

Retrospective study of Risk factors affecting early dental implant survival

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Abstract

PURPOSE: This article study aims at the factors which can affect early implant survival.

METHODOLOGY AND MATERIALS USED:

This study was conducted on two groups of patients

A) Patients with failed implants before loading

B) Patients without failed implants

For this study the variables taken into consideration were age, gender, implant type(cylindrical or tapered), different implant surface treatment ,implant's length ,type of bone ,type of surgery single stage or two stage, pre-operative prophylactic use of antibiotics and no use of antibiotics ,immediate implant placement (fresh socket) or delayed (mature socket) .

Results:

Total 1095 implant patients were evaluated considering the above variables.

It was found that 73 cases were found (6.69%) of failed implants in early stage.

Conclusion:

It seems that pre-operative prophylactic antibiotic therapy ,different types of implant surfaces , bone density, fresh socket with or without pathology may contribute to the early survival of the implant.

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I. Introduction :

Now a days different types of endosseous designs of implants are very widely used worldwide with higher success rate. Despite the continuous advancement ,research and development done till date in this field, small no. of patients may experience implant failure . Success of dental implant depends on the site of dental implant placement, patient's health, surgeon's experience, the precision of surgical technique and type of implant.(1) Failure of endosseous dental implant may occur prior to occlusal loading with a prosthetic super structure.

(2) Based on chronological criteria, the biological failures can be classified in to "early failures" (due to unsuccessful osseointegration) and "late failures" (due to loss of osseointegration).

Several factors are seen to be contributing in implant failure such as smoking, implant characteristics,infection , insufficient bone quantity and quality. In this study it was hypothesised that age , gender, implant surface, type and height, no pre-operative prophylactic use of antibiotics, type of surgery (one stage or two stage), fresh socket placement and bone quality may be associated with high survival rate of dental implants .

METHODOLOGY AND MATERIALS USED:

The data was collected from the patients visited to the maxillofacial surgery department of Shaheed Beheshti university of medical sciences for the period of September 2008 to October 2015.

Patients which were selected for the study had a missing tooth and received dental implant.The exclusion criteria were having a systemic disease affecting the bone healing, history of bone grafting, jaw fracture, radiotherapy , history of previous implant failure and smoking.

Total patients were divided into two groups:

(1) Implant failed before loading

(2) No implant failure

The different surfaces of implants were classified into 4 categories; resorbable blast media (RBM) , sand blasted and acid etched (SLA) ,osseospeed surface and calcium phosphate coated. The implant length considered was divided into two groups (L1) comprising of implants shorter than 10 mm and (L2) implants

equal or more than 10 mm of length. The types of implants were studied into two groups of cylindrical implants and tapered implants.

The quality of bone was categorised into four types D1,D2,D3 and D4 (Lekholm and Zarb classification). The two types of implant surgeries were studied as one stage tissue level implant surgery and two stage bone level implant surgery. Also the patients were studied into two groups (1) Those who received pre-operative prophylactic antibiotic therapy (2 gms. of amoxicillin one hr. before surgery) and (2) those who didn't.

The Patient's age range considered here was age groups of 20-40,41-60 and above 60 years. Moreover the time of implant placement was evaluated into two groups (1) fresh socket placement (2) mature socket placement (more than three months after tooth extraction).

II. Results :

The statistical analysis was performed by using SPSS software (IL,USA) version 19.

Chi-Square was used to compare the variables between the two groups.

A total of 1095 implants were evaluated in this study and the outcome is as follows

(a) 73 (6.69%) implants failed in early stage

(b) Taking into consideration of the different types of implant surfaces ,(a) SLA. surface showed 45 failures out of 626 (6.7%) ,(b) 12 failures out of 345 (3%) in calcium phosphate coated implants ,

(c) 21 failures out of 64 RBM (32.1%) coated implants, and (d) 3 failures out of 69 Osseospeed implants (3.1%)

TABLE :1 : Comparison of different implant surfaces between two groups

Groups	RBM	SLA	Calcium phosphate coated	Osseospeed	Chi square test
Group 1	21	45	12	3	P=0.001
Group 2	43	581	333	66	

Implant failure in different types of implants, it is observed that 37 failures out of 629 cylindrical (5.9%) and 36 failures out of 464 tapered implants (7.8%) .This data revealed no significant difference between the above two types of implants (Table 2). Revealing implants failures on the basis of its length it is found that Group L1 (less than 10 mm of length) 32 failures out of 476 implants (6.7%) and for Group L2 (equal or more than 10 mm of length) 41 failures out of 617 implants (6.6%) . This comparison didn't reveal any significant results (Table 2) .(P=0.53) .

Failures were judged on the basis of types of implants surgery, 14 failures out of 317 for one stage implants (4.4%) and 59 failures out of 776 two stage implants (7.6%) (Table2) (P=0.61).

For gender related comparison of failure rate it was seen that 21 failures out of 388 males (6.2%) and 49 failures out of 705 females (7%) (Table 2) (P=0.71).

For fresh socket implant group 47 failures out of 118 (49.8%) and for mature socket implant group 47 failures out of 975 (2.7%) were observed.The inference of this analysis showed that fresh socket implant group is far more susceptible for failures (Table 2) (P=0.001).

Reviving for pre-operative prophylactic group, 48 failures out of 1037 implants (4.6%) and in the group who did not received pre-operative prophylactic antibiotic therapy 25 failures out of 56 implants (44.6%) (Table2) (P=0.001) were observed. So significant success rate is observed in pre-operative prophylactic antibiotic therapy patients.

