

Management and Maintenance of Dental Implant Failures

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ABSTRACT

Background: As the implant treatment modality is gaining popularity in the field of dentistry, the clinicians should introduce protocols for a systematic and consistent supportive care of the peri-implant tissues. Even though dental implants have known to be a reliable long-term treatment modality for patients, it should be understood that all the implants may not be successful and failures do occur. Management and maintenance phase play a vital role in the long-term success of implant treatment. There should be an effective teamwork between the dental team and the patient during this lifelong therapy. A diligent homecare by the patient is mandatory to increase the success of their implants. There should be a continuous encouragement by the clinician so that the patients adhere to the homecare instructions. This review article describes certain guidelines for management and maintenance care of dental implants.

Keywords: Dental implants, complications, failures.

INTRODUCTION

Over the past quarter century, dentistry has undergone numerous changes, however no developments have been significant than those in the field of implant dentistry. Although the patient population will benefit from the rise in implant therapy, the clinician is often confronted with increasingly complex potions. In spite of the fact that there are relatively reported success rates with this form of therapy, failures can occur. A detailed understanding of different aspects of failure is therefore considered necessary.¹

Failed implant sites present a challenging therapeutic dilemma to the clinician: the alveolar bone in these sites is usually further reduced, thus making it less than ideal for further implant placement. However, implant therapy is the only treatment of choice in most of the cases, which allows a fixed prosthetic reconstruction. The preferred alternative treatment plan for previously failed implants is redo of implants. Even though re-implantation is taking an ever-growing portion in dental practice, it is based only on clinical

judgement, as data on the success or failure rates of these secondary procedures are almost nonexistent. Periodontal literature provides very little information about the effectiveness of surgical procedures carried out to correct previously unsuccessful procedures.²

There is a need for intervention when the clinical and radiological findings suggest that there is an unstable peri-implant conditions and when there is a presence of progressive bone loss. Based on the aetiology of the problem, peri-implantitis can be treated by various strategies. If the major aetiological cause is biomechanical forces, then the first step includes an examination of prosthesis fit, the number and location of the implants and an evaluation of the occlusion. Occlusal equilibrium, the number and location of the implants and improvements in the prosthetic design can prevent the peri-implant tissue from undergoing further breakdown. The subsequent step involves a surgical procedure to remove deep peri-implant soft tissue pockets or regeneration of bone around implants.

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If bacterial infection is the major aetiological factor, then the first step includes managing the acute infection and reducing inflammation. This may include removing the plaque deposits with the help of plastic instruments and polishing of all accessible surfaces with pumice. 0.12% chlorhexidine is used for subgingival irrigation of all peri-implant pockets, systemic antimicrobial therapy for 10 days followed by a better patient compliance to oral hygiene till a healthy peri-implant site is achieved. This might be adequate to restore the gingival health or may require a surgical approach in the second phase.³

MANAGEMENT OF IMPLANT FAILURES

Non-Surgical Therapy: The most conservative approach to treatment involves non-surgical therapy. This treatment modality includes three subcategories:

a) Pharmacological therapy

Sub gingival irrigation twice or thrice a day for a period of 10 days upto 3 weeks is recommended for patients with an ailing implant. This can then be completed at home by the patients by adhering to the diligent instructions given by clinician or dental hygienist. Due to the antimicrobial effect and substantivity, chlorhexidine is most commonly prescribed by the clinicians. Systemic administration of antibiotics and local application of tetracycline fibers are among the various other pharmacological treatments. Various antibiotics which are found to be susceptible by the bacteria responsible for failing implants are: penicillin G, amoxicillin, amoxicillin- metronidazole combination and amoxicillin-clavulanate.⁴

