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The Success and Faliures in Implants

KEYWORDS: Implants, implant survival, periodontitis, peri implantitis, osseointegration.

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ABSTRACT *This review summarizes the current knowledge concerning the success and failures in implants. It recommends a general dentist with a knowledge and information regarding inclusion of an implant in a treatment plan. A key part of implant therapy is the assessment process in which an attempt is made to identify variables that increase the risk of complications leading to implant failure. Success is often difficult to define since it implies that a large number of criteria have been met such as stability, functionality, little or no change in bone support, acceptable esthetics and overall patient satisfaction. Apart from success, we have implant survival which is simply defined as any implant that remains in place at the time of evaluation, regardless of any outward signs, symptoms or history of problems. Lastly, we have implant failure which is the result of events that may jeopardize or prevent Osseo integration from occurring, or is due to the loss of already obtained Osseo integration (functional ankylosis). The authors have researched and compiled their knowledge regarding a treatment option which has a high degree of success and has been preferred by practitioners.*

Introduction

In the past few decades, the widespread availability and successful use of dental implants have greatly expanded the treatment options for replacement of missing teeth. A key part of implant therapy is the assessment process in which an attempt is made to identify variables that increase a risk of complications leading to implant failure. In many cases, early identification makes it possible to avoid or eliminate them. Risk factors for implant failure are environmental, biologic or behavioral factors that are a part of the causal chain leading to implant complications. Peri-implantitis and implant failure is not caused only by presence of one risk factor. It is the combination of multiple risk factors that has clinical importance.

To minimize the risk of implant complications clinicians can use a number of technical procedures, such as adhering to a strict hygienic surgical protocol, performing the osteotomies with sharp drills, achieving early implant stability, and avoiding damage to vital anatomic structures during surgery. Since ongoing oral infections can lead to implant complications it is highly recommended to treat any endodontic, periodontal or other oral infections are treated prior to implant placement.

Identifying factors that might increase the risk of failure or complications with implants as well as determining whether the patient's expectations are reasonable. In the examination and evaluation of a candidate for dental implants the most common indications are replacement of one or more missing teeth, support of a removable full or partial denture. Patients who successfully pass a screening and evaluation can be considered as candidates for implant placement.

Implant success, survival & failure:

An individual, unattached implant is immobile when tested clinically. A radiograph doesn't demonstrate any evidence of peri-implant radiolucency. Vertical bone loss is less than 0.2 mm annually following the implant's 1st yr. of service. Individual implant performance is characterized by an absence of persistent &/or irreversible signs & symptoms such as pain, infections, neuropathies, paresthesia, or violation of the mandibular canal. In the context of the above, a success rate of 85 % at the end of a 5 yr. observation period & 80 % at the end of a 10 yr. period are minimum criteria for success.[1]

Table 1: implant success , survival and faliures.

Group	Clinical Conditions	Management
I – Optimum health SUCCESS	a) No pain or tenderness upon function b) 0 mobility c) <2mm radiographic bone loss from initial surgery d) No exudates history e) Bleeding index – 0 to 1	Normal maintenance
II – Satisfactory health SURVIVAL	a) No pain on function b) 0 mobility c) 2-4mm radiographic bone loss d) No exudates history e) Bleeding index – 0 to 1 (may have transient BOP 2 condition)	Reduce stresses Shorter intervals between hygiene appointments. Gingivoplasty Yearly radiographs

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III – COMPROMISED health	a) May have sensitivity on function b) No mobility c) Radiographic bone loss >4mm (less than 1/2 of implant body) d) Probing depth >7mm e) May have exudates history f) Bleeding index – 1 to 3	Reduce stresses Drug therapy, antibiotics, CHX Surgical re-entry, revision surgery Change in prosthesis &/ or implants
IV - Clinical failure OR ABSOLUTE FALIURE (any of the following conditions)	a) Pain on function b) Mobility c) Radiographic bone loss > 1/2 the length of d) Implant e) Uncontrolled exudate f) No longer in mouth g) "sleepers" h) implants exfoliated	Removal of implant, bone graft

Anatomical Considerations:

Hard tissue: Together with root cementum and periodontal membrane, the alveolar bone constitutes the attachment apparatus of the teeth, main function of which is to distribute and resorb forces generated by mastication and other tooth contacts. Alveolar bone is lost as a result of disease, trauma or extensive post extraction bone modeling (independent sites of formation and resorption and results in the change in shape or size of the bone.) may pose therapeutic problems in periodontal reconstructive and/or implant dentistry.

