate how much bone loss has occurred.

Although no treatment protocol has yet been proven to eliminate peri-implantitis and stop further bone loss, one clinical approach that has been proposed is to decontaminate the implant surface and recreate a surface on which bone can potentially re-attach.22 Though unpredictable, the best approach may include a combination of measures: open-flap debridement, removal of granulation tissue, debridement of the implant surface using a combination of chemical agents and mechanical instrumentation, and antibiotic supportive therapy, followed by an increase in the frequency of recare appointments.23 This approach may slow or stop further disease progression.

Clinical Relevance
Maintaining osseointegration is as important as achieving it. As the number of patients receiving dental implants increases, so must the focus on preventing and managing diseases such as peri-implant mucositis and peri-implantitis that may jeopardize long-term implant success. In addition to satisfying biologic and prosthodontic principles regarding implant restorations, professional supportive therapy and effective patient self-care are essential. Among the steps that are necessary to maintaining peri-implant soft- and hard-tissue health are daily plaque removal with toothbrushes (manual/power), interdental devices (floss), and/or other preventive adjuncts. Further research is needed to identify the specific differences between dental implant restorations and natural teeth regarding bacterial colonization and the attachment apparatus. As a greater understanding of these and other factors develops, it should be possible to refine implant-maintenance protocols to better ensure long-term success and high levels of patient satisfaction.
The long-term success of dental implants as well as lasting patient satisfaction with implant therapy depend on proper maintenance and follow-up care. Studies have demonstrated that periodontal pathogenic bacteria can seed healthy implant sites. There is also evidence of a cause-and-effect relationship between bacterial plaque accumulation and development of inflammatory changes in soft tissue around dental implants.

**STEP 1: Evaluation of the Occlusal Seal/Prosthesis Stability**

**Occlusal Seal:**
If the prosthesis is screw-retained, the integrity of the occlusal restoration over the screw-access opening should be evaluated.

**Prosthesis Stability:**
Using two mirror handles, an attempt should be made to move the implant-supported prosthesis. Any sign of movement may indicate cement wash-out or screw loosening. The security of both cement- and screw-retained restorations should also be tested by attempting to lift the crown or fixed prosthesis with gloved fingers and/or an instrument. No movement or salivary percolation (bubbles) should be detected.

**STEP 2: Analysis of Oral Hygiene**

**Oral Hygiene:**
The patient’s oral hygiene (self-care) should be evaluated by noting the presence or absence of hard and/or soft deposits, along with the health of the surrounding soft tissue. Biofilm formation may result in peri-implant mucositis, similar to gingivitis; peri-implant mucositis is reversible with proper care. The use of any adjuncts that may optimize self-care (e.g., a power brush) should be discussed.
Polishing:
For polishing, no single prophylaxis paste works equally well on all tooth surfaces and aesthetic restorations. The only prophylaxis paste that should be used on dental implant components and aesthetic restorative materials is one that will not damage the surface.

By carefully and routinely evaluating patients’ soft-tissue health and the stability of the prosthesis at professional recare appointments, the dental implant team can help ensure the long-term success of the implant-supported prosthesis and a continued high level of patient satisfaction.

References

The Journal of Implant & Reconstructive Dentistry is a publication of BIOMET 3i LLC. The Institute for Implant & Reconstructive Dentistry is the training and education department of BIOMET 3i LLC.

Debridement:
Plaque and calculus accumulations should be carefully debrided using instruments that are safe to use on titanium implants and abutments, such as plastic scalers. Stainless steel curets may scratch or gouge abutments, creating reservoirs to which bacteria can attach. A light exploratory stroke is usually sufficient to remove any deposits.

Radiographs:
Periapical radiographs should be obtained at the time of prosthesis insertion to verify the fit of the restorative components and establish a baseline for peri-implant bone height relative to the implant restorative platform. A radiograph may confirm misfit/loose components. If at any follow-up clinical evaluation, pocket depths have increased by more than 2mm when compared to the baseline, or if there are clinical signs of disease, additional radiographs are indicated.
**References**


In support of their research or for preparation of their work, one or more of the authors of the publications cited in the references may have received financial remuneration from BIOMET 3i LLC.