Anti-microbial therapy for Peri-implantitis³

Antimicrobial	Adult Dosage
Clindamycin	300 mg, then 150-300 mg q8h
Amoxicillin/ clavulanate	875 mg q12h
Metronidazole plus 1 of the following	500 mg, then 250 mg q6h or 500 mg q12h
Pencillin V K	250-500 mg q6h
Amoxcillin	1000 mg, then 500 mg q12h
Erythromycin	250 mg q6h
Azithromycin	500 mg x 1d, then 250 or 500 mg q24h x 4d.
Clarithromycin	250-500 mg q12h or 1 g PO q24h

b) Occlusal therapy

Occlusal interference is another factor which can lead to ailing and failing implants. When there is a presence of occlusal interferences or premature contact, occlusal adjustments may be required. Whenever there is an evidence of parafunctional habits like grinding or bruxism, the implant prosthesis should be examined. Overloading of the implant should be prevented by correction of such occlusal interferences. The use of nightguard therapy has also been proved to be beneficial.⁵

c) Mechanical debridement.

Mechanical debridement is another non-surgical treatment modality which is suggested for the treatment of ailing or failing implants. Plastic hand instruments or ultrasonic instruments with plastic insert tips have been recommended for the local debridement of tissues around an implant. The use of plastic instruments helps in plaque removal around the implants without causing any damage to the soft titanium surface of dental implants. In the presence of peri-implantitis, the implant surface may be contaminated with soft tissue cells, microorganisms and their products. Hence, these contaminated surfaces should be treated as so to aid in the new bone regeneration and re-osseointegration.⁶

Prophy jet, the use of a high pressure air powder abrasive which is a mixture of sodium bicarbonate and sterile water has been recommended because it eliminates the microbial deposits, does not cause any change in the surface topography and does not have an adverse effect on cell adhesion. Chemotherapeutic agents such as chlorhexidine gluconate, stannous fluoride and tetracycline and supersaturated solution of citric acid are found to have the greatest potential to eliminate endotoxins from both hydroxyapatite and titanium implant surfaces. Hence contact with these agents for 30-60 seconds are preferred for the preparation of the implant surfaces. The choice of the method of decontamination depends on the type of implant surface. It has been found that machined titanium surfaces are the easiest to decontaminate and the preferred antibiotics in such cases is topical tetracyclines.⁷

Systemic administration of antibiotics directly targeting gram negative anaerobic organisms has demonstrated a shift in microbial composition and a sustained clinical improvement over a span of 1 year. Significant reduction in total anaerobic count has been observed with the use of Actisite fibers which is a local delivery device containing polymeric tetracycline HCl. Prior to the decision on the surgical treatment modality it is necessary to identify the type of osseous defects. Hence, removal of implant prosthesis is advised to be done 4-8 weeks prior to the regenerative surgical procedure. This enables compliance with oral hygiene procedures, soft tissue collapse and sufficient healing over the implant site with a cover screw in place.⁸

Surgical therapy

The initial phase in surgical therapy is reflection of the tissue and degranulation of the defect. This is followed by exposing and treating the implant surface that has been contaminated with bacteria. The endotoxins should be removed from the surface of failing implant, especially in cases of hydroxyapatite (HA) coated surfaces. Ultrasonic scalers can be used to remove the coating in case of infected implant with HA surface since hand curettes is slow and air abrasives can cause air emboli in marrow spaces.

The literature supports the use of chemical agent to detoxify the failed implant's surface.⁹ The rationale behind this is the similarity between sub gingival flora of natural teeth and dental implants. The osseous defect should be regenerated or obliterated with a suitable grafting material after the decontamination of the implant. Freeze dried bone graft is preferred if the detoxification is complete and if the detoxification is incomplete, an alloplast is preferred. The use of alloplast or an allograft is based on the effectiveness of detoxification. When the implant surface is clean and detoxified, biologic healing can be accomplished with an allograft such as DFDBA.¹⁰

To retain these grafts in optimal position, membranes can also be utilized in combination with graft materials which aid in bone regeneration around failing implants. Resorbable membranes are mostly preferred today. It is necessary that the membrane should extend 3-4mm beyond the defect

and should be secured in position. The primary closure of flap should then be achieved with the help of mattress and interrupted sutures without tension. The implant is then covered and kept out of function for a period of 10-12 weeks. After ensuring that the healing is complete, stage 2 type surgery is performed to attach the abutment.¹¹

