

# Crestal Bone Loss Evaluation around Single Piece Zirconia Implants and Titanium Implants

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**Abstract:** ***Aim:** Dental implants are root analogues installed into the jaw bone to replace the missing tooth. Success and survival of an implant do, however, not depend solely on osseointegration. The purpose of this study is a comparative assessment of crestal bone loss at the end of one yr around zirconia and titanium dental implants. **Materials and Methods:** Patients in the mean age group between 25 to 55 years and partially edentulous areas will be randomly selected for a double-blind clinical trial. 20 implants will be placed using the roll of the dice method. All the patients will be assessed for crestal bone loss using radiovisiography around Zirconium and Titanium implants after 12 months of implant placement. **Results:** All the patients were regular for a follow-up duration of 12 months by the completion of the study. Both the experimental sites showed no statistical significance crestal bone loss, between 2 Group A and B after 12 months follow up. **Conclusion:** All the implants healed uneventfully without any perimplantitis and other complications. However, by the comparison between groups, there is no significance in Crestal bone loss between the groups at 12 months followup.*

**Keywords:** zirconia dental implants, crestal bone loss, radiovisiography, sopro imaging software

## 1. Introduction

Edentulous individuals experience a debilitated competence to perform vital life assignments. Various treatment modalities have been put forth to replace the missing tooth. However, implant therapy has achieved more attention and connotation.

Dental implants are biocompatible metal anchors surgically placed into the jawbone within the gums to replace missing teeth. Titanium remains the material of choice for obtaining and maintaining this bone to implant contact. Dark grayish coloris the main drawback of titanium that appears via peri-implant mucosa, hence impairing esthetic results in a thin mucosa biotype's presence<sup>1</sup>. Zirconia is a metal oxide identified in 1789 by German Chemist Martin Heinrich Klaproth.<sup>2</sup> The utilization of zirconia implants eliminates complications and meets the request of patients for metal-free implants.<sup>3</sup>

Dental implants that placed after reflecting flaps show some bone resorption. During the initial phase of healing bone resorption of varying degree almost always occur in crestal region. The extent of alveolar height reduction is related to the bone thickness at each specific site. Radiographic examination was carried out using radiovisiography taken using a paralleling long-cone technique. These examinations are done on the day of fixture placement and after few months of the restoration. The measuring reference is radiopaque implant length. The implant shoulder and the alveolar crest are the reference points. Assessment of dental implant bone loss at 1 yr followup is the main objective of the study illustrating the

differences in bone loss of single piece zirconia and titanium implants.<sup>4</sup>

## 2. Materials and Methods

The study population included patients who reported to the department of Periodontics St Joseph dental college who seek replacement of lost teeth between April 2018 to April 2019. A randomized, double-blinded clinical trial was planned and patients were enrolled using the roll of dice method of partially edentulous patients was undertaken to evaluate the crestal bone loss around zirconia dental implant and titanium implant. A total of 20 implants were placed for the study bilaterally, after completion of the presurgical phase of treatment. Study was discussed with the patient and signed informed consent was taken from the patient.

All The patients underwent oral prophylaxis and underwent routine blood investigations. Patients with any systemic diseases, smokers, pregnant or lactating females, individuals with poor oral hygiene were excluded in the study. Presurgical radiographic evaluation was done using radiovisiography. The selected sites were randomly divided into Experimental site A (zirconia implant) and Experimental site B (titanium) by using the roll of dice method. 10 custom made zirconia implants and 10 titanium implants were placed in site A group A and group B respectively. After surgery postoperative instructions were given to the patient and 6 months later all the implants were loaded

Clinical parameters like, Crestal Bone Loss (Fig. 1 and Fig. 2) is assessed the measuring reference is radiopaque implant

length. The implant shoulder and the alveolar crest are taken as the reference points. Measurements of the distance between 2 reference points were performed at the mesial and distal aspect using the radiographic imaging technique called SOPRO digital imaging software. Mean values are measured and recorded for each implant. Crestal bone loss is assessed by calculating the difference between measured bone levels.