Table 2: Comparison of variables between the two groups of

Variables	Group 1	Group 2	Chi-square test
Implant length	L1 32 , L2 41	L1 444 , L2 576	P=0.53
Surgery type	OS 14 , TS 59	OS 303 ,TS 717	P=0.61
Implant type	CY37 , TP 38	CY 592 , TP 428	P=0.22
Gender	M 24, F 49	M 364 ,F656	P=0.71
Immediate or delayed placement	FR 26 ,DL 47	FR 71 ,DL 949	P=0.001
Prophylactic antibiotic therapy	PA 48 ,WPA 25	PA 989 ,WPA 31	P=0.001
CY:Cylindrical,TP:Tapered,L1;<10mm,L2 >_ 10mm ,OS; one stage,TS:Two stage ,M; Male ,F; Female, FR; fresh socket ,DL ;delayed ,WPA:without prophylactic antibiotic therapy,PA; Prophylactic antibiotic therapy			

For bone quality variable it was found that it was found that 13 failures out of 260 implants (5%) placed in D1 bone , 12 failures out of 534 implants placed in D2 bone (2.2%) ,23 failures out of 169 implants placed D3 bone (13.6%) , and 25 failures out of 130 implants placed in D4 type (19.2%) (table 3) (p=0.001).

Table 3 : Evaluation of the frequency of various bone types between the two groups

Group	D1	D2	D3	D4	Chi-square test
Group 1	13	12	23	25	P=0.001
Group 2	247	522	146	105	

For age group variable age group of 20- 40 years implant failure was reported in 19 patients out of 259 patients (7.3%) , for 40-60 age group failure was 36 out of 562 patients (6.4%) ,and for above 60 year group it was 18 out of 272 patients (Table 4) (P=0.88).

Table 4 :Evaluation of age groups in the two categories

Group	20-40 years	40-60 years	60 years above	Chi square test
Category 1	19	36	18	P =0.88
Category 2	240	526	254	P=0.88

III. Discussion:

Early detection of the potential risk factors in the implant survival may prevent early implants failure. It is seen that failure generally occurs due to inability to establish a close contact between the bone and implant ,formation of fibrous tissue between implant and bone. The failure of osseointegration is clinically detected by implant mobility and by radio graphically by perimplantitis radiolucency. The surface treatment on implants is a key factor in early implant osseointegration.

Amongst the above four surface types which were evaluated in this study RBM factor implants showed maximum implants and lowest for the calcium phosphate coated implants.

Asepsis is also a key factor in implant success. The bacterial invasion may cause implant failure at any time during implant treatment and its crucial while early healing period. Another factor for the impaired healing is observed due to surgical trauma like overheating of the bone ,micro movements ,patient's local and systemic factors which play imperative role.

Ahmed et al.(11) stated that implants with RBM or SLA surface had comparable survival rate in short term and the SLA surface seemed to be superior in posterior maxilla with poor bone quality.

Hong et al (10) carried out study in dog tibia four different implant surfaces and concluded that average bone-implant ratio is 95.4% in hydroxy appetite coating (HA) ,87.1% inRBM ,86% in SLA group .So HA surface showed greater osseointegration than the other surfaces.

According to KIM et al (12) his study on RBM and calcium phosphate coated implants showed same survival rate. He also stated that in the recent studies higher failures which were seen in RBM might be due to other factors such as technical errors, various implant brands with RBM surface with different designs and different manufacturing process and different types of implants.

Also this study didn't demonstrate any significant difference between the one stage and two stage procedures .Nevertheless any previous study mentioned any difference in the survival rate between the submerged and non-submerged implants.

Considering the implant length factor in the recent studies showed equal or not much difference in survival rate for L1 and L2 groups.

The bone type variable seems to be important in primary stability of dental implants in the recent studies it is revealed that highest failures occurred in D4 type of bone and lowest in D2 type of bone. The two controversial points to be considered in this evaluation are the reliability of the surgeon's perception about bone quality during the surgery, as well as the fact that the bone quality is the same as bone density .

Age seems to be prognostic factor in implant success . In elderly patients delayed healing time, systemic factors and poor bone quality are the contributing factors.

Moy et al.(29) reported the same in his studies . But the current study noted no difference in the failure rate among various age group.

Sharaf et al.(34) strongly promoted pre-operative prophylactic use of the antibiotics for implant success. Esposito et al.(35) in his study didn't prove any efficacy of pre-operative prophylactic antibiotic therapy.

Gunther et al. (36) and Morris et al.(37) also suggested little or no benefit of pre-operative prophylactic antibiotic therapy in their respective studies.

Regarding fresh socket and mature socket implant placement Penarrocha - Diago et al.(25) reported in their studies the survival rate of dental implants placed in fresh extraction socket was similar to the implant placed in-mature socket .

Immediate implants placed in posterior maxilla often have higher failure rate. However the present studies showed higher failure rate in fresh socket .Since considering the multifactorial etiology , determination of all the factors needs a large sample size and strict control of variables.

Also several variable which were not taken into consideration in this studies should be considered as limitations of this study including the experience of the surgeon , patient's nutritional status and oral hygiene condition before and after the implant placement, drilling speed , use dull drills as well as the indication and parameters for selection of the type and techniques.

Also smoking was not considered in this present studies which is a proven risk factor for implant failure. Also in bone graft cases many variables interfere with the outcome of the treatment such as bone substitute, soft tissue coverage ,type of ,membranes used ,delayed or immediate dental implant placement.

So further detailed studies are required to address the above mentioned variables.

IV. Conclusion

Within the above limitations of this study it can be concluded that preoperative prophylactic antibiotic therapy, different types of implant surfaces, bone density and fresh socket implant placement might contribute to the dental implant success.

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