ORIGINAL RESEARCH

Assessment of the Survival Rate of Short Dental Implants in Medically Compromised Patients

Kyatsandra N Jagadeesh[1], Amit Kumar Verma[2], Anuj Singh Parihar[3], Anuraj S Kochhar[4], Abhaya C Das[5], Mohammed A Razi[6]

Abstract

Aim: To assess the survival rate of short dental implants in medically compromised patients.

Materials and method: This follow-up study was conducted on 342 medically compromised patients of both genders (580 dental implants). The failure rate of dental implants was assessed.

Results: There were 142 diabetes mellitus patients with 254 dental implants, 108 patients with hypertension with 190 dental implants, 26 patients with mental disabilities with 40 dental implants, 20 oral cancer patients with 36 dental implants, and 46 osteomyelitis subjects with 60 dental implants. There were 60 (10.5%) short dental implant (SDI) failures of which a maximum of 25 (22.7%) were seen with 4 mm diameter. Maximum failure was seen with osteomyelitis patients 8 (13.3%) followed by diabetes mellitus 32 (12.5%). Out of 270 dental implants in 130 control patients, implant failure was seen in 11 (4.07%). There was a significant ($p < 0.05$) bone loss on follow-up at 6 months, 1 year, and 2 years.

Conclusion: Medically compromised patients are more prone to dental implant failure as compared to healthy subjects.

Clinical significance: Since medically compromised patients are prone for implant failure, careful selection of cases is necessary.

Keywords: Dental implant, Medically compromised, Short implant.

The Journal of Contemporary Dental Practice (2020): 10.5005/jp-journals-10024-2854

Introduction

Dental implants are widely used nowadays. They have been proved to be a boon to dentistry. A careful insertion of dental implants ensures high survival rate for longer duration. Preferably longer dental implants are used depending on the amount of bone available. However, shorter dental implants (SDIs) can be used in resorbed ridges where there in limited bone height.

Shorter dental implants have a low success rate as compared to longer dental implants. Dental implants <8 mm are short dental implants.[1] Despite this, there is limited use as compared to longer dental implants, and there is not much data suggesting success rate based on implant length. Researchers have found similar survival rate of SDI as with long implants. However, there are instances when SDIs encounter higher mechanical stress as compared to longer implants. Patient can have insufficient bone leading to implant failure.[2]

To obtain favorable results, careful oral evaluation as well as radiographic exercises is needed. Dental implant planning should be performed before inserting implants in these patients to prevent future complications.[3] Procedures such as direct or indirect sinus lift, guided bone regeneration or edentulous ridge expansion are performed in these patients. The limitation of such procedures is that healing time is prolonged. It is found that dental implant insertion in resorbed dental ridges, especially in the maxillary posterior region, can lead to sinus perforation. Moreover, there are more chances of implant failure. These procedures are quite expensive and have high morbidity. Considering such shortcomings, SDIs may be regarded as substitutes.[4]

Studies mentioning success and failure rates of SDIs have been conducted, but there is limited data of success rates of SDIs in medically compromised patients. Since there are insufficient studies mentioning the utility of short dental implants in patients with resorbed denture ridges, the present study is an attempt to evaluate their survival rates in medically compromised patients.

[1]Department of Prosthodontics and Implantology, Sree Siddharth Dental College, Sree Siddharth Academy of Higher Education, Tumkur, Karnataka, India

[2]Department of Prosthodontics, Sardar Patel Postgraduate Institute of Dental and Medical Sciences, Lucknow, Uttar Pradesh, India

[3]Department of Periodontics, Peoples Dental Academy, Bhopal, Madhya Pradesh, India

[4]Department of Orthodontics, Max Hospital, Gurugram, Haryana, India

[5]Department of Periodontics and Oral Implantology, Institute of Dental Sciences, Siksha O Anusandhan (Deemed to be University), Bhubaneswar, Odisha, India

[6]Department of Periodontology, Hazaribagh College of Dental Sciences and Hospital, Hazaribagh, Jharkhand, India

Corresponding Author: Anuj Singh Parihar, Department of Periodontics, Peoples Dental Academy, Bhopal, Madhya Pradesh, India, Phone: +91 8827047003, e-mail: dr.anujparihar@gmail.com

How to cite this article: Jagadeesh KN, Verma AK, Parihar AS, *et al.* Assessment of the Survival Rate of Short Dental Implants in Medically Compromised Patients. J Contemp Dent Pract 2020;21(8):880–883.