Perigingival Regenerative Therapy is preferred while treating one stage implant or when prosthesis has to be maintained. 3mm hole is made on the membrane before placing on the implant. Complete coverage and isolation of vertical bony defect should be ensured once the membrane is placed. The flap is then closely sutured back to the neck of the implant. The membrane should be left in place for 6-8 weeks post surgery.¹²

Horizontal bone defect in the unaesthetic zone can be treated by techniques like gingivectomy and apically displaced flaps there by reducing the peri-implant pocket depth and improving access for oral hygiene. Vertical one to two walled bone defects can be treated by respective surgery to reduce the pocket depth, to create a smooth implant surface, for osseous correction and to increase the width of keratinized gingiva. Smooth implant surfaces coronal to the bone level helps to prevent further progression of the disease and site which can be easily maintained by the patient. Hence, high speed diamond burs and polishers should be utilized to alter the surfaces with threads or roughened topography like hydroxyapatites to achieve a smooth and continuous surface.¹³

Various bone grafting techniques and guided bone regeneration and even in combination with platelet rich plasma have been used for regeneration of lost bone in three wall or circumferential defects. Periodic maintenance, subgingival plaque removal and proper oral hygiene instructions are important for the success of any peri-implant treatment.⁵

IMPLANT MAINTENANCE

Basically, maintenance of dental implants includes the professional cleaning by the dentist and oral home care by the patient itself. Good oral hygiene on the patient's part is mandatory. The position and design of prostheses that are difficult to manage may limit the effectiveness of mechanical cleaning. The patient should be recalled every 3 months

during the first year and at least every 6 months thereafter. Apart from the dentist's clinical role, the patient and the dental hygienist also play a significant role in the implant maintenance and success.¹⁴

Success of dental implant is greatly determined by the effectiveness of maintenance of peri-implant hard and soft tissues.¹⁵ Maintenance phase for patients with dental implants should be scheduled every 3 months for a minimum of 1 hour and should constitute the following:¹⁶

- Update of patient's recent medical and dental history
- Review of oral hygiene and modifying the oral hygiene habits if required
- Evaluation of clinical findings
- Radiographic examination of implant and peri-implant tissues
- Assessment of implant stability
- Plaque and calculus removal from the implant surface
- Setting of maintenance intervals.

Peri-implant diagnostic Parameters

Various clinical and radiographic parameters that are used to assess the peri-implant health during the maintenance phase are:

i. Plaque and Mucosal Assessment

Various authors have modified indices to evaluate the mucosal conditions of peri-implant margins and for assessment of plaque.^{17,18}

ii. Bleeding on Probing

Lang et al. in their study concluded that there was no bleeding on probing at healthy peri-implant sites while there was a substantial increase in bleeding at both peri-implant mucositis (67%) and peri-implantitis sites(91%).¹⁹

iii. Peri-Implant Probing Depth

Probing is an effective approach to assess the deleterious changes in peri-implant sites. Probing should be carried out every 3-4 months for a period of 1 year after the placement of prosthesis. Probing should not be done for the first 3 months after the placement of abutment since it can interfere with

healing. Probing depth of 5mm or more indicates signs of peri-implantitis.²⁰

iv. Width of Peri-Implant Keratinized Mucosa

The presence of keratinized mucosa increases the strength at implant soft tissue interface as it consists of more hemi desmosomes. The role of keratinized gingiva around teeth and implant is still controversial.¹⁴

v. Peri-Implant Sulcus Fluid Analysis (PISF)

Peri-implant sulcus fluid analysis provides a non-invasive method of assessing the role of host response in peri-implant disease. Niimi and Ueda reported that there is a positive correlation between PISF volume, accumulation of plaque and the degree of peri-implant soft tissue inflammation.²¹

vi. Suppuration

Bleeding, suppuration, increase in peri-implant pocket depth, mobility and bone loss are seen in cases of peri-implantitis. Hence the presence of suppuration is a definite indication of the disease and it also suggests the definite need for anti-infective therapy.²²

vii. Occlusal Evaluation.

