Respective Study/Original Study Comparison of Bone Loss between Long and Short Implants

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Abstract
*For the implant placement bone resorption following tooth loss often limits the quantity of bone available. When resorption occurs in areas of poor bone quality and strong masticatory forces, treatment options may include augmentation procedures or the exclusive use of short implants. An implant supported prostheses maintains bone, preparation of adjacent teeth and increases survival rate of prosthesis. Clinical strategies to improve the success rate of implants placed in sites with reduced bone quantity have included the use of large-diameter implants, rough surfaced implants for greater bone-to-implant contact or simply a greater number of implants. The purpose of the present study was to evaluate the comparison of bone loss in Long &short implant ten implant placed in different length 8mm ,11.5mm,13mmand 3.5 and 4.7 diameter were placed in the mandibular molar region . Radiographs with RVG or IOPA were obtained at 0,3 &6 months after loading and were evaluated by RVG for bone loss in longer and short implant . The result showed a mean **bone loss in long implants 2.667 & 1.763 in short implant** after 6 month .The findings concluded that the success and survival rates for long implant .The height of the crown is an important determinant in implant prosthesis as it bears the lateral forces and distributes it to the crest thereby resulting in a favorable treatment outcome.*
Key word- marginal bone loss, short implants, reduced bone height, bone loss long and short implant.

Date of Submission: 08-10-2020   Date of Acceptance: 22-10-2020

I.   Introduction

Bone resorption following tooth loss often limits the quantity of bone available for implant placement. When resorption occurs in areas of poor bone quality and strong masticatory forces, treatment options may include augmentation procedures or the exclusive use of short implants. Clinical strategies to improve the success rate of implants placed in sites with reduced bone quantity have included the use of large-diameter implants, rough surfaced implants for greater bone-to-implant contact or simply a greater number of implants.[3].

For this study we concluded that an unfavorable crown-to-root ratio is a significant factor for clinicians to consider when establishing a long-term prognosis. Guidelines for unfavorable crown-to-implant ratios do not exist in the dental literature. A design factor that is closely related to the crown-to-implant ratio is implant length. Numerous publications address the issue of implant length as a predictor of implant survival. These studies have produced conflicting results. Some studies report higher failure rates with short implants.[1]

The null hypothesis is that the longer implant is better to shorter implant average crown-implant ratio of that which is considered favorable for a natural tooth in terms of implant stability and bone loss. We will evaluate the functionality of short dental implant and peri implant bone loss due to excess load in implant site.

In this study we determine to compare the long and short implant stability & bone loss with assess the marginal bone level using RVG or IOPA.

II. Material And Methods

Source of Data:

This study was conducted in the Department of Prosthodontics &Implantology, D.J. College of Dental Sciences & Research, Modinagar. Patients coming for tooth replacement (With indication for implant) were selected from Out Patient Department randomly. A written informed consent was taken in the prescribed form from each patient.

Criteria for patient selection:
The study protocol involved a screening appointment to verify eligibility base on inclusion and exclusion criteria. In addition to a thorough clinical examination radiographic assessment was done to estimate the morphologic characteristic of the proposed implant site and the location of surrounding anatomic land marks.
There will be certain inclusion & exclusion criteria that need to be followed.

Inclusion Criteria:
The inclusion criteria for patient selection include:
1. Patients aged above 18 years
2. Appropriate alveolar bone should be available
3. Willing to accept the condition of the study and to give written informed consent
4. Sufficient inter-occlusal mesiodistal space for placement of implant
5. The patient is available for the follow up study

Exclusion Criteria:
Certain exclusion criteria include:
1. Systemic contraindication to surgery
2. Immunosuppressed or immunocompromised
3. Use of drugs such as steroids, need to carefully considered
4. Pregnant or nursing
5. Uncontrolled diabetes
6. Uncontrolled neuromuscular diseases
7. Poor oral hygiene and motivation
8. Active periodontitis
9. Bruxism
10. Lack of opposite occluding dentition/prosthesis in the area intended for implant placement

PROCEDURE:
A total of 10 patients would be taken for the study and would be divided into groups.Long and short implant.
At first, patient should be prescribed with proper medication an hour before surgery and twice daily thereafter for the following five days**.** Only healthy patients with no risk of implant surgery should be selected after adequate medical history & examination will be included. In this study, the required area would be anaesthetized and strict asepsis protocols will be observed to prepare the osteotomy site for implant placement. In cases where the vertical height of the bone is reduced during ridge preparation, proper length of the implant is selected accordingly. Subsequently Post-operatively antibiotics, anti-inflammatory and analgesic will be prescribed for 5days and chlorhexidine 0.12% mouth rinse prescribed twice a day for 14 days. Patient will be recalled after 1 week and 1, 3, 6 month period to check the implant stability.

