IMPLANT COMPLICATIONS : A REVIEW

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ABSTRACT

To rehabilitate the edentulous arches or partially edentulous arches, various treatment options have been available for the clinicians. Since the last few years, an implant has been the most acceptable treatment with a success rate of 95-99 %.Though the success rate is high but it is inevitable to avoid the complications. Knowledge regarding the types of complications that can occur with dental procedures is an important aspect of treatment planning, dentist patient communication and post treatment care. Various complications may be encountered that includes mechanical, biological, esthetical or prosthetic causes for the failure of an osseo-integrated implants.

INTRODUCTION

Modern dentistry aims to restore the patient to normal function, comfort, aesthetics and health regardless of the atrophy, disease or injury to the stomatognathic system. Continued researches in treatment planning, implant designs, materials and techniques has enabled clinicians to predict a good outcome for treatment[1 2]

Rehabilitating completely edentulous and partially edentulous arches using dental implants have been used as treatment modalitysince long. Though the success rate is 95%, complications are unavoidable[3, 4].

As the time elapsed the implant complications increased. Connection related complications increased from 4.3% to 26.4 % in 10years, loss of retention of restorations have increased to 24.9% from 6.2% in 10 years.[5].

The National Institutes of Health, Consensus Development Conference Statement in 1978 on Dental Implant: Benefits and Risk concluded that, “Thousands of patients have been treated with dental implants for years and there is no question that many received long-term benefits”. However, the report further stated that, “some implants, fail in patients within six months; and some have resulted in extensive bone loss and produced irreversible defects and complications[6].

Lack of primary stability, surgical trauma, and contamination through micro-organisms, occlusal load, improper diagnosis and treatment plan, improperly fabricated prosthesis maycause implant failure[7].

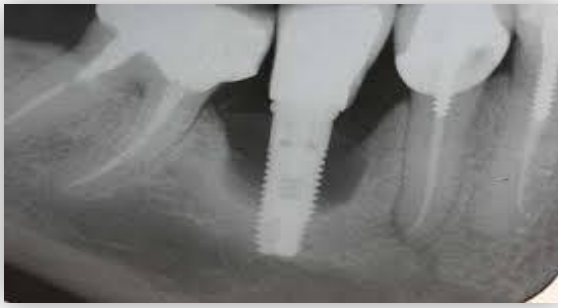
High Success rate has been reported for dental implants that support crown and fixed bridgework[8-13].Complications regarding the implants have also been

reported, if, encountered may lead to the complete failure[14].

IMPLANT PROSTHODONTICS

The selection, planning, development, and placement, replacement of missingteeth and/or associated structures, and maintenance of restoration with dental implants (GPT-9).

AILING AND FAILING IMPLANT

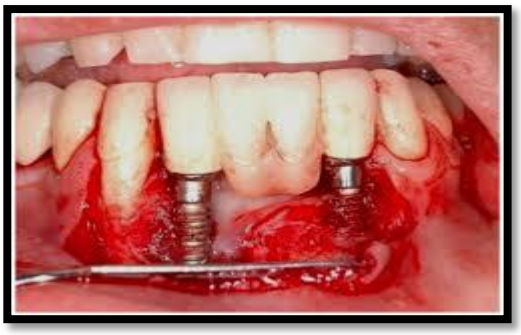


An implant that may demonstrate bone loss with deeper clinical probing depths but appears to be stable when evaluated at 3-4 months interval[15].

Shows radiographic bone loss without clinical signs of mobility and inflammation[16].

An implant is said to be failed when signs of inflammation, bleeding on probing and suppuration is also seen [15, 16, and 17].

FAILED IMPLANT



Failed implants are those which are associated with progressive bone loss, clinical mobility, peri implant radiolucency, dull sound on percussion and are non-functionalas intended[16].

IMPLANT FAILURE

It is defined as the total failure of the implant to fulfil its purpose (functional, aesthetic or phonetic) because of mechanical or biological reasons in the first instance at which the implant performance is measured quantitatively and or inadequacy of the host tissue to establish or maintain osseo-integration[18, 19, and 20].

