

Maintenance for Patients with Implant-Supported Dental Restorations

Educational Objectives

Following this unit of instruction, the practitioner should be able to:

1. Describe the expected periodontal response that occurs following implant placement and restoration.
2. Describe the appropriate steps to maintain dental implants and supported restorations.
3. Understand the importance of an established maintenance protocol to increase longevity of dental implants and supported restorations.
4. Discuss the influence of relevant risk indicators in the maintenance protocol of restored dental implants.

Introduction

Dental implants have been increasingly used for tooth replacement for several decades.¹ Post-therapy complications may occur, including both biological and mechanical failures. Biological complications (peri-implant mucositis and peri-implantitis) have been often diagnosed with a poor understanding of the causes or how they may have been prevented. Though inflammation is often present around dental implants following placement of a restoration, studies have shown a ten-year survival rate of 80-100%, dependent upon the presence of risk factors.²

Peri-implant mucositis is a reversible inflammatory status of the gingiva and peri-implantitis is characterized by inflammation of the gingiva with concomitant bone loss.³ Peri-implantitis has been reported to occur around up to 47% of restored implants.³⁻⁶ In addition to bacterial colonization as etiological factor,⁶ there are clearly patient and prosthetic factors contributing to the loss of restored dental implants.⁷ Besides biological problems, the most common complications reported for implant-borne restorations have been shown to be screw loosening, porcelain fracture, loss of retention, and esthetic concerns.⁸ In addition, excess cement has been identified as a risk indicator for peri-implant diseases with cement-retained restorations presenting higher prevalence of peri-implant complications than screw-retained restorations.⁹

An expert panel convened by the American College of Prosthodontists (ACP), American Dental Association (ADA), Academy of General Dentistry (AGD) and American Dental Hygienists' Association (ADHA) critically reviewed a recently published systematic review¹⁰ on the topic of maintenance of patients with implant-borne restorations. This Quality Resource Guide (QRG) is based on the clinical practice guidelines published by the expert panel, as well as other literature on the topic of implant function and complications after placement and restoration.¹¹

Tissue Surrounding an Implant-Supported Restoration

It is important to understand normal and abnormal tissue presentation around dental implants to properly diagnose a biological problem. One of the key anatomical findings of the gingival mucosa around dental implants is that the collagen fibers do not insert onto the implant neck as they do to the cementum at the cervical area of a tooth. This affects the presentation of the soft tissue around the implant, which is more like mucosa with epithelium adaptation coronal to a connective tissue band, rather than a gingival sulcus and junctional epithelium coronal to a highly cellularized and vascularized connective tissue attachment to natural teeth. It has been suggested that the presentation of the connective tissue fibers running

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The following commentary highlights fundamental and commonly accepted practices on the subject matter. The information is intended as a general overview and is for educational purposes only. This information does not constitute legal advice, which can only be provided by an attorney.

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parallel to the implant (rather than perpendicularly attaching to it) allows bacteria to more easily penetrate the epithelial layer and subsequently the connective tissue.^{12,13}

The soft tissue wound created by the placement of a dental implant takes several weeks to heal depending on the load of bacteria on the site.¹⁴ After initial healing, the tissue goes through repeated injuries during placement of a healing abutment, a restorative abutment, the impression, temporization and final restoration, offering various opportunities for inflammation to be initiated. After the definitive restoration has been placed, the average height of the peri-implant epithelial junction is normally about 2 mm and the connective tissue band below is approximately 1.5 mm. Thus, the biological width of implants is usually greater than 3 mm.¹³ Implant systems (tissue-level vs. bone-level),¹⁵ implant material and implant surface characteristics,^{16,17} and implant protocol (flap vs. flapless insertion),¹⁸ each have a different effect on the biological width. To expedite treatment, and potentially improve the esthetic outcome in anterior cases, immediate or earlier implant placement followed by provisionalization has been advocated and can also influence biological width.¹⁹

It is well accepted that there are significantly deeper probing depths around restored dental implants compared to natural teeth.²⁰ The clinician must be careful not to misdiagnose bone loss around dental implants by basing decisions solely on probing depths. Similarly, the bleeding on probing around implant sites is normally more prevalent than around natural teeth.²¹ These characteristics may lead to more difficulty in accurate assessment of peri-implant mucositis vs. peri-implantitis around restored implants.

Why Maintenance of Dental Implants is Important

Peri-implant mucositis is defined as inflammation, without bone loss, in the soft tissues surrounding dental implants. Peri-implantitis is defined as inflammation around dental implants that involve the soft and hard tissues.²² It may be difficult to tell exactly when peri-mucositis becomes peri-implantitis unless the patient is seen for careful and timely clinical and

radiographic evaluations. Ideal radiographic follow-up should include bitewing images for assessment of bone crestal height in relationship to the implant neck and periapical images to evaluate of bone density surrounding the implant body. Occasionally, additional images are necessary based on location or suspected complications.