Source of support: Nil

Conflict of interest: None

Materials and Methods

This retrospective study was accomplished in the Periodontics and Implantology Department, Department of Periodontics, Peoples Dental Academy, Bhopal. The study consisted of 342 patients of both genders (580 dental implants). We also included 130 normal (control) participants (270 dental implants) of age range

20–50 years. The approval for the study was obtained from the institutional ethics committee before commencement. Informed consent was obtained from all the participants. Inclusion criteria were medically compromised patients in age range 20–50 years such as diabetes mellitus, mental disability, hypertension, oral cancer (without radiotherapy) and patients with osteomyelitis, who were under medication with controlled medical problems. All patients had insufficient residual mandibular or maxillary bone due to mandible atrophy or sinus pneumatization. Exclusion criteria were pregnant women, drug abusers, smoking habit, and patients with periodontal pathology. The study was carried out by trained investigators.

Patient data such as name, age, and gender were recorded. All implants were positioned in 1- or 2-stage procedures at an interval of 6 months. Patients were administered local anesthesia (LA) and dental implants were inserted following standardized surgical protocol. Patients were recalled for follow-up. In all cases, a thorough clinical and radiographic evaluation was performed. Intraoral radiographs and panoramic radiographs were taken to assess treatment outcome.

The distance between coronal bone to implant contact to implant shoulder depicted marginal bone loss (MBL).[5] It was calculated on both the mesial and distal sides. First measurements were taken at 6 months, second after 1 year, and third after 2 years during follow-up using intraoral radiographs and panoramic radiographs. All the measurements were taken thrice and the mean of all values was considered. The change in MBL at recall visits was recorded. Excessive marginal bone loss, signs of peri-implantitis, presence of mobility, pain, or discomfort was considered as implant failure.

Data were entered in an MS Excel spreadsheet and evaluated with SPSS version 21 (IBM. Chicago, USA) using Kaplan Meier survival analysis. Kruskal Wallis test was applied to assess MBL and failed implants with the level of significance set below 0.05.

Results

Table 1 shows the details of the patients including disease type, number of patients, and the number of dental implants. Table 2 shows survival rate with short implants. There were 60 (10.5%) dental implant failures of which a maximum of 25 (22.7%) were seen with 4 mm diameter followed by 20 (13.3%) with 4.5 mm diameter and 15 (4.6%) with 5 mm diameter dental implants which was found to be significant ($p < 0.05$).

Osteomyelitis patients showed the maximum failure, in 8 (13.3%) patients, followed by diabetes mellitus in 32 (12.5%), oral cancer in 4 (11.1%), mental disability in 4 (10%), and hypertension in 12 (6.3%). Statistical analysis showed a considerable difference ($p < 0.05$) (Table 3). We found that out of 270 dental implants in 130 control patients, implant failure was seen in 11 (4.07%).

Table 4 and Figure 1 showed that at 6 months, there was 0.34 mm mesial bone loss and 0.56 mm distal bone loss, at 1 year 0.52 mm mesial and 0.68 mm distal bone loss, and at 2 years 0.61 mm mesial and 0.72 distal bone loss was recorded. The difference was significant ($p < 0.05$). Figure 2 indicates the Kaplan Meier survival analysis for survival rate of dental implants.

Table 1: Distribution of patients

Medical condition	*Number of patients*	*Number of implants*
Diabetes mellitus	142	254
Hypertension	108	190
Mental disability	26	40
Oral cancer	20	36
Osteomyelitis	46	60
Total	342	580

Table 2: Survival rate of short dental implants

Diameter (mm)	*Total*	*Survival*	*Failure*	*p value*
5	320	305 (95.3%)	15 (4.6%)	0.05
4.5	150	130 (86.7%)	20 (13.3%)	
4	110	85 (77.2%)	25 (22.7%)	
Total	580	520 (89.6%)	60 (10.3%)	

Kruskal Wallis, $p < 0.05$, significant

Table 3: Implant failures in systemic disease patients and controls

Medical condition	*Number of implants*	*Failure*
Diabetes mellitus	254	32 (12.5%)
Hypertension	190	12 (6.3%)
Mental disability	40	4 (10%)
Oral cancer	36	4 (11.1%)
Osteomyelitis	60	8 (13.3%)
Control	270	11 (4.07%)