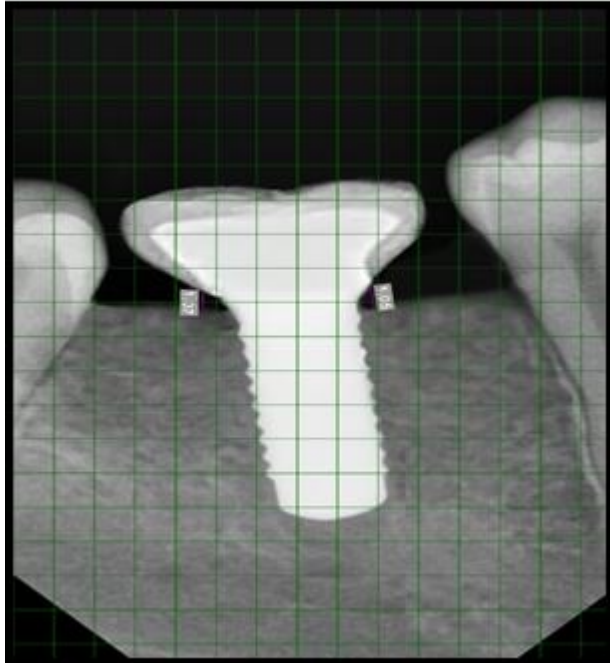


Figure 1: Site A Crestal bone loss (CBL) after 12 months

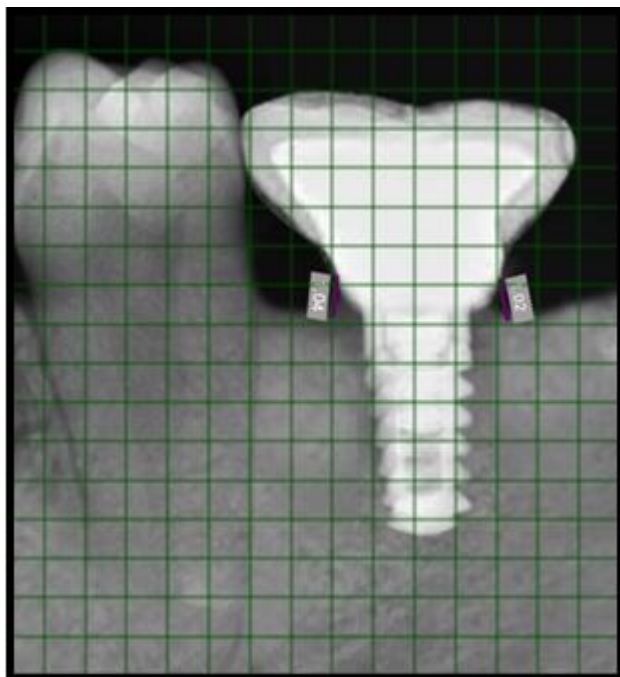


Figure 2: Site B Site A crestal bone loss (CBL) after 12 months

### 3. Results

This study was conducted to assess crestal bone loss at 12 months of the zirconia and titanium dental implants placement. A total of 20 sites and 10 patients were selected randomly from the outpatient department of periodontics, St Joseph dental college. Clinical parameter for zirconia and titanium implants were measured at baseline and followup the data obtained was subjected to statistical analysis

Data were entered in MS-Excel and analyzed in SPSS V22. Descriptive statistics were represented with Mean & SD. Independent t-test, were applied to find significance.  $P < 0.05$  was considered statistically significant.

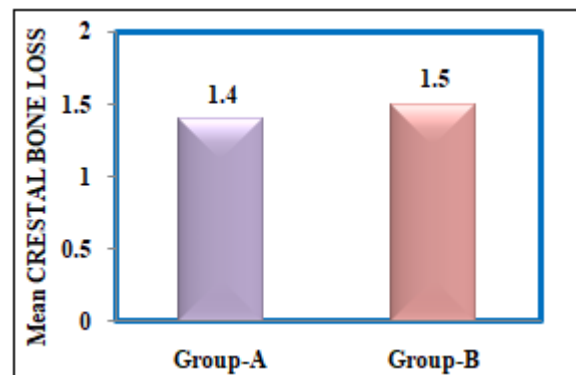
**Table 1:** Mean, Standard Deviation of Crestal Bone Loss of Group A and Group B

Variable	Group	N	Minimum	Maximum	Mean	SD	P-value
Crestal Bone Loss	A	10	1.0	2.0	1.40	0.46	0.64
	B	10	1.0	2.0	1.50	0.47	

Statistical Analysis: Independent t-test. Statistically significant if p value is  $< 0.05$

#### Inference

Crestal bone loss at 12 months showed means of 1.40 and 1.50 in group A and group B respectively. When the means were compared it revealed a statistical insignificance with a P value of 0.64.