Available bone: Is particularly important in implant dentistry as it describes the external architecture or volume of edentulous area considered for implants. Amount and density of available bone in the patient are primary determining factors in predicting individual patient success. (Table 2)

As the bone resorbs first its width decreases at the expense of facial cortical plate, as lingual cortical plate is thicker, especially in the maxilla. With respect to width, the pattern of bone resorption with time is 25% in first yr 40% within 3 yrs of extraction. Once division B bone is reached, it remains for more than 20 yrs.

Bone density: Describes the internal structure of the bone, reflecting its internal structure. Higher failure rates have been recorded in poor quality bone as compared to higher quality bone. The highest clinical failure rates have been reported in posterior maxilla. Also, lower success rate was noted in posterior mandible as compared to anterior mandible. Thus, implant survival was found to be location specific. (Table 3)

Soft tissue: If osseous and gingival tissues are different for thick and thin tissue biotypes. It seems logical that these distinctions would significantly influence implant site preparation and treatment planning. Studies conclude that lack of keratinized tissue doesn't impair the health or functions of implants. However, it forms a strong seal around the implant. (table 4)

Patient selection:

This aspect includes the identifying factors that might increase the risk of failure or create complications with implants. First and foremost factor is to evaluate what candidate is fit for dental implants. The replacement of missing teeth is greatly required by edentulous patients, existing bone, jaw relationship, lip support, phonetics are the main considerations in these patients.

In partially edentulous patients remaining teeth should be examined for any pre-existing infections. A detailed medical and dental history should be documented in written to avoid and adverse reactions and complications. For a successful implant therapy all oral lesions, infections should be diagnosed and properly treated and a through radiographic examination is indicated before implant therapy. A detailed information regarding the treatment should be explained to the patient, a patient who understands what is being done are usually quite co-operative which leads to increased probability of successful therapeutic outcomes.

Maintenance:

Daily self-control (oral hygiene) and adherence to a maintenance recall schedule is absolutely required for long term success. Patient should initiate rinsing regimen immediately after surgical placement. Combination of rinsing brushing and daily home care should be advised. Recall visits every 3-4 months & radiographs to document changes in osseous topography or presence of peri-implant space every 6 months.[2]

Complicating factors:

Apart from the factors causing implant failure the factors that can complicate the implant therapy are:

Biologic complications: which involve peri-implant supporting hard and soft tissues.

Technical complications: when strength of materials is no longer able to resist the forces that are being applied.

Esthetic and phonetic complications: high expectation of the patient and less than optimal patient related factors.

Surgical complications: includes perilous bleeding, damage to adjacent teeth, nerve injury and jaw fractures. Post operative instructions such as hematoma and infections. (table 5)

Risk factors:

In dental implants the assessment is intended to identify the variables that increase the risk of complications of leading to implant loss or compromised clinical outcomes. It is essential that the reasons for implant failure are understood so these threats to the implant survival and success can be minimized.

Risk assessment should be performed before placement of implants, during the phase of implant placement and Osseo-integration, during the phase of implant maintenance and after an implant has failed and been removed.

Periodontitis :

Infections defined as peri-implantitis and peri-implant mucositis are common features around implants. There is abundant data showing that poor oral hygiene and microbial biofilms are important etiologic factors leading to the development of peri-implant infections and implant loss, periodontitis increases the risk for implant failure. Ongoing oral infection can lead to implant complications, so it

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is highly recommended that any periodontal infection be treated prior to implant placement. In risk assessment discussions with patients it is a good idea to emphasize that based on their history of periodontitis they may be at an increased risk of developing peri-implantitis and there should be an extra diligent in adhering to a rigorous post insertion implant maintenance programme

Endodontic infections:
The occurrence of an implant periapical lesion is termed retrograde peri-implantitis[17]. Bacterial contamination from a previously extracted natural tooth can cause periapical lesions [3-4]. Although the presence of ongoing oral infection does not guarantee that implants will fail, such infections appear to increase the risk of failure.

Drug influenced enlargement:
When there is a significant gingival enlargement around the teeth or implants. Oral hygiene and maintenance procedures can become quite difficult. Therefore medications associated with gingival enlargement should be considered in the overall risk assessment prior to implant placement.

Age related risk factors:
For a dental implant treatment, chronological age by itself is suggested as one of the risk factors for success, but it would not be a contraindication. In general reserved capacity of bone and soft tissue make it possible to establish osseo-integration in the long run. Rather than aging itself, the specific nature of the disease process, such as osteoporosis or diabetes, and local bone quality and quantity at the implant site, mostly related to aging, are more important for successful dental implant treatment. Indeed most of the longitudinal studies of survival rates of implants include some subjects who are well over 75 years of age.[5] An upper limit of exclusion is usually not listed in such studies. It is clear that implants can be quite successful when placed in patients who are in their eighth and ninth decades of life.