Kruskal Wallis, $p < 0.05$, significant

Table 4: Marginal bone loss on the mesial and distal aspects of dental implants (in mm)

Time	*Mesial (mean)*	*Distal (mean)*	*p value*
6 months	0.34	0.56	0.01
1 year	0.52	0.68	0.04
2 years	0.61	0.72	0.05
p value	0.01	0.51	

Kruskal Wallis, $p < 0.05$, significant

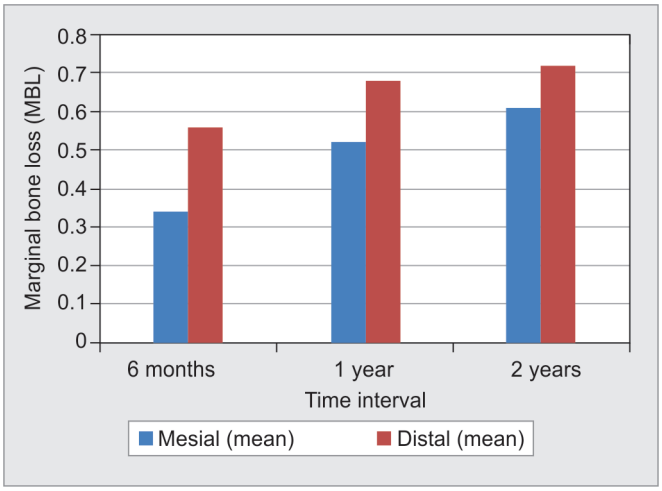

Fig. 1: Marginal bone loss on the mesial and distal aspects of dental implants

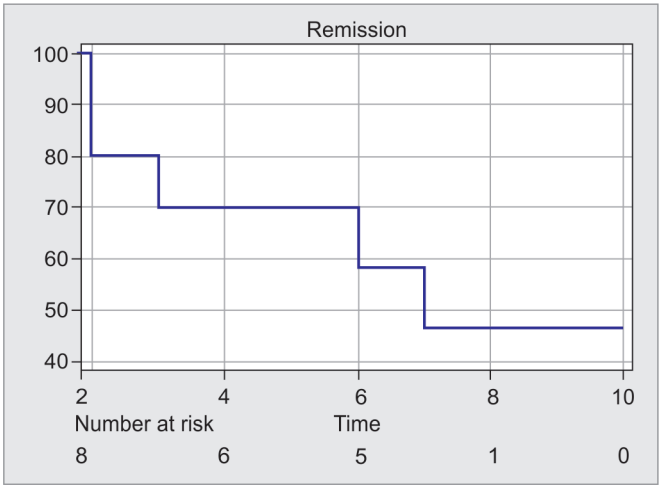

Fig. 2: Kaplan Meier survival analysis for survival rate of dental implants

Discussion

Dental implant in medically compromised patients is challenge for dental practitioners.[6] General health plays an important role in ensuring the success of dental implant treatment. There have been certain absolute contraindications for dental implant insertion in medically compromised patients. It has been observed that medical conditions may increase the risk of treatment failure.[7] Conditions like myocardial infarction (MI), stroke, transplantation of organs, immunosuppressant, bleeding and clotting disorders, patients with malignancy, valvular prosthesis surgery, alcohol and drug abusers, psychiatric illness, osteoporosis, and intravenous bisphosphonate therapy are relative contraindications.[8] Conditions like diabetes mellitus, hypertension, osteomyelitis, oral cancer, and mental disability pose challenges as the general health of patients is compromised.[9] The present study was an attempt to evaluate the survival rates of SDIs in medically compromised patients.

The present study was carried out on 342 patients with 580 dental implants. In our study, we included 142 diabetes mellitus patients with 254 dental implants, 108 hypertension participants with 190 dental implants, 26 mental disabilities with 40 dental implants, 20 oral cancer patients with 36 dental implants, and 46 osteomyelitis subjects with 60 dental implants. There are very few studies of assessment of shorter dental implant outcome in medically compromised patients.

