Dentistry has become so exciting and challenging since predictability has been recognized for long-term dental implant and restoration success1-3. As the number of patients selecting dental implants as a treatment option continues to grow, the dental team 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 and effective patient oral hygiene4,5. The value of using conventional periodontal parameters to determine peri-implant health is not clearly evident in the literature4. Therefore, it is paramount that the dental implant team understands 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 the dental implant.

Direct anchorage of alveolar bone to a dental implant body provides a foundation to support a prosthesis and transmits occlusal forces to the alveolar bone. This is the definition of osseointegration6. With the increased acceptance of dental implants as a viable treatment option for the restoration of a partially edentulous or edentulous mouth, the dental team is faced with maintaining and educating those patients.

Recently, the focus of implant dentistry has changed from obtaining osseointegration, which is highly predictable, to the long-term maintenance health of the peri-implant hard and soft tissues. This can be achieved through appropriate professional care, patient cooperation, and effective home care7. Patients must accept the responsibility for being co-therapists in maintenance therapy, so the dental team essentially must screen the potential implant patient. Diagnosis and treatment planning based on a risk-benefit analysis should be performed subsequent to a thorough medical, dental, head-and-neck, psychological, temporomandibular disorder and radiographic examination.*

There is convincing 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 be modified using various adjunctive aids for oral hygiene to effectively clean the altered morphology of the peri-implant region before, during, and after implant placement. For instance, interproximal brushes can penetrate up to 5 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 provide a welcome adjunct.

Hygiene with dental implants is so tedious and critical to their long-term success that the patient and dental professional must exercise considerable effort. 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, probe-able pockets, and a radiographic evaluation of the peri-implant bone housing still remains the standard mode for evaluating the long-term status of endosseous dental implants. For instance, successful and stable endosseous dental implants exhibit no mobility. But, if there is clinically perceptible mobility, then subsequent to radiographic evaluation of the implant and its surrounding bony housing, the abutment retaining screw, and/or prosthetic abutment collar interface should be examined for looseness or breakage. All these modes of clinical assessment are used routinely, ex-cept for periodontal probing since periodontal tissues that appear to be in a state of good health, the baseline data and data from subsequent recare visits should be recorded in the daily progress notes to properly assess the peri-implant status longitudinally.

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 mucositis, routine probing of the peri-implant tissue should not be performed.

Usually during the first year subsequent to restoring dental implants, a 5-month recare schedule should be implemented, especially if the patient lost teeth because of periodontal disease. But if after 12 months, the patient’s implants are stable and peri-implant tissues are healthy, then a 4-6 month recare regimen can be implemented. However, be cognizant of each patient’s level of home care effectiveness, systemic health, and periodontal status of the peri-implant tissue when determining these recare 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 as part of the maintenance visits. For dental implant restoration, if the screw retained, the dental professional needs to remove the prosthesis at least once a year to more easily assess the status of the peri-implant’s hard and soft tissues, the existence of acceptable remodeling of the prosthetic components or the implant fixture itself, and the patient’s level of home care effectiveness. Remember that the presence of any symptoms of infection, radiographic evidence of peri-implant bone loss, and/or neuropathies may be indicative of an ailing or failing implant.

Implants vs natural teeth

It is essential to understand the periodontal relationship between the gingiva and the struc-ture it attaches to be it a natural tooth or an implant. (Figs. 1 and 2) The fiber orientation of the gingival cuff around a natural tooth attaches periodontally to the long axis of the tooth. (Fig. 1) This acts as a barrier when inser-tion of a periodontal probe within the sulcus. The tip advances apically till the tip con-tacts the periodontal fibers and is halted at the orientation is not seen around implants. With an implant the gingival fiber orientation is parallel to the implant long axis. (Fig. 2) When a periodontal probe is inserted into the sulcus around an implant the probe tip advances passing be-tween the fibers of the gingival cuff till the crestal bone prevents it from further advancement.

The peri-implant mucosal seal may be broken by bacteria to bacterial pla-quemade up around peri-implant tissues. The presence of any symptoms of infection, ie. exudate, swelling, bleeding on probing, inflamed peri-implant soft tissue, and/or radiographic evidence of peri-implant alveolar bone loss. Lastly, routine periodontal probing of dental implants should not be performed, because this procedure could damage the weak epithelial attachment around dental implants, possibly creating a pathway for the ingress of periodontal pathogens. Commercially available plastic-probes should be used when investigating the crevicular depth around dental implants. Where the probing depth around dental implants may be related closely to the thick-ness and type of mucosa surround-ing the implant. A healthy peri-implant sulcus has been reported to range from 1.5 to 5.5 mm, which is greater than those depths reported for natural teeth. In essence, the best indicator for evaluating an unhealthy site would be probing data gathered longitudinally.

For all of these reasons, personal home care and consistent monitoring and hygiene visits are essential to preventing the critical to the success and longevity of endosseous den-tal implants. This is especially true in an environment withadjacent diseased tissue. If affected by periodontal disease, could act as a reservoir for patho-genic bacteria, gram-negative anaerobic rods, and seed peri-implant sulcus.

