DENTAL IMPLANTS: ORAL HYGIENE AND MAINTENANCE

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Dentistry has become so exciting and challenging since predictability has been recognised for long-term dental implant and restoration success (Adell et al, 1981, Cox and Zarb, 1987, Albrektsson et al, 1981). 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.

The value of using conventional periodontal parameters to determine peri-implant health is not clearly evident in the literature (Orton et al, 1989). 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 osseointegration (Rateischak and Wolf, 1995). 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 log-term maintenance health of the peri-implant hard and soft tissues. This can be achieved through appropriate professional care, patient cooperation, and effective home care (Meffert et al 1992). 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, tempromandibular disorder and radiographic examination (Meffert 1993).

There is convincing evidence that bacterial plaque not only leads to gingivitis and periodontitis (Warrer et al, 1995), but also can induce the development of peri-implantitis (Lang and Karring, 1994). Thus, personal oral hygiene must begin at the time of dental implant placement and should be modified using various adjuctive 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 3mm into a gingival sulcus or pocket and may effectively clean the peri-implant sulcus (Balshi, 1986). In addition to mechanical plaque control, daily rinses using 0.1% chlorhexidine gluconate or Listerine (Ciancio et al, 1995) 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,

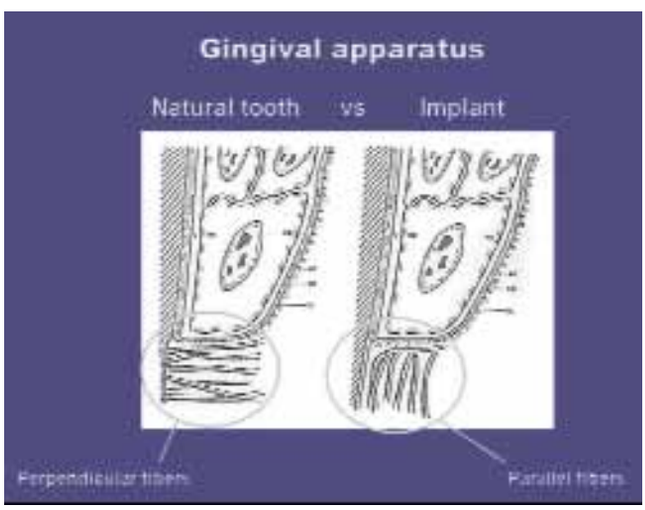

Figure 1: Comparison of crestal gingival fibre orientation

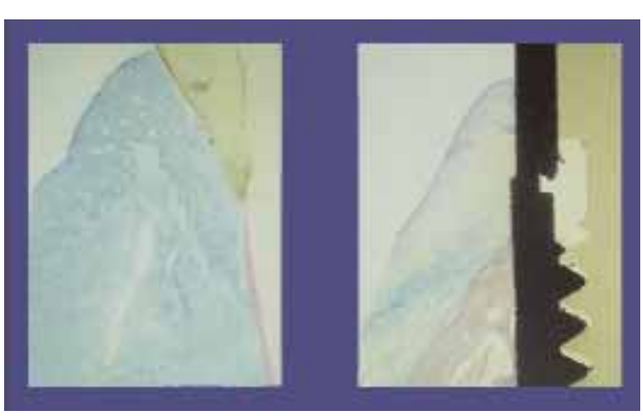

Figure 2: Microscopic comparison of gingival fibre orientation (natural tooth on left, implant on right)

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the dental professional should concentrate on the peri-implant tissue margin, implant body, prosthetic abutment to implant collar connection, and the prosthesis (Garg, 1995).

Clinical assessment

Clinical inspection for signs of inflammation, i.e. bleeding on probing, exudate, mobility, probe-able pockets, and a radiographic evaluation of the peri-implant bony 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 (Lekholm et al, 1986), and/or prosthetic abutment collar interface should be examined for looseness or breakage.

All these modes of clinical assessment are used routinely, except for periodontal probing around peri-implant tissues that appear to be in a state of good health. The baseline data and data from subsequent recare visits should be recorded in the daily progress notes to properly assess the peri-implant status logitudinally.

Subsequent to a thorough intraoral examination, unless there is visual evidence of soft tissue changes, i.e. 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 three-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 four to six-month recare regimen can be implemented (American Academy, 1996). However, be cognisant 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 during these maintenance visits (Baumgarten, 1995). For dental implant restorations that are 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 mobility of the prosthetic components or the implant fixture itself, and the patient's level of home care effectiveness (Meffert, 1995). 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 (Meffert, 1992).