RADIOGRAPHIC INVESTIGATION
It plays an important role in treatment planning. All patients would be subjected to radiographic examination of the implant site using the following radiographs
Pre-Fixture placement Panoramic Radiographs and RVG
Post-Fixture Placement A Radiographic follow up will be conducted during the following periods;
• 0 month (Immediately post operative)
• 3 months
• 6 months

Intraoral radiograph were taken if visual assessment of the marginal bone attached at the distal and mesial surfaces for all implant with magnified panoramic radiographs. The mesial and distal marginal bone levels of all implant will be determined during baseline and recall evaluations. Currently the best method for measuring marginal bone levels around implant is examination of scanned and digitized conventional radiograph which will be used in the study. Measurement will be obtained from images of successive radiograph that had been scanned and digitized. The distance from the widest supra-crestal part of the implant to the crestal bone level will be measured on the magnified image. To account for variability, the implant width can be measured and compared with the documented dimension, and ratios will be calculated to adjust for distortion.

CASE 1 (LONG & SHORT IMPLANT)

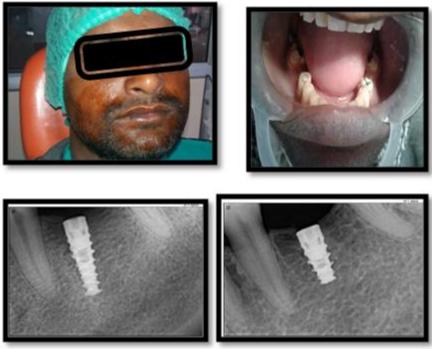**Figure-1** Pre-operative orthopantomogramof male patient with bilaterally missing mandibular first molars
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Figure 2a-RVG at surgery time (46)and **2b-**RVG surgery time (36)

Figure 3a   : implant stability wrt (46) and **3b-** implant stability wrt (36)
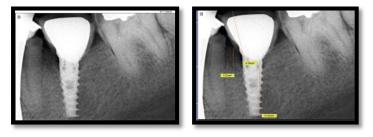
Figure 4-after 3 month-Orthopantomogram

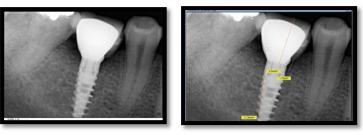**Figure 5a-**RVG after 3 month (36) and **5b-**RVG readings after 3 month (36)

Figure 6a-RVG after 3 month (46) and **5b-**RVG readings after 3 month (46)
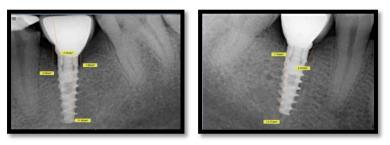

Figure 7a-RVG after 6 month (36) and **5b-**RVG readings after 3 month (46)

CASE 2 (SHORT IMPLANT)

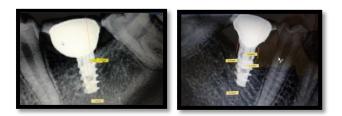**Figure 8-** Pre-operative orthopantomogramof female patient with bilaterally missing mandibular first molars

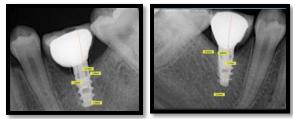**Figure 9a-**RVG readings after 3 month (36)and **9b-**RVG readings after 3 month (46)

Figure 10a-RVG readings after 6 month (36)and **10b-**RVG readings after 6 month (46)
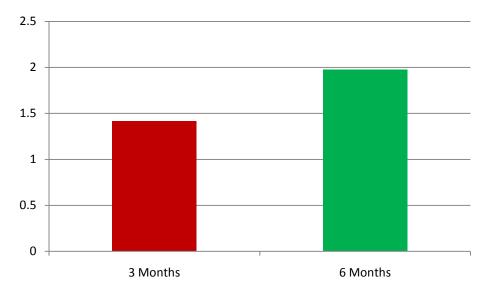