Bruxism:
Bruxism is generally considered a contraindication for dental implants, although the evidence for this is usually based on clinical experience only. So far, studies to the possible cause-and-effect relationship between bruxism and implant failure do not yield consistent and specific outcomes. This is partly because of the large variation in the literature in terms of both the technical aspects and the biological aspects of the study material. Nevertheless, given the seriousness of possible biological and biomechanical complications, careful pre-surgical planning and (post-) prosthetic preventive measures should be given consideration in bruxists.

Smoking :
One of the largest epidemiological studies reporting an association between smoking and periodontitis is National Health and Nutrition Examination Survey (NHANES) III survey which included 12,329 U.S. adults 20 years and older.[6] Smoking increases the risk of implant failure it has been shown by the increased proportions of Actinobacillus Actinomycetemcomitans, P.gingivalis and T.forsynthesis .Smoking alters the gingival crevicular fluid , tobacco products decrease the proliferative capacity of T and B lymphocytes. Locally nicotine acts as a vasoconstrictor and impairs gingival blood flow. It binds to the root surface and reduces the collagenase production.[7]

Diabetes:
Periodontal disease is a complication of diabetes and is a risk of poor diabetic control. The placement of dental implants in the diabetic patient remains controversial. A patient with a late onset, diet control has a lower risk of implant failure. However an insulin dependent diabetic patient is at a higher risk of implant failure.[8] (Figure 1)

Anticoagulants:
The evidence from clinical trials and focused reviews supports continuing oral anticoagulation for patients needing dento-alveolar surgery, including placement of dental implants. The INR of any anticoagulant needs a close monitoring, dicloxacillin and nafcillin increase the warfarin metabolism which decreases the INR. Prophylactic doses may reduce the normal flora and vitamin K which leads to an elevation of INR.[9] (Figure 2)

Local hemostasis will control the bleeding in the few patients who develop postsurgical bleeding. (Table6& Table 7)

Cancer chemotherapy & history of radiation:
Patients receiving chemotherapy are likely to develop complications numerous episodes of fever and documented septicemia with organisms of streptococcus virudens group. All of the infections hemorrhagic and mucosal complications followed the cytotoxic and myelosuppressive cycle induced by chemotherapy. Management of a dental implant in a patient about to undergo chemotherapy requires that the implants are either removed before therapy or retained with protective care provided

Patients who have received radiation (>/= 60Gy) to the head neck as a part of treatment of malignancies are at an increased risk of developing osteoradionecrosis (ORN). This complication is triggered by extraction of teeth or insertion of an implant.

Immunosuppression & HIV:
Corticosteroids have and anti-inflammatory action and interfere with wound healing and have an immune suppressant effect on lymphocytes by blocking the inflammatory events needed for satisfactory repair. They increase the rate of post-operative infections, such patients may be a risk group. Medical advice should be taken first and it would be prudent to consider the benefit from antibiotic prophylaxis.

Patients infected with HIV suffer progressive deterioration in immunity i.e. fall of T-helper (CD4) cell count. Patients taking their regular medications (HAART) live for many years without developing severe opportunistic infections. There is no evidence that immune incompetence is a contraindication to implants.

Osteoporosis:
Osteoporosis is caused due to the deficiency of sex hormones, in both men and women. In women it causes the loss of direct action on estrogen on intestine and kidney leading to increase number of bone multicellular units and uncoupling of bone formation, bone resorbtion.

Men exhibit only a slow phase of bone loss during increase level of sex hormones kidney globulin (SHBG), it binds to the sex steroid in an active complex. Cancellous bone is much more richly vascularized by osseous vascularization this arrangement produces a much higher surface to volume ratio to extracellular fluids. Therefore cancellous bone responds more quickly to metabolic alteration. A proper adjustment of surgical technique and a longer

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healing period may be considered in order to achieve osseointegration.

Sjogren syndrome:
The primary oral symptom of Sjogren syndrome is xerostomia. Patients have extensive oral implications include xerostomia, rampant caries, chronically inflamed, irritated and burning mucosa. Inflamed, enlarged and hardening of salivary glands is found.

Since, Sjogren syndrome often accompanies other conditions that increase the risk of implant failure, it is important that implant candidates with Sjogren syndrome be carefully evaluated for numerous other risk factors that might be present.