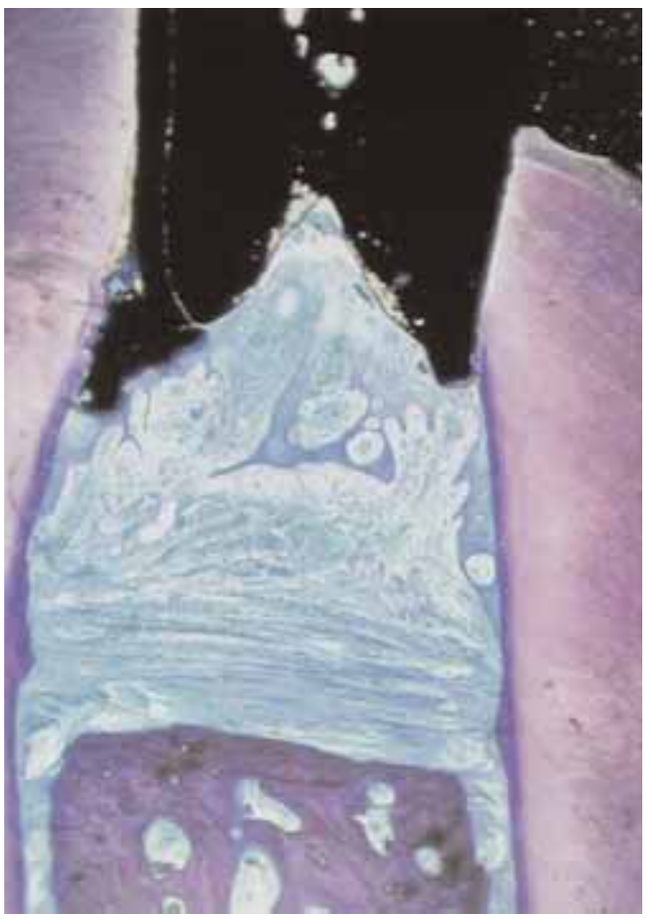

Figure 3: Gingival fibres between two natural teeth showing orientation perpendicular to the long axis of the teeth

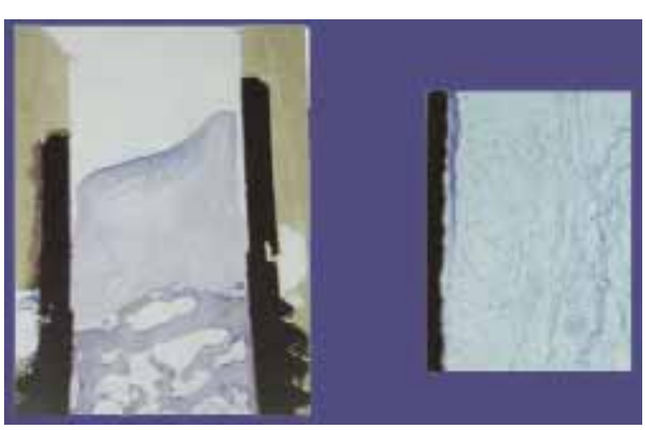

Figure 4: Gingival fibres between two implants showing orientation parallel with the long axis of the implants

Implants vs natural teeth

It is essential to understand the periodontal relationship between the gingiva and the structure it attaches to be it a natural tooth or an implant. (Figures 1 and 2). The fibre orientation of the gingival cuff around a natural tooth attaches

Figure 5: Plastic curettes for scaling dental implants and demonstration of the implant surface after use. Note that there is no alteration to the surface

perpendicular to the long axis of the tooth (Figure 3). This acts as a barrier when insertion of a periodontal probe within the sulcus. The probe tip advances apically till the tip contacts the perpendicular fibres and is halted. This orientation is not seen around implants. With an implant the gingival fibre orientation is parallel to the implants long axis (Figure 4). When a periodontal probe is inserted into the sulcus around an implant the probe tip advances passing between the fibres of the gingival cuff till the crestal bone prevents it from further advancement.

