

## Original Article

### Retrospective Study for Survival Rate of Implant Supported Zirconia Fixed Prosthesis

Deepak Goyal<sup>1</sup>, Ranjana Balla<sup>2</sup>, Shuchi Gupta<sup>3</sup>, Ritesh Gupta<sup>4</sup>

<sup>1</sup>Reader, <sup>2</sup>Senior Lecturer, <sup>3</sup>Professor, Department of Prosthodontics, <sup>4</sup>Professor and Head of the Department, Department of Oral Surgery, Adesh Institute of Dental Sciences and Research, Bathinda Punjab, India

#### ABSTRACT:

**Background:** Zirconia has been used in dentistry for around 15 years for different indications, with a primary aim on replacement of metal to improvise esthetics. Therefore, the main aim of this clinical study was to retrospectively evaluate the survival outcomes of titanium based dental implants and the survival of zirconia complete-arch fixed prosthesis. **Materials and methods:** The present retrospective study consisted of patients that were treated between the last 3 years with titanium dental implants and zirconia prosthesis. The fit of each prosthesis was established by visual, radiographic, and tactile tests. Patients were followed up for 3-4 months for any complications or routine oral hygiene checkups. All the failures and complications were recorded amongst the subjects for 4-year period and recorded in a tabulated form. These were analyzed statistically using SPSS software. **Results:** For first year the interim survival rate was 99.07%, for second year it was 99.6%, during third year it was 99.63%. There was only 1 prosthesis failure during the first year and for the rest of the years the interim survival rate was 100%. There was one failure in first year leading to the interim survival rate of 99.48%. In the second year there were 3 failures giving the interval failure rate of 97.7%. The interim survival rate was 100% for the rest of the years. **Conclusion:** In the present study, the zirconia prosthesis offered a great survival rate of more than 95% in a four year duration.

**Key words:** Implants, prosthesis, zirconia.

Received: 11 January, 2019

Revised: 28 January, 2019

Accepted: 10 February, 2019

**Corresponding author:** Dr. Deepak Goyal, Reader, Department of Prosthodontics, Adesh Institute of Dental Sciences and Research, Bathinda Punjab, India

**This article may be cited as:** Goyal D, Balla R, Gupta S, Gupta R. Retrospective Study for Survival Rate of Implant Supported Zirconia Fixed Prosthesis. J Adv Med Dent Res 2019;7(2):68-70.

#### INTRODUCTION

Various prosthodontic materials have been described and used for fixed complete dentures for the patient's rehabilitation with edentulism.<sup>1</sup> These can be distinguished using 4 main criteria's: type of retention; design of framework; prosthetic material used and usage of prosthetic gingiva.<sup>1</sup> All the designs have their own advantages and disadvantages associated with esthetics, asset, simplicity, fabrication method, complications, and cost of treatment. Zirconia is a newly emerging material for their fabrication and has been associated to have numerous advantages for the dentist and patient, like good esthetics, better strength, durability and good biocompatibility compared with metal materials, decreased accumulation of plaque, and favorable response of soft-tissue. The traditionally used monochromatic zirconia in dentistry is yttria-stabilized tetragonal zirconia poly-crystal, that

has a high fracture resistance between the range of 5 and 10 MPa $\mu\text{m}^{1,2}$  and flexural strength between the range of 900 and 1400 MPa.<sup>3,4</sup> These properties are the maximum amongst all dental ceramics presently accessible.<sup>3</sup> Zirconia has been used in dentistry for around 15 years for different indications, with a primary aim on replacement of metal to improvise esthetics.<sup>3</sup> However, the primary complication associated with the use of zirconia for fixed prostheses is the high incidence of veneered porcelain fracture, that ranges between 15% and 54%.<sup>5,6,7</sup> Degradation at low-temperature is provided concern with zirconia and has been illustrated in vitro studies,<sup>8,9</sup> but the clinical proof for failure due to degradation of zirconia is absent, and the fracture incidence of zirconia has been found to be lesser than 1%.<sup>2,6,10,11</sup> Therefore, the main aim of this clinical study was to retrospectively evaluate the survival outcomes

of titanium based dental implants and the survival of zirconia complete-arch fixed prostheses.