Occlusal disharmonies can result in various problems like loose abutment screws, failure of implants and even prosthesis failure. Thus, occlusal evaluation must be carried out at regular intervals.²³

viii. Radiographic Evaluation

Periapical / vertical bitewing radiographs should be taken at 6-8 months. This should then be compared with the baseline radiographs and any changes in the crestal bone during the first year of loading should be noted. At one year, these radiographs should be compared with vertical bite wing radiographs. If there is presence of any crestal bone changes, then radiographs should be repeated every 6-8 months until the bone is stable for 2 consecutive periods. If there are no changes in the crestal bone, then radiographs need to be scheduled only once in 3 years.¹⁴

ix. Evaluation of Implant Stability/Mobility

Assessment of mobility is one of the main factors for evaluation of implant health. Periotest has been introduced to evaluate the initial degrees of mobility. A non-invasive device based on the principles of resonance frequency has been recently developed to evaluate implant stability.²⁴

Professional Cleaning

Implants require an intensive care and not just mere brushing of teeth. Natural teeth are protected from the external attacks better than implants. This is mainly because periodontal ligament which anchors the teeth to the socket has a protective defense mechanism. Even though there is a long-term predictability of implants, complications can occur in a number of cases which eventually can result in implant loss and prosthesis failure. Adequate maintenance programs, routine professional hygiene care as well as prompt diagnosis and treatment of peri-implant pathology will help to mitigate and avoid implant loss/failure which occur due to these complications.²⁵

Instrument Selection

The chosen instruments should be light and should either be disposable or sterilizable, efficient in plaque and calculus removal without causing any damage to implant surface, simple to use, should not be expensive and should be easily adaptable in implant sulcus.²⁶

Using sonic and ultrasonic scaler tips on the surface of implants can result in micro roughness and plaque accumulation. Use of stainless steel tip can trigger gouging of polished collar. This can be avoided by using metal sonic and ultrasonic instruments with nylon sleeves and plastic inserts.¹⁵

Polishing devices

Air powder polishing units should not be used since it can cause damage to the surface of implants. The air pressure can also cause a break in connection between the soft tissue and coronal part of the implant and may result in emphysema.²³

Rubber cup with a non-abrasive polishing paste or gauze strip with tin oxide can be utilized for polishing titanium surfaces of the dental implants.¹⁴

Oral irrigators

Oral irrigators can be used for sub gingival irrigation with or without antimicrobials. Chlorhexidine gluconate can be used for the irrigation. Care should be taken not to insert the cannula to the base of the sulcus to prevent fluid distention in the surrounding tissues.²⁷

Locally Applied Chemotherapeutics

Early and timely intervention with locally applied chemotherapeutics with the help of plastic irrigation tip can either delay or reverse inflammation. Antibiotic or antimicrobial like Arestin, Atridox, PerioChip or Dentomycin or antiseptic agents like peroxide, Listerine or chlorhexidine can be used for this purpose.²⁸

At-Home Implant Care

Brushing

Manual tooth brushes

Mechanical force can easily cause erosion of implants. Therefore, tooth brushes with synthetic bristles and rounded ends are preferred for implants. Hollow bristles serve as niches for colonization and growth of bacteria and hence should be avoided. A medium sized short head soft tooth brush with modified bass technique is recommended for cleaning of implants.¹⁵

Mechanical tooth brushes

Mechanical tooth brushes have higher plaque removal ability and are superior when compared to manual brushes. Automated tooth brushes have a rotary, reciprocal or sonic action and are recommended as a routine mode of brushing.¹⁵

Dental floss

Interdental areas can be cleaned effectively with the help of dental floss. Super-Floss is considered as the best floss for implant types. Proxi-Floss which has a textured surface aids to carry medicaments to implant surface and surrounding tissues. Flossing should be done gently and care should be taken not to cause trauma to the tissue. Large embrasures and under connector bars can be cleaned with the help of woven flosses with threaders.²⁹