CLASSIFICATION

1. Rosenberg et al [20 21]	2.Espisito et al [17 18]	3. Truhlar et al[17 21]	4.Cranin [23]
Infectious failure Traumatic failure	Biological Mechanical Iatrogenic Inadequate patient education	Late failures Early failures	Intra-op complications Short term complications (first 6 months post-operatively) Long term complications

5. Heydenrijik et al[24]	6. Adell et al[25]	7. Goodacre et al [27]	8.Balshi [26]
Early failures Late failures Soon late failure Delayed late failures	Loss of Osseo integration Gingival complications Mechanical complications	Esthetic Phonetic Functional Ergonomic	Mechanical Biological Aesthetic

9. Misch etal[28]

TREATENT PLAN RELATED

Wrong angulation
Improper implant location
Too close
Too far apart
Lack of communication

PROCEDURE RELATED

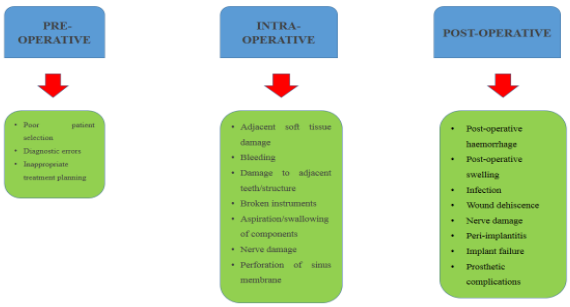
Lack of primary stability
Mechanical complications
Mandibular fracture
Ingestion/aspiration

REVIEW OF LITERATURE

Jemtet al[29] conducted a study on peri-implantitis surgery prevalence and delayed implant failures in a large number of patients. "Early implant failures," was significantly associated with the five factors mainly to the "surgeon" (HR 5.13), followed by "absence of prosthetic treatment" (HR 2.71). The risk for an early failure was found to be 7.0% and 0.1% when all the significant factors were presentand absent respectively. So the role of dentists is strongly associated with the early failure of the implant.

Maria herreroetal[30]studied the success rate of implant retained prosthesis placed by prosthodontics residents. With a mean prosthesis age of 4.5 years, a success rate of 71% in implants and 81% was seen with the implants restored with single crown.Most commonly porcelain fracture in FDP (15%),lack of stability (31%) and retention (29%) in RPD were observed. Thus success rate of implant retained prosthesis was observed to be lower as compared to previous studies.,

Flanagan[31]reported that forces of occlusion may result in implant failure, when acted cyclically and off-axially in range of 50-400N,leading to micro-moment of Osseo-integrated implant.Vasile etal [32]reported that peri-implantitis is the most common complication encountered leading to total bone loss around an Osseo-integrated implant.According to Joan Pi-Anfruns[33], 2014 , implant complications can be divided into :



Bryce etal[34] reported that causes for early failure of implants can be local or general factors which includes various systemic and medical conditions of the patient.Vere j. etal[14], reported the incidence of mechanical complications of implant .

Table 1 Reported incidence of mechanical complications associated with implant retained single crowns and implant retained fixed partial dentures with, or without, cantilever extensions

Complication	Implant single crowns[2]	Implant retained fixed partial dentures[7]	Implant retained fixed partial dentures with cantilevers[6]
Screw loosening	12.7% (5.7%-27%)	5.8% (3.8%-8.7%)	8.2% (3.9%-17%)
Loss of retention	5.5% (2.2%-13.5%)	Not reported	5.7% (1.0%-16.5%)
Veneer fracture	4.5% (2.4%-8.4%)	13.2% (8.3%-20.6%)	10.3% (3.9%-26.6%)
Framework fracture	3% (1.1%-8.3%)	0.8% (0.4%-1.8%)	0
Screw fracture	0.35% (0.09%-1.4%)	1.5% (0.8%-2.8%)	2.1% (0.9%-5.1%)
Implant fracture	0.14% (0%-0.64%)	0.4% (0.1%-1.2%)	1.3% (0.2%-8.3%)