The physical characteristics of the peri-implant soft tissue are the focus of all oral hygiene in- struction. The presence or ab-sence of keratinized tissue in this critical area has not been un-equivocally documented to state that peri-implant tissues are keratinized. This is owing to the presence of pathogenic bacteria with or without keratinized tissue present around dental implants. How-ever, the ability of the patient to maintain good home care around dental implants is facilitated by the presence of keratinized tissue surrounding dental implants. Thus, if a patient has no keratinized tissue around an implant, and a pull test confirms that peri-implant mucositis exists, then placement of a soft tissue autograft may be recommended. This soft tissue graft is recommended to fa-cilitate proper mechanical oral hygiene maintenance.

Specific criteria for obtaining clinical data around dental implants that would allow proper monitoring and detect early possible failure of the dental implants has not been clearly defined. Presently, the presence of mobility is the best in-dicator for diagnosis of implant failure. As opposed to natural teeth, dental implants exhibit minimal clinically undetectable movement because of the ab-sence of a periodontal ligament. Therefore, healthy implants should appear nonmobile, even in the presence of peri-implant bone loss, if an adequate amount of support-alveolar bone still exists.

When monitoring the health of the peri-implant soft tissues, the practitioner should be cognizant of changes in soft tissue color, contour, and consistency. The presence of a fistulous tract could indicate the presence of a pathologic process or implant fracture.

Bleeding

There is controversy in the liter-ature as to the accuracy and sig-nificance of bleeding upon probing around dental implants. Presently, the literature advo-cates the use of bleeding on pro-bing as an indicator of peri-implant disease, because it can occur prior to histologic signs of inflammation or concurrently with other signs of implant failure, ie. bone loss. However, as previously men-tioned, routine probing is not rec-ommended.

Radiographic evaluation

Radiographic interpretation is one of the most useful clinical pa-rameters for evaluating the status of an endosseous dental implant. Inversion of biologic width, pre-dictable remodeling, or so-called sauceration, is an average mar-ginal bone loss of 1.5, during the first year following prosthetic re-habilitation followed by an aver-age of 0.2mm of vertical bone loss every 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 rad-iolucency should be found, because such a rarefaction usually indicates infection or failure to osseointegration.

Professional cleaning instrumentation

Instruments made of metal, such as stainless steel, should be limited to natural teeth and not to be used to probe or scale dental implants. The rationale for this well-documented and spoken conclusion is that this metal is so hard it can scratch, contami-
or cause a galvanic reaction at the implant-abutment interface.

Ideally, hand periodontal scalers for cleaning dental implants can be plastic, Teflon, gold-plated, or made of wood. When using gold-plated curettes, the manufacturer recommends not sharpening these hygiene instruments, as the gold surface could be chipped exposing the hand metal underneath this coating. Stainless steel scaling instruments may abrade the implant surface, stripping off any surface treatment such as hydroxyapatite (HA) as the instruments hardness is greater than the titanium alloy the implant is fabricated from.

Other cleaning armamentarium contraindicated for use with dental implants are air powder abrasive units, flour or pumice for polishing, and sonic and ultrasonic scaling units. Ultrasonic, pizzio, or sonic scaler tips may mar the implants surface leading to microroughness and plaque accumulation. The stainless steel tip may also lead to gouging of the implants polished collar. However, some clinicians advocate using 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 be avoided during hygiene appointments. Even the use of baking soda powder in these units may strip off any surface coating on the implant. Additionally, the air pressure may detach the soft tissue connection with the coronal of the implant leading to emphysema.

Titanium or titanium alloy surfaces of dental implants can be polished using a rubber cup along with a non-abrasive polishing paste or a gauge strip with tin oxide. Not only is the hygiene armamentarium important, but so are the home care techniques used to maintain endosseous dental implants. Patients should be taught the modified Bass technique of brushing using a medium-sized head, soft-bristled toothbrush. The use of intradental brushes should be used by implant patients after being shown their proper use. The plastic-coated wire brush is the only type to be used with dental implants to clean and not scratch the implant surface.

Recently, automated mechanical toothbrushes have been advocated as a daily mode of tooth cleansing. These devises may be a rotary, circular, or sonic type. With these home care instruments, the key to their effectiveness is proper instruction on their use and then diligent daily use by the implant patient.

As with natural dentition, adjunctive cleaning aids such as flossing are still valuable. With dentured patients, an implant patient’s home care requirements should be individually tailored according to each patient’s needs. Individual needs are based on the location and angulation of the dental implants, the position and length of transmucosal abutments, the type of prosthesis, and the dexterity of each patient.

The other popularized type of cleansing device is the use of oral irrigators with or without the addition of antimicrobial solutions. Also, oral rinses with antimicrobial properties such as Listerine or chlorhexidine have been widely advocated throughout the literature.

Summary
During the infancy years of dental implantology, the emphasis for long-term success of unsegregated implants was the surgical phase of dental implantology. In the years that followed, the emphasis for success had switched from a purely surgical influence to focusing more on the proper fixture placement which would be dictated by the prosthetic and aesthetic needs of each particular case.

In more recent years, the dental professional has recognized professional implant maintenance and diligent patient home care as two critical factors for the long-term success of dental implants. The microbiota and clinical presentation of peri-implantitis is the same as periodontitis around a natural tooth.

A complete list of references is available from the publisher.

Dr. Gregori Kurtzman, DDS, is in private general practice in Silver Spring, Maryland, USA. He can be reached at dr_kurtzman@maryland-implants.com.

Dr. Lee Silverstein, DDS, MS, is in private periodontal practice in Marietta, Georgia, USA. He can be reached at kenperio@bellsouth.net.