Graph 1: Comparison between Mean Values of Crestal Bone Loss in Group A and Group B

### 4. Discussion

Osseointegration is the biological fixation of implant relating to the direct bone to implant contact (BIC) without an intervening connective tissue layer. BIC is considered to be an essential indicator for successful osseointegration which, governs the overall success and survival of implants. The Implant-Tissue interface is an extremely dynamic region of interaction.

The process of osseointegration involves an initial interlocking between the alveolar bone and the implant body and later, biological fixation through continuous bone apposition and remodeling. This complete process is followed by changes in

Bone microstructure. To evaluate the success of various dental implants the osseointegration of the implants the process of initial loss of bone begins at the implant bone interface of crestal region numerous studies were conducted to prevent this crestal bone loss.<sup>5</sup>

The expected amount of crestal bone loss around the implant during first year of placement should be less than 2mm apical to the implant abutment junction. Findings of current study are in accordance with the Rossi et al 2011.<sup>6</sup>

One of the most important parameters to be assessed in an implant placement is the crestal bone loss (CBL). The mean crestal bone loss by the end of 12 months follow-up period was but was not statistically significant indicating peri-implant health. The non-significant bone loss that occurred was also invariable as explained by **Yuko ujiie et al<sup>7</sup> 2019**. The results of the present study are in accordance with **Mohammad d et al<sup>8</sup> 2016** which showed non-significant bone loss.

Survival rates , plaque index, and probing depths and the Crestal bone loss around zirconia and titanium dental implants of the current study showed no significant difference in the marginal bone levels were observed between titanium and custom made zirconia implants which are in accordance with the study done by **Anoop nair et al<sup>9</sup>, 2017**.

However, the study has certain limitations. Limited number of patients and shorter follow up period may have contributed to the lack of any detectable significance between the groups. Longer follow up with larger sample size is necessary to study the efficiency of the material in attaining a predictable treatment outcome.

## 5. Conclusion

All the implants healed uneventfully and survival rates for both the implants are considered to be good and crestal bone loss around both the groups found to be non significant showing better treatment outcomes. However studies with larger sample size with longer follow-ups are to be conducted to make out significant results.

## References

- [1] Saurabh Gupta, (2016) Academic and Research Scientist, India A Recent Updates on Zirconia Implants: A Literature Review. *Dent Implants Dentures*, vol11; issue 1.
- [2] Rahul Patil; (2015) Zirconia versus titanium dental implants:A systematic review. *Journal of dental implants*, Vol: 5 ; Issue 1; 39-42.
- [3] Zeynep O' zkurt, DDS, PhD\*Ender Kazazog' lu, DDS, Ph.D. (2011) Zirconia Dental Implants; A Literature Review. *Journal of Oral Implantology* 37(3):367-76 .
- [4] Laura Gaviria, John Paul Salcido, Teja Guda, Joo L. Ong. (2014) Current trends in dental implants. *J Korean Assoc Oral Maxillofac Surg* ; 40: 50-60.
- [5] Prasad DK, Shetty M, Bansal N, Hegde C. (2011) Crestal bone preservation: a review of different approaches for successful implant therapy. *Indian J Dent Res*; 22:317–23. [PubMed] [Google Scholar]
- [6] Rossi F, Zavanelli AC, Zavanelli RA. Photoelastic comparison of single tooth implant-abutment-bone of platform switchngv/s conventional implant designs. *The Jrnl of Contemp Dent Pract*. 2011; vol12: 124–30. [PubMed] [Google Scholar].
- [7] Yuko Ujiie, Reynaldo Todescan, and John E. Davies. (2012) Peri-Implant Crestal Bone Loss: A Putative Mechanism. *International Journal of Dentistry*, Vol 2012.
- [8] Mohammad D. Al Amri et al. (2016) Crestal bone loss around submerged and non submerged dental implants: A systematic review. *J Prosthet Dent* ; vol115: 564-570.
- [9] Anoop nair et al. (2017) 'Clinical and radiological comparative evaluation of custom made zirconia versus titanium dental implants; An in vivo study.' *Journal of Applied Dental and Medical Sciences*, vol 4, issue 1.