Vere J. etal [14],Pjetursson etal [8] and in Berglundh etal[10] reported thatin period of 5 years and 10 years , the survival

rates for implant supporting crowns and fixed partial dentures exceeds to 95% and 93% respectively. In 55% of implant cases, the loss of implant occurs before functional loading. Pjetursson etal[35] conducted a study on implant supported fixed dental prosthesis. Survival rate increased to 97.2% after 5 years when rough surface implants were used. 95.4% and 80.1% are the rate of implant survival after 5 and 10 years of function. Metal–ceramic implant supported FDPs had survival rate of 96.4% after 5 years and 93.9% after 10 years.Fractures of the veneering material (13.5%), peri-implantitis and soft tissue complications (8.5%), loss of access hole restoration (5.4%), abutment or screw loosening (5.3%), and loss of retention of cemented FDPs (4.7%) were complications observed after 5 years. It was concluded that implant supported FDPs are the good options of treatment though technical and biological complications were frequent (33.6%).

Heasman[36]etal and Heitz[37] etal concluded that peri-implantitis is similar to periodontal disease.Bashutski[38, 39], D'Silva NJ, Wang HL reported that overcompression of the bone during placement leads to unusual failure of the implants. Abt[40] in 2009 reported that dental implant failure after bone augmentation was on higher side in smokers than in non-smokers.Levin L Schwartz-Araz et al[41] in 2008 studied the difference in success rate ofimplant in current smokers, non-past smokers and smokers and compared the long term marginal loss, survival and success of single placed implants using radiographs. Concluding that past smokers had more marginal bone loss than non-smokers. W.Chee et al[42]in 2007 reported proper patient selection and treatment planning can avoid complications. Claudia Cristina Montes[43], in 2007 reported that there is no clinical cause for failure of implant.Men (4.5 %) had more failure rate than women (3.1%). 88.2% of the implants were failed before loading. 58.5 % implants failed in posterior jaw. No reason for the failure of 75% of the implants was reported. Identified causes were 17.5% iatrogenic conditions, poor bone quality and quantity (3%), peri-implantitis (1%), and 3.5% missing data. Results suggested that host factor, notidentified clinically, contribute to an increased riskfor implant loss.In 2007, Streitzeletal[44] compared the effect of smoking on the implant with or without bone augmentation procedures.It concluded that biological complications were commonamongst smokers.In 2006, Shelemay etal[45] reported that cause of peri-implant mucositis is same as that of gingivitis and shift of micro-organisms takes place from gram positive to gram negative anaerobes.In 2006, Ardekian et al[46], reported that sinus membrane perforation is seen where alveolar bone is less than 5mm but overall success remains unaffected.In 2006, Jung etal[47], reported the risk of maxillary sinus penetration in which the implant penetrated the sinus membrane and the bone at 2, 4 and 8 mm. Pathologic and radiographic changes were not seen in the study of 8 dogs. Hence, concluded that sinus lift procedure is not a contraindicationand protrusion of implants into sinus cavity will not lead to sinus complications in canines.Stephelynn DeLuca et al[48] in 2006 reported at the time of implant surgery, non-smoker (13.33%) had a significant lower implant failure rate than smokers (23.8%), concluding that smoking is not an absolute contraindication.

Park etal[49] reported the aesthetic complications of the implants may be

visibility of titanium abutment through gingiva, lack of papillae and malpositionimplant.Kalpidisand Konstantinidis etal[50], reported a case in which lingual cortical plate was perforated during osteotomy preparation in mandibular premolar region. Critical haemorrhage and multiple hematomas were observed and verified by CT scan.Peter K.Moy[51] etal in 2005 reported that the risk of implant failure is significantly aged (60 – 79 years) than in young patients (40 years).Proussaefs etal[52] ,reported that survival and success rate of implants at second stage surgery was 100 % in cases of non-perforated membranes than with the perforated sites 69.6.Tiwani etal[53], found that over a period of 10 years retrospective institutional study, 1 case of aspiration and 36 cases of ingestion were reported.Ercolietal[54] reported that mechanical complications may arise if bone is continuously drilled or if the drill reaches beyond 15 mm in 5 osteotomies.John C.Keller[55] reported that osteoporosis affects Osseointegration of implant, but under the forces of mastication long term biomechanical stability is yet unknown. Leonhardt[56]etal reported that the incidence of peri-implantitis has been increased gradually to 16%. Goodacre[57] etal reported that incidence of bleeding as a complication is about 24 %. Fistulae have been reported in 1% of cases associated with loose abutment screws or ill-fitting frameworks. Soft tissue hyperplasia affects to 20% of fixed prosthesis over an observation period of 9 years.Goodacreetal[33,57]reported the incidence of various prosthetic complications in implant therapy.