Scleroderma:
It is a chronic autoimmune disease featuring fibrosis of connective tissue and blood vessels. Presenting hardening and contracture of skin as a result the skin becomes tart leading to a mask like appearance, resulting in problems in all types of dental care. Placement of dental implants in such patients requires a rigorous maintenance program.

Bisphosphonates:
Bisphosphonates were introduced as an alternative to hormone replacement therapy for osteoporosis and they are also used to treat osteolytic tumors. Nitrogen containing Bisphosphonates inhibit the farnesyl diphosphate synthase enzyme of the cholesterol biosynthesis pathway and disrupt the isoprenylation branch pathway, which inhibits proteins and other factors that play a rate-limiting role in osteoclast resorbtion of bone. For patients having a history of oral bisphosphonate treatment exceeding 3 years and those having concomitant treatment with prednisone, additional testing and alternate treatment options should be considered.[10]

Systemic Lupus Erythematosus:
Systemic lupus erythematosus (SLE) is an autoimmune disease that affects many organ systems. It is a Type III hypersensitivity reaction caused by antibody-immune complex formation. If implants are absolutely required for s patient with SLE it should be emphasized that bacteremias from oral surgery procedures increased the risk of developing infections. Antibiotic coverage is considered to minimize this potential problem.

Polymorphisms:
Polymorphisms are small variations in base-pair components of DNA that occur with a frequency of approximately 1-2% in the general population. However, gene polymorphisms can affect in subtle ways how different people respond to environmental challenges.

The studies conducted in this field have led to the conclusion that is a synergistic effect between polymorphisms and smoking that puts dental implants at a significantly higher risk of developing biologic complications during function. However, further studies in this area are warranted since a validated generic risk factor for implant failure would have immense clinical utility.

Conclusion:
The key part of implant therapy is the assessment process to identify variables and make it possible to avoid and eliminate them. A good understanding of these factors determines the prognosis of implant therapy

Table 2: implant selection on the baisis of availability of bone.

DIVISION	DIMENSION	TREATMENT OPTIONS
A – Abundant bone	Width :>5 mm Height :> 10-13 mm Length :>7 mm Angulation :< 30 degrees Crown : implant <1	Division A root form
B – barely sufficient bone B width : 4 -5 mm B-w minus width : 2.5 – 4 mm	Width : 2.5-5 mm Height :> 10-13 mm Length :>12 mm Angulation :<20 degrees Crown : implant <1	Osteoplasty – modification to other division (division A) Narrow & more implants (division B root form, plate form) Augmentation (division A) – for greater force factor, esthetics
C – compromised bone Unfavorable C-w : continued resorption of width C-h : height resorption C-a : unusual – adequate height & width. But, angulation > 30	Width :< 2.5 mm Height :< 10 mm Length :>12 mm Angulation :>30 degrees Crown : implant >=1 mm	Osteoplasty for C-w Root form implants Sub periosteal implants Augmentation Ramus frame implants Transosteal implants
D – deficient bone Healthy anteriors with posterior division D	Crown : implant > 5mm	Augmentation – recommended Endosteal (root form, ramus frame) sub periosteal Sinus graft procedures (upgrading to A or C-h)

Table 3: classification of bone density by Carl E. Misch.

Bone	Density
D1	Dense cortical plate
D2	Thick dense to porous cortical plate on the crest; coarse trabecular bone within
D3	Thin porous cortical bone on crest; fine trabecular bone within
D4	Fine trabecular bone
D5	Immature, non-mineralized bone

Table 4: Gingival biotypes

Features	Thick biotype (flat gingival biotype)	Thin biotype (pronounced scalloped gingival , periodontal biotype)
Buccal maginal gingival	Thick	Delicate ; may often be located apical of the cemento-enamel junction (receded)
Interdental papillae	Often short	High & slender

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Buccal cortical wall	vertical distance between the interdental bone crest and the buccal bone is short (about 2 mm).	vertical distance between the interdental bone crest and the buccal bone is long (>4 mm)
Zone of attached gingival	Wider , adequate	Narrower , minimal
Bone	Thick underlying bony architecture	Thinner bony architecture, often having fenestration or dehesence

Table 5: Complicating factors that may result in implant failure.