**MATERIALS AND METHODS**

The present retrospective study consisted of patients that were treated between the last 3 years with titanium dental implants and zirconia prosthesis. All implants were internal hexagonal as well as axially aligned with varying diameters. Standard surgical and prosthodontic protocols were used for placement of implants. Systematic treatment planning was done for implant placement. 6 implants were used for maxillary prosthesis and 5 were used for mandibular prosthesis. Depending on the patient preference and clinical situation, loading was either immediate or delayed. Healing period of 3 months was given to every patient. Fixed prosthesis was fabricated using same brand of zirconia using the criteria provided by the manufacturer. There was no dentition only replacements showing enough space for gingival prosthesis. There was indirect zirconia interface in all the prosthesis. The fit of each prosthesis was established by visual, radiographic, and tactile tests. The tissue surface of prosthesis was smoothened to produce proper contours and facilitate the oral hygiene. The tissue surface was tested clinically with mild tissue pressure that lead to blanching that attained normal coloration within a few time after the insertion of prosthesis. Tightening of the prosthesis was done as per the regulations with appropriate screw. Patients were followed up for 3-4 months for any complications or routine oral hygiene checkups. In case of loss of implant, replacement was carried out and it was considered as implant failure. In case of fracture of prosthesis, prosthesis failure was considered.

Patient level failure was regarded if there was a need to remake the prosthesis without any prosthesis fracture. All the failures and complications were recorded amongst the subjects for 4-year period and recorded in a tabulated form. These were analyzed statistically using SPSS software.

**RESULTS**

Table 1 illustrates the 4-year survival of implant used for prosthesis placement. There were 1070 implants placed during the first year. During second and third year 710 and 540 implants were placed respectively. During the third year 300 implants were placed. For first year the interval survival rate was 99.07%, for second year it was 99.6%, during third year it was 99.63%. There were no implant failures in the third year, therefore the survival rate was 100%.

Table 2 shows the 4-year survival rate of the prosthesis. There were 190 prosthesis places during the first year, during the second year 130 prosthesis were placed, during third year 90 were placed and during fourth year 50 were placed. There was only 1 prosthesis failure during the first year and for the rest of the years the interim, survival rate was 100%.

Table 2 shows the 4-year survival rate of the prosthodontic treatment. There were 190 prosthesis places during the first year, during the second year 130 prosthesis were placed, for third year 90 were placed and for fourth year 50 were placed. There was one failure in first year leading to the interim survival rate of 99.48%. In the second year there were 3 failures giving the interval failure rate of 97.7%. The interim survival rate was 100% for the rest of the years.

Table 1: Analysis of implant survival

Time interval	Implants in interval	Failure in interval	Interval survival rate
0-1	1070	10	99.07
1-2	710	3	99.6
2-3	540	2	99.63
3-4	300	0	100

Table 2: Analysis or prosthesis survival

Time interval	Prosthesis in interval	Failures in interval	Interval survival rate
0-1	190	1	99.48
1-2	130	0	100
2-3	90	0	100
3-4	50	0	100

Table 3: Analysis of prosthodontic treatment

Time interval	Prosthesis in interval	Failures in interval	Interval survival rate
0-1	190	1	99.48
1-2	130	3	97.7
2-3	90	0	100
3-4	50	0	100

## DISCUSSION

Use of CAD-CAM for zirconia has additional advantages, like better fitting of the prosthesis due to digital technology used for fabrication, decreased laboratory procedure to digital technology used for fabrication and presence of a permanent digital file for reproduction in future, and the chance for construction of a prototype or replica structures in acrylic resin for patient approval and adjustments. However, the disadvantages associated with the use of these materials include the inability to repair fractures, low lenience of minute in accuracies in the impression, difficulty in adjustment and polishing, and few scientific information on clinical outcomes.<sup>2</sup> The usage of monolithic zirconia is now popular to decrease technical complications, and dental laboratories work even offer guarantees to insure against any fracture.<sup>11</sup> The cumulative implant failure rate of our study 2.4% is similar to that shown by different studies.<sup>12,13</sup> Some of the failure of implant occurred after the definitive insertion of zirconia prosthesis, and this resulted in the remake of prosthesis after new implants placement. Despite the low incidence of implant failures, failures of maxillary implant was around 3 times more than failures of mandibular implants. This difference was also seen by others.<sup>12,13</sup> As per our study, There were 1070 implants placed during the first year. During second and third year 710 and 540 implants were placed respectively. During the third year 300 implants were placed. For first year the interim survival rate was 99.07%, for second year it was 99.6%, during third year it was 99.63%. There were no implant failures in the third year, therefore the survival rate was 100%. There were 190 prosthesis places during the first year, during the second year 130 prosthesis were placed, during third year 90 were placed and during fourth year 50 were placed. There was only 1 prosthesis failure during the first year and for the rest of the years the interim survival rate was 100%. There were 190 prosthesis places during the first year, during the second year 130 prosthesis were placed, for third year 90 were placed and for fourth year 50 were placed. There was one failure in first year leading to the interim survival rate of 99.48%. In the second year there were 3 failures giving the interim failure rate of 97.7%. The interim survival rate was 100% for the rest of the years. On comparing the findings of the present study with other clinical trials on conventional veneered zirconia prosthesis, it was found that a significantly decreased incidence of technical complications; studies in the past have shown rates of fracture of veneered porcelain as much as 46.5%.<sup>14</sup> A limitation associated with the present study was that it gave no heed to the marginal bone loss as there was no standardized method for periapical x-rays. Nevertheless, there were no implants with gross marginal bone loss, which was defined as more than 30% of the implant length during the follow-up visits.