Overdenture loss of retention (30%)

Resin veneer fracture (22%)

Overdenture relines (19%)

Overdenture clip/attachment fracture (17%)

Porcelain veneer fracture (14%)

Overdenture fracture (12%)

Opposing prosthesis fracture (12%)

Acrylic resin base fracture (7%)

Prosthesis/abutment screw loosening (7%/6%)

Prosthesis screw fracture (4%)

Metal framework fracture (3%)

Abutment screw fractures (2%)

Implant fractures (1%)

Charles J. Goodacre[57] et al , reported loosening of over denture retentive mechanism, implant loss in irradiated mandible and maxillary overdentures, haemorrhage related complications, resin and veneer fracture , and over denture clip / attachment fracture are the common complication associated with implant supported prosthesis.

Robert L. Simon[58]concluded thatthe implant failure rate was 4.6% with complications of abutments screw loosening (7%) and loss of cement bond(22%). Sharawy[59] etal reported osseous damage may be reduced if implant site is prepared at a speed of 2500 rpm.Niamatu[60] reported a case of airway obstruction after an implant was paced and was secondary to sublingual hematoma and sublingual bleeding.Quirynen[61] etal reported that an active or inactive retrograde peri-implantitis may result in cases with over prepared or overheated osteotomies observed as periapicalradiolucencies radiographically.Bartling[62] etal checked the incidence of the variation in the sensation using the standard neurological tests in 94 patients. At first post-operative

appointment incidence of 8.5% was found. Complete anaesthesia was seen only in one patient for 2 months and resolved later in 4 months. No permanent altered sensation was found over 6 months.

Hofshneider[63] etal and Bavitz[64] etal reported that sublingual and submental arteries course finally to lingual cortical plate from floor of the mouth. It must be taken into consideration that edentulous mandible is shorter and perforations occur deeper in the floor of the mouth and the sublingual haemorrhage has been iatrogenic in nature.

Charles J. Goodacre[65] et al concluded greater implant loss occurred with over dentures. Greater loss was observed in maxilla thanmandible with fixed complete dentures and over dentures. Mechanical complications were screw loosening / fracture, implant fracture; framework, resin base and veneering material fracture, opposing prostheses fractures and over denture mechanical retention problems.

Esposito[66] etal told that anatomic conditions and the surgical trauma are two main aetiologies responsible for early implant failure in branemark implant (3.63 %) due to peri-implantitis.

Ann M. Parein[67] et al evaluated long term outcome, the type and prevalence of prosthetic complications. Significantly fewer complications were found in prostheses supported by one or more implants in premolar than in molar region. Cemented restorations showed fewer complications than screw retained while restoring single tooth.

Robert Hass[68] et al reported that most common complication observed was abutment screw loosening. William Becker[69] et al reported bone quality, quantity, length of implant, and minimized occlusal contacts are the factors contributing for success.

Zarb[70]etal reported that inadequate availability of superior cortical bone, improper drilling and incorrect use of equipment may lead to failure of Osseo-integration in the first stage surgery.Albrektsson[71] reported mucosal perforations and fistulae were the gingival complications. An occurrence of 3 – 5 % was found formechanical complications such as fracture of abutment screw, fixture, or prosthesis.Ericsson and Albrektsson[72] stated, bone resorption was seen when drilling was done at 47°c for 1 minute in rabbits.It concluded that an increase in temperature or duration while drilling may lead to bone necrosis.

CONCLUSION

In the recent times, the dental implant therapy for rehabilitation of the occlusion has been the most accepted and successful treatment if the principles are followed. For the implant treatment to be successful, the stability of the implant should be considered as the main factor. The implant must be stable in the jaw bone after the healing phase is completed.

Awareness and knowledge of various risks involved during the whole procedure, adequate experience of the clinician is needed.

Four essential steps: proper and careful selection of the patient, correct selection of the implant, proper surgical technique and the precise prosthetic replacement have to be considered strictly and followed to prevent or reduce the number of complications.

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