Technical complications	Screw loosening and fracture Implant fracture, Fracture of restorative materials
Esthetic complications	Poor implant placement, Deficiency in implant placement site, Unaesthetic dimensions of the implant crown. Lack of available bone resulting doesn't allow ideal implant placement.
Phonetic complications	Unusual palatal contours Narrow spaces under and around the suprastructure. Full arch implant supported fixed prosthesis in severely atrophied maxilla.
Surgical complications	Hemorrhage and hematoma Neurosensory disturbances (hypothesia,hyperthesia) Damage to adjacent teeth

Table6: Haemostatic agents

Patients on anticoagulants	Haemostatic agents	Recommendation
Post-operative bleeding	Oxycellulose , Absorbable gelatin, Collagen with sutures.	Recommended
Post- operative bleeding	Antifibrinolytic agent like tranexamic acid Aminopropionic acid (5%) Four times a day for 2 min. For 4-5 days.	Recommended

Table 7: Drug reactions for patients on anticoagulants

Patients on oral anticoagulants	Drugs	Recommendation
Oral anti-coagulants	NSAIDs	Not recommended
Oral anti-coagulants	Acetaminophen (high dose)	Not-recommended
Oral anti-coagulants	Acetaminophen (low dose)	Recommended

Figure 1: Effect of diabetes mellitus on bone remodeling.

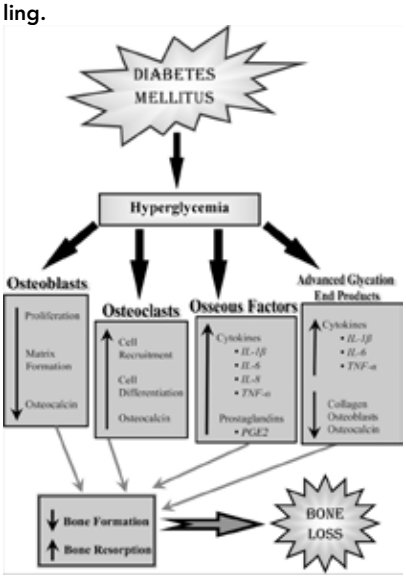
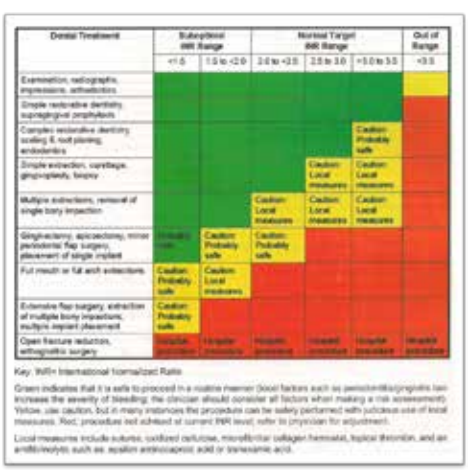


Figure 2 : Recommendations for dental treatment in patients on oral anticoagulant therapy.



REFERENCE

1. Albrektsson T, Zarb G, Worthington P. the long term efficacy of currently used dental implants. Int J Oral and Maxillofac Implants 1986:1; 11-25. | 2. Listgarten A Max, Lai H Chern. Comparative microbiological characteristics of failing implants and Periodontaly diseased teeth. J Periodontol 1999;70: 431-437. | 3. McAllister BS, Masters D, Meffert RM. Treatment ofimplants demonstrating periapical radiolucencies. PractPeriodontics Aesthet Dent 1992;4(9):37–41. | 4. Rosenberg ES, Torosian JP, Slots J. Microbial differences in clinically distinct types of failures of osseointegrated implants. Clin Oral Implants Res 1991;2: 135-144. | 5. Riggs BL, Melton 3rd LJ. Evidence for two distinct syndromes of involutional osteoporosis. Am J Med 1983;75:899—901. | 6. Jemt T. Implant treatment in elderly patients. Int J Prosthodont1993;6:456—61. | 7. Zambon JJ, Grossi SG, Machtei EE, Ho AW, Dunford R,Genco RJ. Cigarette smoking increases the risk for subgingival infection with periodontal pathogens.J Periodontol 1996; 67: 1050–1054. | 8. Takeshita F, Iyama S, Ayukawa Y, Kido MA, Murai K, SuetsuguT. The effects of diabetes on the interface between hydroxyapatiteimplants and bone in rat tibia. J Periodontol 1997;68: 180–185.41. | 9. Bacci C, Berengo M, Favero L, Zanon E. Safety of dentalimplant surgery in patients undergoing anticoagulationtherapy: a prospective case–control study.Clin. Oral Impl. 2011;22(2):151-156. | 10. Green JR, Rogers MJ. Pharmacologic profile of zoledronic acid: A highly potent inhibitor of bone resorption. Drug DevRes. 2002;55:210-224. |