A systematic review of periodontal parameters and dental implant outcomes concluded that patients treated for chronic periodontitis exhibited significantly greater long-term probing depths around their implants and had a higher incidence of peri-implantitis than periodontally healthy patients.²³ Further, if individuals with a history of periodontitis did not follow through with maintenance in a dental office, the number of dental implant losses was almost three times higher.²⁴

Higher levels of bleeding on probing around natural teeth, as well as more dental plaque around dental implants, have been directly associated with peri-implantitis and increased probing depth, attachment loss and bleeding on probing levels around dental implants in the same mouth.²⁵ In a study of 80 patients diagnosed with peri-implant mucositis, patients not participating in a maintenance program progressed from peri-mucositis to peri-implantitis at more than twice the rate of patients participating in a maintenance program.²⁶

Evidence shows that supportive dental implant therapy is necessary for better longevity outcomes. A systematic review⁷ showed that a reasonable interval for implant maintenance for most patients is 5 to 6 months. However, the protocol for supportive periodontal maintenance care should be tailored according to a patient's risk profiling,²⁷ and so should maintenance program for dental implants.

Studies have shown the critical role of periodontal disease history in the incidence of peri-implant mucositis and peri-implantitis.²⁸⁻³⁰ Therefore, implant maintenance may need to occur at shorter intervals for patients with a history of periodontal diseases. Besides history of periodontitis, restorative factors are important and should be assessed at maintenance visits. Restorative margins that are submucosal tend to be more difficult to maintain, and may need maintenance care at closer intervals.³¹

Interproximal contacts of implant-supported restorations may tend to open over time, which can facilitate food impaction and inflammation around dental implants and adjacent teeth.^{32,33} The ability of patients to clean implant-supported restorations and prostheses at home also needs to be carefully assessed at each visit. In summary, the diagnosis of periodontitis, supervision of restoration factors, control of periodontal and peri-implant health and assessment of the patient's ability to perform oral hygiene are key factors in the longevity of dental implants, and must be part of each maintenance visit.

Professional Maintenance

Professional maintenance begins with educating patients about dental implant and implant-borne restoration maintenance, the clinician must explain and demonstrate effective modalities of oral hygiene. These methods must be reinforced at each maintenance visit. Most oral hygiene procedures that are beneficial for natural teeth may be safely applied around dental implants. Electric and conventional toothbrushes are safe and efficient methods of dental plaque removal around implant-borne restorations, with no significant differences between specific methods.¹⁰ By measuring dental plaque, bleeding on probing and pocket depth, it was shown,³⁴ that the use of a dentifrice containing 0.3% triclosan in a sodium fluoride silica base was more effective than a 0.243% sodium fluoride in a silica base product in controlling peri-implant mucositis.

However, the evidence regarding addition of triclosan to fluoride in reducing dental plaque, gingival inflammation and bleeding around natural teeth when compared to fluoride toothpaste alone is weak according to a review of 30 studies.³⁵ Triclosan-containing toothpastes in the management of peri-implant diseases may not be clinically better than fluoride-based products, however, that comparison is difficult to make due to the high variability in results in different studies.³⁶

One randomized clinical trial compared the effects of chlorhexidine (in-office and at-home) to professional mechanical debridement alone in patients with peri-implant mucositis and treated chronic periodontitis. The authors reported that both treatment modalities

resulted in improvement of the clinical parameters and a temporary reduction of the microflora around dental implants with mucositis at 24 hours. However, there were no significant inter-group differences after 8 months.³⁷ One study concluded that peri-implant mucositis could be resolved with professional cleaning in conjunction with either a 0.2% chlorhexidine mouth rinse or application of 1% chlorhexidine gel topical antimicrobial agent.³⁸ Others have suggested no additional benefit of chlorhexidine in patients with good oral hygiene though.³⁹ While chlorhexidine use during implant maintenance may be of some value, further research is needed to demonstrate its long-term effects.