Interproximal Cleaners

When it is difficult to use floss, patients can be advised to use interdental aids depending on the size and shape of the embrasure. Various devices include foam tips, interproximal brushes and disposable wooden picks which help in removing plaque and also help to deliver antiseptic rinses.³⁰

The selection of interproximal brushes should depend on the interproximal area. StaiNo Interdental brush can adequately clean larger interproximal spaces and smaller interdental brushes like sulcabrush or Go-Betweens Cleaners can be used to clean narrow interproximal spaces.²⁸ Plastic coated interproximal brush is generally recommended for use for dental implants since brushes with exposed metal wire tip can cause scratches in abutment's titanium surface.³¹

Antimicrobials

Mouth rinses like chlorhexidine gluconate are effective means of maintaining good oral care.¹⁵ Topical antimicrobials like chlorhexidine digluconate (0.12%), plant alkaloids or phenolic agents have been found to cause lesser surface alterations.³²

Intraoral Camera

Patients can use the intraoral camera to monitor periodic tissue checks or to assess the efficacy of their oral care. They can even look for areas of food lodgement, redness, swelling or other signs around implant and thus can prevent any infections by taking early preventive measures.²⁸

CONCLUSION

Rehabilitation with dental implant treatment has become a standard procedure and will undoubtedly gain popularity in the coming years. Early detection and timely treatment of progressive bone loss around the implants is necessary to save failing implants. Long term success of dental implants requires regular maintenance and monitoring. Assessment of patient's general and oral health, professional implant maintenance and patient home care are the key factors which ensures long term success.

Recall maintenance visit should always include the assessment of soft and hard tissue health, patient's level of compliance with oral hygiene and plaque control, integrity and stability of the prosthesis. Long term success of both periodontal and implant therapy depends on an effective partnership between the patient and practitioner.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

REFERENCES

- 1) Mantena SR, Gottumukala SNVS, Sajan S, Rama Raju A, Rao B, Iyer S Implant Failures-Diagnosis and management Int J Clin Implant Dent 2015; 1(2):51-59
- 2) Machtei EE, Mahler D, Oettinger-Barak O, Zuabi O, Horwitz J. Dental implants placed in previously failed sites: Survival rate and factors affecting the outcome. Clin Oral Implants Res 2008;19:259-264.
- 3) Wadhawan R, Deep A, Manas B, Maniar A, Gaba N. Management of Ailing & Failing Implants: A Review. IOSR-JDMS. 2016;15(3):101-109.
- 4) Eversole LR, Rizioiu IM. Preliminary investigations on the utility of an Erbium, Chromium YSGG laser. CDA J. 1995; 23:41- 47.
- 5) Quirynen M, Van Der Mei HC, Bollen CML, Schotte A, Marechal M, Doornbusch GI et al. An in vivo study of the influence of the surface roughness of implants in microbiology of supra- and subgingival plaque. J Dent Res 1993; 72(9):1304-1309.
- 6) Mombelli A and Long NP. The diagnosis and Treatment of Peri-implantitis. Periodontol 2000. 1998; 17: 63-76.
- 7) Buser D, Merickske-Stern R, Dula K, et al. Clinical experience with one-stage, non-submerged dental implants. Advances Dental Res. 1999; 13:153-161.
- 8) Schwartz-Arad D, Herzberg R, Levin L. Evaluation of long-term implant success. J Periodontol. 2005; 76(10):1623-1628.