Figure 11-Post-Operative Orthopantomogram

III. Results
Table 1: Implant Stability& Bone loss around implant

Patient Details	Implant site	Implant Stability (ISQ)			Bone loss around implant (mm)			
					3 month		6 month	
		0 Base line	3 months	6 months	Mesial	Distal	Mesial	Distal
TARANUM	36	64	B=58 L=56	B=62 L=65	1.16mm^2	No bone loss	1.71mm^2	0.60mm^2
	46	58	B=52 L=54	B=60 L=64	2.11mm^2	2.07mm^2	1.26mm^2	1.58mm^2
AMARPAL	36	65	B=65 L=68	B=68 L=69	3.52mm^2	No bone loss	3.20mm^2	2mm^2
	46	64	B=56 L=62	B=63 L=65	1.75mm^2	No bone loss	2.47mm^2	1.16mm^2

Table 2: COMPARISON OF BONE LOSS BETWEEN THE TWO INTERVALS

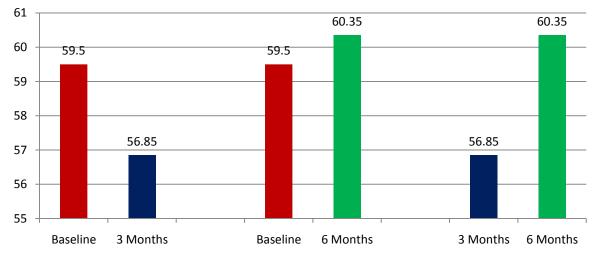|	Mean	N	Std. Deviation	P value
3 Months	1.41	10	0.819	0.045 (Significant)
6 Months	1.97	10	1.484	

The bone loss was 1.41±0.819 at 3 months time interval which increased to 1.97 ± 1.431 at the 6 months interval. The increase at the 6th month was statistically significant (p=0.045)

GRAPH- 1 COMPARISON OF BONE LOSS BETWEEN THE TWO INTERVALS

TABLE-3 COMPARISON OF IMPLANT STABILITY   BETWEEN THE TWO INTERVALS

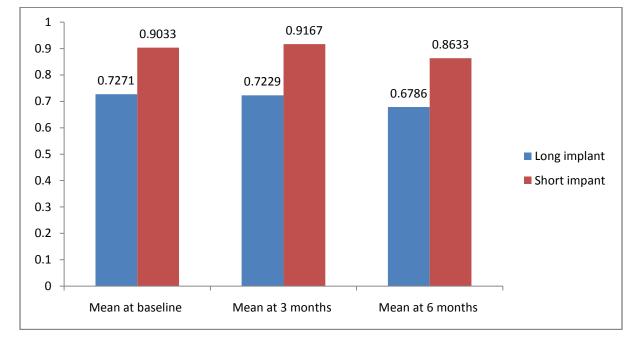|	Mean	N	Std. Deviation	P value
Baseline	59.50	10	5.911	0.388 (Non-Significant)
3 Months	56.85	10	13.222	
Baseline	59.50	10	5.911	0.642 (Non-Significant)
6 Months	60.35	10	9.812	
3 Months	56.85	10	13.222	0.042 (Significant)
6 Months	60.35	10	9.812	

GRAPH-2 COMPARISON OF IMPLANT STABILITY BETWEEN THE TWO INTERVALS

At the baseline the implant stability was 59.50± 0.108 and at the 3 months time interval the implant stability was 56.85± 13.22. The difference in the implant stability between the two time intervals was statistically non-significant. At the 6 months interval the implant stability was 60.35± 9.812 and the difference between the baseline and 6 months time interval was statistically non-significant.

group	N	Mean	Std. Deviation	Std. Error Mean	P value	Sig.
Baseline						
Long implant	7	.7271	.06676	.02523	.008	Significant
Short implant	3	.9033	.09074	.05239		
3 months						
Long implant	7	.7229	.07041	.02661	.009	Significant
Short implant	3	.9167	.11015	.06360		
6 months						
Long implant	7	.6786	.07669	.02899	.03	Significant
Short implant	3	.8633	.08505	.04910		

At the baseline, 3 months & 6 months time interval, comparison was found to be statistically significant between the two types of implants i.e. the short implant & long implant.
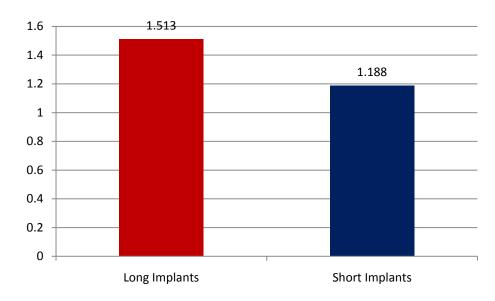
Table 4: comparison of bone loss between two groups long &short implant