It is established that diabetes mellitus is a state of hyperglycemia because of either defect in insulin production or its secretion. Insulin affects the regeneration of bone matrix. Diabetic patients have poor clot quality, reduced level of osteoblastic activity, diminished bone formation with increased osteoclastic function, and higher susceptibility to periodontitis. Cardiovascular diseases such as hypertension can lead to poor blood supply leading to limited oxygen or nutrients in the osseous tissue. They can also have xerostomia. They have high osseointegration failure rates. Cancer patients usually undergo radiotherapy or chemotherapy which alters osseointegration process. Radiotherapy impairs vascular and cellular processes of healing. There is a possibility of osteoradionecrosis. Patients with mental disability cannot maintain good oral hygiene. Moreover, most of the patients are on selective serotonin reuptake inhibitors (SSRI), which tend to affect bone formation. Osteomyelitis is an inflammatory condition that can lead to dental implant failure. Oral tissues healing and implant success rate are affected in systemic conditions generally due to increase of susceptibility to other diseases or by interference with healing.[10–13]

Nguyen et al. conducted a study in which SDIs (7 mm-long dental implants) were assessed in 33 patients with 47 implants in the over four years.[14] Patients with diabetes mellitus, mental disability, hypertension, oral cancer and osteoradionecrosis were assessed. They used 38 dental implants with 4 mm diameter, 8 with 4.5 mm diameter, and 1 with 5.0 mm diameter. There was 95.74% survival rate of implants as recorded during follow-ups. Survival rates were independent of implant diameter. The authors found higher mean MBL recorded at 1 year as compared to 3 months. However, when MBL was compared at 1 and 2 years, the difference was nonsignificant ($p > 0.05$).

We found that there were 60 (10.5%) dental implant failures of which a maximum of 25 (22.7%) were seen with 4 mm diameter followed by 20 (13.3%) with 4.5 mm diameter and 15 (4.6%) with 5 mm diameter dental implants.

Verma et al. conducted a study of 25 medically compromised patients and 25 normal healthy patients. The number of failed dental implants in the study group was 3 and 1 in the control group. Extraction of dental implants was carried out for 5 teeth in the study group and 6 implants in the control group. On comparing, the results were statistically significant for failed dental implants.[15]

We observed that there were 0.34 mm mesial bone loss and 0.56 mm distal bone loss at 6 months, 0.52 mm mesial and 0.68 mm distal bone loss at 1 year, and 0.61 mm mesial and 0.72 distal bone loss at 2 years. Maximum failure was seen with osteomyelitis patients (8, 13.3%) followed by diabetes mellitus (32, 12.5%), oral cancer patients (4, 11.1%), patients with mental disability (4, 10%), and hypertensives (12, 6.3%). We observed that out of 270 dental implants in 130 control patients, implant failure was seen in 11 (4.07%).

It has been suggested that diabetes mellitus and other medical conditions reduce the immunity of patients. The healing capacity of body decreases especially in diabetic patients. Hence special consideration should be given to these patients.[16] Villa et al. evaluated the survival rate of 323 short implants and concluded that short parallel implants can support different prosthesis in the case of limited bone height.[17] Calvo-Guirado et al. evaluated the implant stability and bone resorption with different short implants placed in a dog's maxilla and concluded that the amount of crestal bone loss after remodeling over a period of 12 weeks was less in the extra-short implant, compared to that of wide extra-short implants.[18] Anitua et al. on evaluation of short implants for a period of 10–12 years found that SDIs are alternative to existing longer dental implants.[19]

The limitation of the study is its small sample size. A long-term follow-up was not done. Evaluation of medical condition of the patient before placement of dental implant and careful case selection helps in increasing the success rate in the practice of primary care procedure. Further long-term studies are required to access the success of short dental implants in patients with other medical conditions.

Conclusion

Short dental implantshave insufficient surrounding bone. They can be placed in patients with poor bone quantity. They can be used where direct or indirect sinus lift is not possible. In such cases, the use of short dental implants is of paramount importance. Medically compromised patients are more prone to dental implant failure as

compared to healthy subjects. Careful case and implant selection helps in the successful outcome of dental implants. In future, large-scale studies on large population may be useful in providing better results.