- 9) Kreisler M, Gotz H, Duschner H, et al. Effect of Nd: YAG, Ho: YAG, CO₂, and GaAlAs laser irradiation on surface properties of endosseous dental implants. *Int J Oral Maxillo Impl.* 2002; 17:202-211.
- 10) Levin L, Laviv A, Schwartz-Arad D. Long-term success of implants replacing a single molar. *J Periodontol.* 2006; 77(9):1528-1532.
- 11) Gatewood RR, Cobb CM, Killoy WJ. Microbial colonization on natural tooth structure compared with smooth and plasma-sprayed implant surfaces. *Clin Oral Implants Res.* 1993; 4:53-64.
- 12) Deporter DA, Todescan R Jr, Pilliar RM, et al. Sintered, porous-surfaced dental implants: pushing the envelope of current practice. *Int Mag Oral Impl.* 2003; 4:53-60.
- 13) Zablotsky MH. A retrospective analysis of the management of ailing and failing endosseous dental implants. *Implant Dentistry.* 1998; 7:185-189.
- 14) Carl E Misch, "An implant is not a tooth: a comparison of periodontal indices," *Contemporary Implant Dentistry.* Mosby, Elsevier 3rd edition.2007.
- 15) L. H. Silverstein and G. M. Kurtzman, Oral hygiene and maintenance of dental implants. *Dentistry Today.* 2006; 25 (3) : 0-75.
- 16) T. G. Wilson Jr., "A typical maintenance visit for patients with dental implants," *Periodontal* 2000. 1996; 12(1) : 29-32.
- 17) A. Mombelli, M. A. C. van Oosten, E. Schurch Jr., and N. P. Land, "The microbiota associated with successful or failing osseointegrated titanium implants," *Oral Microbiol Immunol.*1987; 2(4): 145-151.
- 18) P.Apse, G. A. Zarb, A. Schmitt, and D. W. Lewis, "The longitudinal effectiveness of osseointegrated dental implants. The Toronto study: peri-implant mucosal response," *Int J Periodontics Restorative Dent.* 1991; 11(2) : 95-111.
- 19) N. P. Lang, A. C. Wetzel, H. Stich, and R. G. Caffesse, "Histologic probe penetration in healthy and inflamed peri-implant tissues," *Clin Oral Impl Res.* 1994; 5(4): 191-201.
- 20) Gulati M, Govila V, Anand V, and Anand B. Implant Maintenance: A Clinical Update. *Int Sch Res Notices.* 2014: 908534
- 21) Niimi A, Ueda M. Crevicular fluid in the osseointegrated implant sulcus: a pilot study. *Int J Oral Maxillofac Implants* 1995; 10(4): 434-436.
- 22) B. Klinge, M. Hultin, and T. Berglundh, "Peri-implantitis," *Dent Clin North Am.* 2005; 49 (3): 661-676.
- 23) S. Humphrey, "Implant maintenance," *Dent Clin North Am.* 2007;50(3): 463-478.
- 24) N. Meredith, "Assessment of implant stability as a prognostic determinant. *Int J Prosthodont.* 1998; 11(5):491-50.
- 25) R. E. Cohen, "Position paper: periodontal maintenance," *J Periodontol.* 2003;74(9):1395-140.
- 26) L. D. T. Mortilla, "Hygiene and soft tissue management: the hygienist's perspective," in *Dental Implants:The Art and Science*, C. A. Babbush, Ed. W.B. Saunders, Philadelphia, Pa, USA 2001; 9: 423-444.
- 27) Suvarna H Patil, Veena HR, Mahantesha Chkrasali, Abhishek C Shah. Dental Implant Maintenance-A Review. *International Journal of Dental Clinics.* 2012; 4(1).
- 28) R. E. Goldstein and K. J. Nimmons, "The expanding esthetic practice: implant maintenance—part 1," *Contemporary Esthetics & Restorative Practice.* 2005;12-13.
- 29) Babbush CA, Hahn JA, Krauser JT, Rosenlicht JL. Dental implants- The art and science. Philadelphia:W.B.Saunders. 2nd edition.2010
- 30) G. Sison, "Implant maintenance and the dental hygienist," *Access Supplement.* 2003;1-13.
- 31) A. K. Garg, F. Duarte, and K. Funari, "Hygienic maintenance of dental implants," *J Practical Hygien.*1997;6(2): 13-17.

32) D. Thomson-Neal, G. H. Evans, and R. M. Meffert,
"Effects of various prophylactic treatments on
titanium, sapphire, and hydroxyapatite-coated

implants: an SEM study," Int J Periodontics
Restorative Dent 1989; 9 (4): 301-311.