---

**Anita Daniels, RDH**

Ms. Daniels is a registered dental hygienist with clinical experience in periodontics and implant dentistry. She has lectured extensively internationally and throughout the United States on periodontics and all aspects of implant dentistry. Ms. Daniels has written numerous articles for dental and dental hygiene publications. She is the Global Director of Professional Communications for BIOMET 3i and the Editor of the Journal of Implant and Reconstructive Dentistry®. Email: anita.daniels@zimmerbiomet.com

---

**Carl J. Drago, DDS, MS**

Dr. Drago received his dental degree from Ohio State University College of Dentistry and a Master’s Degree from the University of Texas Graduate School of Biomedical Sciences at San Antonio, Texas. Dr. Drago lectures nationally and internationally and has published approximately 75 papers and four textbooks on various subjects in conventional and implant prosthodontics. He currently serves as the Clinical Science section editor for the Journal of Prosthodontics. Dr. Drago maintains a private practice limited to fixed, removable, and implant prosthodontics in LaCrosse, Wisconsin. Email: carl.drago@gmail.com

---

**Ronnie J. Goené, DMD**

Dr. Goené is an associate professor in the department of oral and maxillofacial surgery/pathology at the VU University Medical Center/ACTA Amsterdam. He lectures extensively on implant aesthetic dentistry, and maintains a private clinic limited to implantology in Amsterdam, the Netherlands. Email: ronniegoene@gmail.com

††The contributing clinician is the Global Director of Professional Communications for BIOMET 3i LLC.

‡‡The contributing clinicians have financial relationships with BIOMET 3i LLC resulting from speaking engagements, consulting engagements, and other retained services.
CE Quiz

Clinical guidelines for the management of peri-implant health
Anita Daniels, RDH†, Carl Drago, DDS, MS†† & Ronnie J. Goené, DMD††

To complete this quiz online and immediately download your CE verification document, visit www.dentallearning.net/CGM-ce, then log into your account (or register to create an account). Upon completion and passing of the exam, you can immediately download your CE verification document. We accept Visa, MasterCard, Discover, and American Express.
CE Quiz

1. Peri-implant mucositis:
   a) Is analogous to gingivitis around natural teeth
   b) Is usually reversible
   c) Can usually be prevented by stringent self-care combined with a regular professional recare program
   d) All of the above

2. The most effective therapeutic intervention for peri-implantitis is:
   a) A sustained course of antibiotics
   b) Removal of the affected implant(s)
   c) A subject of controversy, as treatment outcomes are unpredictable
   d) All of the above

3. Research has demonstrated that fluoride toothpaste:
   a) Is just as effective at controlling dental plaque and gingival inflammation as triclosan/copolymer dentifrice
   b) Is significantly less effective at controlling dental plaque and gingival inflammation as triclosan/copolymer dentifrice
   c) Has greater antimicrobial effects than triclosan/copolymer dentifrice when used on natural teeth
   d) Is primarily effective at controlling *P. melaninogenica* and *T. forsythia*

4. Movement of the implant-supported prosthesis:
   a) Is not necessarily a matter of concern
   b) May indicate screw loosening or loss of cement
   c) Should decrease over the course of years
   d) None of the above

5. Probing for pocket depths and attachment loss around implants:
   a) Is unnecessary
   b) Is likely to damage the peri-implant attachment
   c) May be accomplished without damaging the peri-implant attachment
   d) Is similar to monitoring soft-tissue healing around natural teeth

6. A 6mm pocket around a dental implant:
   a) Might be present because plaque caused the tissue to become inflamed
   b) May have been surgically created on purpose
   c) May require no special treatment
   d) All of the above

7. At professional recare appointments, radiographs:
   a) Are not recommended
   b) Are less desirable than CBCT scans
   c) When indicated, should be taken using a paralleling technique and in reproducible positions
   d) Are not as important as they are for patients with natural dentition