The use of conventional dental floss and “water flossing” was evaluated in a study with 28 patients having implant-supported crowns. Bleeding levels at baseline, 14 days and 30 days were assessed. Despite the small study size, the authors concluded that patients using the water flosser had statistically significant less bleeding on probing than patients using conventional dental floss.⁴⁰

In office implant maintenance using polytetrafluoroethylene (PTFE, Teflon) curettes as hand instrumentation or a glycine powder air polishing system, was compared.⁴¹ The authors evaluated probing depths, bleeding on probing and microbiological samples at baseline, 1 week, and 4 weeks. Outcomes were better when using glycine

powder air polishing. Other dental curettes (plastic or metal) have raised concerns due to residual plastic left behind, or damage to the implant surface. Thus, they are not recommended.⁴² Glycine powder air polishing also has shown to be more effective than manual debridement with concomitant local chlorhexidine application in reduction of probing depths and dental plaque at 6 months.⁴³ The use of erbium-doped yttrium aluminum garnet (Er:Yag) lasers also has shown promising results.^{44,45}

In summary, brushing with a regular or electric toothbrush, use of a triclosan/fluoride-containing dentifrice and water flossing for daily oral hygiene appear to be effective in cleaning dental implants. Use of a chlorhexidine rinse may provide additional, short-term, benefits. Professional maintenance with glycine powder air polishing and frequent/consistent visits to the hygienist/dentist are shown to be beneficial (**Table 1**)

Other Risk Factors to Consider During Maintenance of Implant-Supported Restorations

It is important to emphasize that outcomes of professional and at-home maintenance care for healthy adult patients with implant-supported restorations may be different than for patients with acute or chronic oral and systemic diseases, the elderly, smokers or bruxers. Subsequent maintenance intervals should be adjusted if appropriate oral health

status is not present at an evaluation.

Non-attendance to maintenance visits and tobacco smoking are described as negative factors for dental implant longevity. It has been shown that heavy smokers have a higher (36.3%) frequency of peri-implant diseases compared to non-smokers.⁴

Advanced age is not a contraindication to dental implant therapy; however, careful consideration needs to be given to a patient's manual dexterity and ability to execute proper oral hygiene. Further, bone levels, good general health and careful evaluation of medications taken by elderly patients are critical for successful dental implant therapy.⁴⁶ If a frequent maintenance protocol is followed for aging populations, there is high implant and implant prosthesis survival.¹⁰

Bruxism, characterized by clenching and grinding, is a parafunctional habit that is believed to affect the survival of dental implants. That assumption is based primarily on clinical experience and anecdotal reports, rather than evidence.^{47,48} Bruxism, however, should not be ignored until further high quality evidence clarifies the issue. At this time, a maintenance program to follow-up on progression of the habit and compliance in the use of occlusal splints is recommended.⁴⁹ Patients should be encouraged to inform the clinician if symptomatology related to bruxism occurs, and proper adjustment of the occlusal splint should be verified periodically.

Table 1 - Guidelines for professional and at-home maintenance of patients with implant-borne restorations¹¹:

- Patients with implant-borne restorations (fixed or removable) should be advised to visit the dentist every 6 months. However, maintenance visits should occur more often if patient is categorized as higher risk (elderly, impaired ability of performing good oral hygiene, restorative factors, or a history of periodontitis, bruxism, smoking).
- Chlorhexidine gluconate may be used as an adjunct to professional maintenance and in some cases home maintenance.
- Instruments such as glycine powder air polishing system are recommended for professional cleanings.
- Prosthesis components should be replaced if compromised function is diagnosed at professional maintenance visits. Prosthesis contours should be carefully checked to make sure that they are not impeding proper at-home maintenance or causing traumatic occlusion.
- An occlusal device should be considered and is recommended for patients that show signs of clenching or grinding. This device should be inspected and cleaned at every maintenance visit.
- Patients should be advised to brush twice daily with toothpaste containing fluoride or triclosan/fluoride and use hygiene aids such as dental floss, water floss, electric toothbrushes, or regular soft brushes. Dental cleaning solutions should be used for removable restorations supported by dental implants.

Lastly, systemic conditions such as diabetes and osteoporosis have been investigated in the context of peri-implant diseases.⁵⁰⁻⁵² However, the literature is not clear on the specific influence on incidence and progression of peri-implant problems in patients affected by chronic systemic diseases.

As a general rule, the maintenance interval for higher risk patients (smokers, the elderly, bruxers and patients with periodontal diseases, with or without systemic associated chronic conditions) may need to be initially modified to 2 to 4 months. The 7th European Workshop on Periodontology proposed that baseline clinical parameters and radiographs should be established at the time of prosthesis installation for all patients⁵³ to facilitate monitoring

of disease incidence and progression. This can be particularly critical in high-risk patients.

A patient may need a custom maintenance protocol based on the type of restoration that has been placed. Fixed or removable prostheses may need professional removal, cleaning and change of parts. Restorations with deep restorative margins may need to be removed for professional debridement of the region at a maintenance appointment. There is not a recommended difference in maintenance protocols for cemented vs. screw-retained restorations. However, if there is evidence of crown loosening, the restoration must be re-evaluated for loading issues and the screws replaced. This is also applicable to multiple units.

In summary, a maintenance interval and protocol must be established based on restoration and peri-implant status, and consideration of systemic and/or local conditions that could modify a patient's risk for peri-implantitis. Oral hygiene is also a major factor in shortening or extending recall intervals.