Patient Details	Implant site	Bone loss around implant (mm)			
		3 month		6 month	
LONG IMPLANT					
		Mesial	Distal	Mesial	Distal
RAKESH SHARMA 45/M	36	2.5mm^2	3mm^2	2.86mm^2	3.21mm^2
	45	2.1mm^2	2.52mm^2	4.86mm^2	5.53mm^2
AFFRIN 26/F	46	1.58mm^2	1.97mm^2	1.23mm^2	1.33mm^2
AMARPAL 35/M	36	3.52mm^2	No bone loss	3.20mm^2	2mm^2
	46	1.75mm^2	No bone loss	2.47mm^2	1.16mm^2
PUJA 22/F	22	1.4mm^2	No bone loss	0.4mm^2	0.64mm^2
RANI 30/F	37	0.57mm^2	0.28mm^2	0.056mm^2	No bone loss
SHORT IMPLANT					
TARANUM 17/F	36	1.16mm^2	No bone loss	1.71mm^2	0.60mm^2
	46	2.11mm^2	2.07mm^2	1.26mm^2	1.58mm^2

RENU TYAGI 38/F	16	No bone loss	1.79mm^2	2.81mm^2	2.62mm^2

GRAPH 3(A)-COMPARISON OF BONE LOSS BETWEEN LONG AND SHORT IMPLANTS AT 3 MONTHS TIME PERIOD

GP	Mean	Std. Deviation	Std. Error Mean	P value
Long Implants	1.513	0.870	0.329	0.001 (Significant)
Short Implants	1.188	0.796	0.459	

The bone loss at the three months time period was significantly higher in the Long Implants as compared to the short implants when analyzed using Mann Whitney U test.

GRAPH 3(B) COMPARISON OF BONE LOSS BETWEEN LONG AND SHORT IMPLANTS AT 6 MONTHS TIME PERIOD

GP	Mean	Std. Deviation	Std. Error Mean	P value
Long Implants	2.067	1.743	0.658	0.001 (Significant)
Short Implants	1.763	0.834	0.481	

The bone loss at the six months time period was significantly higher in the Long Implants as compared to the short implants when analyzed using Mann Whitney U test

IV. Discussion

Rehabilitating patients with advanced levels of alveolar bone resorption is often problematic and may require surgical intervention.[5] Therefore the placement and restoration of dental implants have become a routine dental procedure. Reduced alveolar height is a very common challenge so an alternative approach for such cases is to use short implants instead of the standard range.[6] Studies have indicated that with increased crown to root ratio, additional bone loss occurred compared with locations that did not have increased crown to root ratio.[8]

In the present study we have compared bone loss long &short implant and implant stability was evaluated at 0 month, 3 months and 6 months.

The difference in the implant stability between the two time intervals was statistically non-significant. At the 6 months interval the implant stability was 60.35± 9.812 and the difference between the baseline and 6 months time interval was statistically non-significant.

Result is comparable to the study done by **Okada S** in which implant stability increased with time but was found to be non significant. Result is not comparable to the study done by **Okada S** in which mean marginal bone loss adjacent around implants ranged between 0.11 and 0.19 mm, with no significant difference.[13]

In the present study the mean for bone loss was 1.41±0.819 at 3 months time interval which increased to 1.97 ± 1.431 at the 6 months interval and was statistically significant.

According to **Polo MG** in which marginal bone loss was associated with prosthesis placement and has encouraged the development of various treatment outcomes and is comparable to our study.

According to **Albrektsson** a maximum of 1.5 mm of bone loss was during first year of loading and thereafter it was 0.2 mm and is comparable to our study**.**[2]

According to **Ghahroudi AAR** the overall bone loss was 0.688 mm, 0.665 mm and 0.935 mm respectively which is comparable to our study.[14]

According to **Romanos GE** bone loss around the implant) were somewhat dependent on the force distribution into adjacent bone, which in turn is dependent on the implant type and form and no implant failures caused by bone loss were seen.[15]

The crown to root ratio for short implant was more as compared to long implant and was statically significant. Our result is comparable to the study done by **Rokni S** in which long Implants with larger surface areas were used more frequently and have lower c/r ratios as compared to the short implants.[16]

V. Conclusion:

Patients with severely atrophic residual ridges have reduced alveolar ridge height so there is reduced C/I ratio so an alternative approach for such cases is to use long implants. Therefore from this study it can be concluded that the mean Implant stability between the two intervals was non-significant at 3 months, but after 6 months was significantly increased. The bone loss at the six months time period was significantly higher in the Long Implants as compared to the short implants when analyzed using Mann Whitney U test. At the baseline, 3 months & 6 months time interval, comparison was found to be statistically significant between the two types of implants i.e. the short implant & long implant

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