8. Plaque and/or calculus on dental implant/restorations:
   a) Should be debrided with a plastic scaler
   b) Should be debrided with a stainless steel curet
   c) Is a normal phenomenon
   d) Must be removed using a heavy working stroke

9. Implant-supported restorations require polishing:
   a) With a specialized polishing agent that will not damage the surface
   b) Every three years
   c) Only when the implant surface becomes cloudy
   d) Rarely

10. Patients who have received dental implants:
    a) Should be expected to maintain them
    b) Can benefit from the use of special power brushes or interdental devices
    c) Should attend professional care visits at regular intervals
    d) All of the above
Clinical guidelines for the management of peri-implant health
Anita Daniels, RDH, Carl Drago, DDS, MS & Ronnie J. Goené, DMD

CE ANSWER FORM (E-mail address required for processing)

Name:
Address:
City:
State:
Zip:
NPI No.:
*Telephone:
*E-mail:
*Specialty:
*AGD Identification No.

License Renewal Date:

EDUCATIONAL OBJECTIVES

• Discuss the differences between maintenance of natural teeth and implant-supported restorations.
• Identify key actions that should be accomplished on professional recare visits.
• Describe the relationship between bacterial plaque accumulation and peri-implant mucositis.
• Summarize the principles of effective implant self-care.

COURSE EVALUATION

Please evaluate this course using a scale of 3 to 1, where 3 is excellent and 1 is poor.

1. Clarity of objectives ................................................................. 3 2 1
2. Usefulness of content ............................................................. 3 2 1
3. Benefit to your clinical practice .............................................. 3 2 1
4. Usefulness of the references .................................................. 3 2 1
5. Quality of written presentation ............................................... 3 2 1
6. Quality of illustrations ........................................................... 3 2 1
7. Clarity of quiz questions .......................................................... 3 2 1
8. Relevance of quiz questions ................................................... 3 2 1
9. Rate your overall satisfaction with this course ......................... 3 2 1
10. Did this lesson achieve its educational objectives? Yes No
11. Are there any other topics you would like to see presented in the future? ____________________________________________________________________

COURSE SUBMISSION:

1. Read the entire course.
2. Go to www.dentallearning.net/CGM-ce.
3. Choose this course from the course listing.
4. Log in to your account or register to create an account.
5. Complete the course and submit for grading to receive your CE verification certificate.

A score of 70% will earn your credits.

If paying by check, make check payable to Dental Learning, LLC.

AGD Codes: 254, 255

QUIZ ANSWERS

Fill in the circle of the appropriate answer that corresponds to the question on previous pages.

1. (A) (B) (C) (D)
2. (A) (B) (C) (D)
3. (A) (B) (C) (D)
4. (A) (B) (C) (D)
5. (A) (B) (C) (D)
6. (A) (B) (C) (D)
7. (A) (B) (C) (D)
8. (A) (B) (C) (D)
9. (A) (B) (C) (D)
10. (A) (B) (C) (D)

Coupon Code: ___________

Price: $29 CE Credits: 2

If you have any questions, please email Dental Learning at questions@dentallearning.net or call 1.888.724.5230.
Fax 1.732.303.0555

BEFORE AND AFTER IMPRINTS

Please photocopy answer sheet for additional participants.

Please direct all questions pertaining to Dental Learning, LLC or the administration of this course to questions@dentallearning.net. COURSE EVALUATION and PARTICIPANT FEEDBACK: We encourage participant feedback pertaining to all courses. Please be sure to complete the evaluation included with the course. INSTRUCTIONS: All questions have only one answer. Participants will receive confirmation of passing by receipt of a verification certificate. Verification certificates will be processed within two weeks after submitting a completed examination. EDUCATIONAL DISCLAIMER: The content in this course is derived from current information and research based evidence. Any opinions of efficacy or perceived value of any products mentioned in this course and expressed herein are those of the author(s) of the course and do not necessarily reflect those of Dental Learning. Completing a single continuing education course does not provide enough information to make the participant an expert in the field related to the course topic. It is a combination of many educational courses and clinical experience that allows the participant to develop skills and expertise.

*Telephone: 1-888-724-5230. *E-mail: questions@dentallearning.net. *Na...