## CONCLUSION

Zirconia prosthesis are widely used these days in dentistry and offer great advantages including good wear resistance, high biocompatibility and high survival rates. In the present study, the zirconia prosthesis offered a great survival rate of more than 95% in a four year duration.

## REFERENCES

1. Bidra AS. Three-dimensional esthetic analysis in treatment planning for implant-supported fixed prosthesis in the edentulous maxilla: Review of the esthetics literature. *J Esthet Restor Dent* 2011;23:219-36.
2. Bidra AS, Rungruanganun P, Gauthier M. Clinical outcomes of full arch fixed implant-supported zirconia prostheses: A systematic review. *Eur J Oral Implantol* 2017;10(suppl 1):35-45.
3. Denry I, Kelly JR. Emerging ceramic-based materials for dentistry. *J Dent Res* 2014;93:1235-42.
4. Miyazaki T, Nakamura T, Matsumura H, Ban S, Kobayashi T. Current status of zirconia restoration. *J Prosthodont Res* 2013;57:236-61.
5. Pozzi A, Holst S, Fabbri G, Tallarico M. Clinical reliability of CAD/CAM cross-arch zirconia bridges on immediately loaded implants placed with computer-assisted/template-guided surgery: A retrospective study with a follow-up between 3 and 5 years. *Clin Implant Dent Relat Res* 2015;17(suppl 1):e86-96.
6. Heintze SD, Rousson V. Survival of zirconia- and metal-supported fixed dental prostheses: A systematic review. *Int J Prosthodont* 2010;23: 493-502.
7. Benetti P, Kelly JR, Sanchez M, Della Bona A. Influence of thermal gradients on stress state of veneered restorations. *Dent Mater* 2014;30:554-63.
8. Alghazzawi TF, Lemons J, Liu PR, Essig ME, Bartolucci AA, Janowski GM. Influence of low-temperature environmental exposure on the mechanical properties and structural stability dental zirconia. *J Prosthodont* 2012;21: 363-9.
9. Flinn BD, deGroot DA, Mancl LA, Raigrodski AJ. Accelerated aging characteristics of three yttria-stabilized tetragonal zirconia polycrystalline dental materials. *J Prosthet Dent* 2012;108:223-30.
10. Abdulmajeed AA, Lim KG, Närhi TO, Cooper LF. Complete-arch implant- supported monolithic zirconia fixed dental prostheses: A systematic review. *J Prosthet Dent* 2016;115:672-7.
11. Bidra AS, Tischler M, Patch C. Survival of 2039 complete arch fixed implant- supported zirconia prostheses: A retrospective study. *J Prosthet Dent* 2018;119:220-4.
12. Parel SM, Phillips WR. A risk assessment treatment planning protocol for the four implant immediately loaded maxilla: Preliminary findings. *J Prosthet Dent* 2011;106:359-66.
13. Maló P, AraújoNobre MD, Lopes A, Rodrigues R. Double full-arch versus single full-arch, four implant-supported rehabilitations: A retrospective, 5- year cohort study. *J Prosthodont* 2015;24:263-70.
14. Mendez Caramês JM, Sola Pereira da Mata AD, da Silva Marques DN, de Oliveira Francisco HC. Ceramic-veneered zirconia frameworks in full arch implant rehabilitations: A 6-month to 5-year retrospective cohort study. *Int J Oral Maxillofac Implants* 2016;31:1407-14.