References

1. Lemos CA, Ferro-Alves ML, Okamoto R, et al. Short dental implants vs standard dental implants placed in the posterior jaws: a systematic review and meta-analysis. J Dent 2016;47:8–17. DOI: 10.1016/j.jdent.2016.01.005.
2. Kim IH, Kuk TS, Park SY, et al. Prognosis following dental implant treatment under general anesthesia in patients with special needs. J Dent Anesth Pain Med 2017;17(3):205–213. DOI: 10.17245/jdapm.2017.17.3.205.
3. Mohajerani H, Roozbayani R, Taherian S, et al. The risk factors in early failure of dental implants: a retrospective study. J Dent (Shiraz) 2017;18:298–303.
4. Benlidayi ME, Ucar Y, Tatli U, et al. Short implants vs standard implants: midterm outcomes of a clinical study. Implant Dent 2018;27:95–100. DOI: 10.1097/ID.0000000000000710.
5. Papaspyridakos P, De Souza A, Vazouras K, et al. Survival rates of short dental implants (≤6 mM) compared with implants longer than 6 mM in posterior jaw areas: a meta-analysis. Clinical oral implants research 2018;29:8–20. DOI: 10.1111/clr.13289.
6. Vissink A, Spijkervet FK, Raghoebar GM. The medically compromised patient: are dental implants a feasible option? Oral diseases 2018;24(1–2):253–260. DOI: 10.1111/odi.12762.
7. Eskow CC, Oates TW. Dental implant survival and complication rate over 2 years for individuals with poorly controlled type I diabetes mellitus. Clin Implant Dent Relat Res 2017;19(3):423–431. DOI: 10.1111/cid.12465.
8. Georgakopoulou EA, Scully C. Biological agents: what they are, how they affect oral health and how they can modulate oral healthcare. Br Dent J 2015;218(12):671–677. DOI: 10.1038/sj.bdj.2015.439.
9. Dalago HR, Schuldt Filho G, Rodrigues MA, et al. Risk indicators for peri-implantitis. A cross-sectional study with 916 implants. Clini Oral Implants Res 2017;28(2):144–150. DOI: 10.1111/clr.12772.
10. Dubey RK, Gupta DK, Singh AK. Dental implant survival in diabetic patients; review and recommendations. Natl J Maxillofac Surg 2013;4(2):142–150. DOI: 10.4103/0975-5950.127642.
11. Bornstein MM, Cionca N, Mombelli A. Systemic conditions and treatments as risks for implant therapy. Int J Oral Maxillofac Implants 2009;24(Suppl):12–27.
12. Parihar AS, Madhuri S, Devanna R, et al. Assessment of failure rate of dental implants in medically compromised patients. J Family Med Prim Care 2020;9(2):883–885. DOI: 10.4103/jfmpc.jfmpc_989_19.
13. Gheorghiu IM, Stoian IM. Implant surgery in healthy compromised patients-review of literature. J Med Life 2014;7(Spec Iss 2):7–10.
14. Nguyen TT, Eo MY, Cho YJ, et al. 7 mM-long dental implants: retrospective clinical outcomes in medically compromised patients. J Korean Assoc Oral Maxillofac Surg 2019;45(5):260–266. DOI: 10.5125/jkaoms.2019.45.5.260.
15. Verma S, Srivastava SK, Khemka A. Success rate of dental implants in medically compromised patients: a retrospective study. J Adv Med Dent Scie Res 2019;7(12):6–8.
16. Gómez-de Diego R, Mang-de la Rosa Mdel R, Romero-Pérez MJ, et al. Indications and contraindications of dental implants in medically compromised patients: update. Med Oral Patol Oral Cir Bucal 2014;19(5):483–489. DOI: 10.4317/medoral.19565.
17. Villa G, De Stavola L, Fincato A, et al. Short, parallel-walled conical connection implants for a broad range of indications in maxilla and mandible: retrospective multicentre study with up to 33 months of fallow up. Quintessence Int 2018;49(8):645–651.
18. Calvo-Guirado JL, Morales-Meléndez H, Pérez-Albacete Martínez C, et al. Evaluation of the surrounding ring of two different extra-short implant designs in crestal bone Maintenance: a Histologic study in dogs. Materials 2018;11(9):1630–1634. DOI: 10.3390/ma11091630.
19. Anitua E, Piñas L, Begoña L, et al. Long-term retrospective evaluation of short implants in the posterior areas: clinical results after 10–12 years. J Clin Periodontol 2014;41(4):404–411. DOI: 10.1111/jcpe.12222.