The peri-implant mucosal seal may be less effective barrier to bacterial plaque than the periodontium around a natural tooth, tissue attachment (Wayant, 1994). There is less vasculature in the gingival tissue surrounding dental implants compared to natural teeth. This reduced vascularity concomitant with parallel-oriented collagen fibres adjecent to the body of any dental implant make dental implants more vulnerable to bacterial insult (Nevins and Langer 1995). During recare appointments, peri-implant periodontal probing should be performed only where signs of infection are present, i.e. 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 (Lang et al, 1994). Commercically available plastic probes should be used when investigating the crevicular depth around dental implants. The probing depth around dental implants may be related closely to the thickness and type of mucosa surrounding the implant. A healthy peri-implant sulcus has been reported to range from 1.3 to 3.8mm, which is greater than those depths reported for natural teeth (van Steenberghe et al, 1993). In essence, the best indicator for evaluating an unhealthy site would be probing data gathered longitudinally (Quirynen et al, 1991).

For all of these reasons, personal home care and consistent professional maintenance have proven to be critical to the success and longevity of endosseous dental implants. This is especially true in an environment with adjacent natural teeth,

Figure 6: Plastic scaler used for recall maintenance

which if affected by periodontal disease, could act as a reservoir for pathogenic bacteria, ie. gram-negative anaerobic rods, and seed the peri-implant sulcus (Mombelli et al, 1995).

The physical characteristics of the peri-implant soft tissue are the focus of all oral hygiene instruction. The presence or absence of keratinised tissue in this critical area has not been unequivocally documented to state that peri-implant tissues are more vulnerable to the ingress of pathogenic bacteria with or without keratinised tissue being present around dental implants. However, the ability of the patient to maintain good home care around dental implants is facilitated by the presence of keratinised tissue surrounding implants. Thus, if a patient has no keratinised tissue around an implant, and a pull from a frenum or a chronic peri-implant mucositis exists, then placement of a soft tissue autogenous or alloplastic connective tissue graft is recommended to facilitate proper mechanical oral hygiene maintenance (Artzi et al, 1993).

Specific criteria for obtaining clinical data around dental implants that would allow proper monitoring and detect early possible failure of osseointegrated dental implants has not been clearly defined. Presently, the presence of mobility is the best indicator for diagnosis of implant failure. As opposed to natural teeth, dental implants exhibit minimal clinically undetectable movement because of the absence of a periodontal ligament. Therefore, healthy implants should appear nonmobile, even in the presence of peri-implant bone loss, if an adequate amount of supporting alveolar bone still exists (Papaioannou et al, 1995).

When monitoring the health of the peri-implant soft tissues, the practitioner should be cognisant of changes in soft tissue colour, 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 literature as to the accuracy and significance of bleeding upon probing around dental implants.

Figure 7: Alteration of implant surface after use of stainless steel scalers

Figure 8: Demonstration of gouging of the implant surface that may occur following use of an ultrasonic scaler

Presently, the literature advocates the use of bleeding on probing 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, i.e. bone loss. However, as previously mentioned, routine probing is not recommended.

Radiographic evaluation

Radiographic interpretation is one of the most useful clinical parameters for evaluating the status of an endosseous dental implant. Invasion of biologic width, predictable remodeling, or so-called saucerisation, is an average marginal bone loss of 1.5 during the first year following prosthetic rehabilitation followed by an average 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 radiolucency should be found, because such a rarefaction usually indicates infection or failure to osseointegration (Apse et al, 1989).

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, contaminate, or cause a galvanic reaction at the implant-abutment interface (Speelman et al, 1992).

Ideally, hand periodontal scalers for cleaning dental implants can be plastic, Teflon, gold-plated, or made of wood (Figures 5 and 6) (Gantes and Nilveus, 1991). 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 abraid the implant surface, stripping off any surface treatment such as hydroxyapatite (HA) as the instruments hardness is greater then the titanium alloy the implant is fabricated from (Figure 7).

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 (Rapley et al, 1990). Ultrasonic, piezo 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 (Figure 8). 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 (Figure 9). 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 nonabrasive polishing paste or a gauze strip with tin oxide. Not only is the hygiene armamentarium important, but so are the home care techniques used to maintain endosseous dental implants. 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 (Figure 10).

Recently, automated mechanical toothbrushes have been advocated as a daily mode of tooth cleansing. These devices 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, adjuctive cleaning aids such as flossing are still valuable. As with dentated 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 popularised 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 (Mombelli and Lang, 1992, Ciancio, 1994, Garg et al, 1997).

Figure 9: Demonstration of alteration of the implant surface following application of an air polisher and baking soda. Note the change in surface texture

Figure 10: Plastic-coated interproximal brush applied around implant abutments and under the superstructure for plaque removal

Summary

During the infancy years of dental implantology, the emphasis for long-term success of osseointegrated 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 recognised 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.

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