The following MetLife QRGs provide additional information about dental implants: Managing Peri-implantitis 1st Ed 2016; Introduction to Dental Implant Therapy 3rd Ed 2015; Implant Placement by the General Dentist 3rd Ed 2016; Immediate Dental Implants 1st Ed 2014.

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POST-TEST

Internet Users: This page is intended to assist you in fast and accurate testing when completing the “Online Exam.” We suggest reviewing the questions and then circling your answers on this page prior to completing the online exam.

(1.0 CE Credit Contact Hour) Please circle the correct answer. 70% equals passing grade.

1. Peri-implant mucositis is a reversible inflammatory status of the gingiva and peri-implantitis is characterized by inflammation of the gingiva with concomitant tooth loss.
 - a. True
 - b. False
2. Peri-implant mucositis is one of the most common biological complications of dental implants and can be diagnosed with a radiograph taken every 2 years.
 - a. True
 - b. False
3. Connective tissue fibers, which are part of the periodontium around dental implants, run parallel to the implant long axis allowing bacteria to more easily penetrate the epithelial layer.
 - a. True
 - b. False
4. Individuals with a history of periodontitis are at a three times higher risk of implant loss when they do not follow a strict maintenance program.
 - a. True
 - b. False
5. Non-compliant Individuals are twice as likely to have peri-implant mucositis progressing to peri-implantitis than individuals who adhere to a well-designed maintenance program.
 - a. True
 - b. False
6. Brushing with a regular or electric toothbrush, use of a triclosan/fluoride-based dentifrice and water flossing between maintenance visits may extend the longevity of dental implants.
 - a. True
 - b. False
7. Individuals who at higher risk of implant failure include the elderly, individuals with dexterity limitations or a history of periodontitis, and individuals who brux or smoke.
 - a. True
 - b. False
8. Individuals who brux should have frequent maintenance visits (2-4 months) and their occlusal guard should be inspected and balanced if needed.
 - a. True
 - b. False
9. Individuals with diabetes and advanced osteoporosis will likely have peri-implantitis.
 - a. True
 - b. False
10. To facilitate monitoring of disease incidence and progression in high-risk individuals, the interval between maintenance visits should be shortened to 5-6 months compared to the usual 11-12 months.
 - a. True
 - b. False

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Preferred Dentist Program ID Number: _____ ☐ Check Box If Not A PDP Member

AGD Mastership: ☐ Yes ☐ No

AGD Fellowship: ☐ Yes ☐ No Date: _____

Please Check One: ☐ General Practitioner ☐ Specialist ☐ Dental Hygienist ☐ Other

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Quality Resource Guide - Maintenance for Patients with Implant-Supported Dental Restorations

Providing dentists with the opportunity for continuing dental education is an essential part of MetLife's commitment to helping dentists improve the oral health of their patients through education. You can help in this effort by providing feedback regarding the continuing education offering you have just completed.

Please respond to the statements below by checking the appropriate box, using the scale on the right.

1 = POOR

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- | | 1 | 2 | 3 | 4 | 5 | |
|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|------------------------------|
| 1. How well did this course meet its stated educational objectives? | ☐ | ☐ | ☐ | ☐ | ☐ | |
| 2. How would you rate the quality of the content? | ☐ | ☐ | ☐ | ☐ | ☐ | |
| 3. Please rate the effectiveness of the author. | ☐ | ☐ | ☐ | ☐ | ☐ | |
| 4. Please rate the written materials and visual aids used. | ☐ | ☐ | ☐ | ☐ | ☐ | |
| 5. The use of evidence-based dentistry on the topic when applicable. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ N/A |
| 6. How relevant was the course material to your practice? | ☐ | ☐ | ☐ | ☐ | ☐ | |
| 7. The extent to which the course enhanced your current knowledge or skill? | ☐ | ☐ | ☐ | ☐ | ☐ | |
| 8. The level to which your personal objectives were satisfied. | ☐ | ☐ | ☐ | ☐ | ☐ | |
| 9. Please rate the administrative arrangements for this course. | ☐ | ☐ | ☐ | ☐ | ☐ | |
| 10. How likely are you to recommend MetLife's CE program to a friend or colleague? <i>(please circle one number below:)</i> | | | | | | |

10 9 8 7 6 5 4 3 2 1 0
 extremely likely neutral not likely at all

What is the primary reason for your 0-10 recommendation rating above?

11. Please identify future topics that you would like to see:

Thank you for your time and feedback.

To Complete Program Traditionally, Please Mail Your Post Test and Evaluation Forms To:

MetLife Dental Quality Initiatives Program
 501 US Highway 22
 Bridgewater, NJ 08807