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CLINICAL OUTCOME OF SINGLE IMPLANTS UNDERWENT IMMEDIATE, EARLY AND DELAYED NON-OCCLUSAL LOADING

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ABSTRACT

Aim: To compare the effectiveness of conventional/delayed loading (group I), early loading (group II) and immediate non occlusal loading (group III) of single implants by assessing peri-implant marginal bone level, width of attached gingiva and probing depth. **Material and method:** Thirty patients requiring single tooth replacement were selected from the OPD of Department of Prosthodontics & Crown and Bridge. In group I, 10 implants were placed at healed sites following standard two stage procedure of implant placement. In group II, 10 implants were placed at healed sites following which a healing abutment was placed at stage I surgery. Following which a definitive restoration was placed on definitive abutment 3 weeks after surgery. In group III, 10 implants were placed at healed sites following which a definitive abutment was placed at stage I surgery. The crestal bone was evaluated around the definitive abutment after placement of provisional/definitive restoration, at baseline (after loading) and 6 months using CBCT. **Results:** In group I the change in mean crestal bone level change from baseline to 6 months on buccal, lingual, mesial and distal sites were 0.47±0.14mm, 0.49±0.15mm, 0.49±0.14mm and 0.49±0.14mm respectively, in group II 0.50±0.09mm, 0.43±0.07mm, 0.45±0.08mm and 0.44±0.06mm respectively and in group III 0.43±0.08mm, 0.43±0.06mm, 0.39±0.06mm and 0.46±0.08mm respectively. **Conclusion:** The results are conclusive of the fact that the placement of definitive abutment at stage I surgery i.e. immediate loading results in a lesser vertical bone loss around implants followed by early loading and then by delayed loading.

KEYWORDS: Bone loss, Implant, CBCT, Loading.

INTRODUCTION

The goal of modern dentistry is to restore the normal contour, function, comfort, esthetics, speech and health, regardless of the loss of hard and soft tissue atrophy, disease or injury of stomatognathic system.[1] Implant dentistry is the second oldest discipline in the dentistry; Exodontia being the first. The history of dental implants begins more than 1300 years ago with the ancient Mayans; 4000 years ago with the ancient Chinese and 2000 years ago with the Egyptian. They used carved bamboo sticks, took pieces of sea shells and, tapped them into the bone to replace missing tooth. History shows that it has always made sense to replace a tooth with an implant in the approximate shape of a tooth.[2]

Implant dentistry has emerged as "a fully accepted discipline" in dentistry. During its period of development its concepts and treatment modalities have undergone tremendous changes. The history of implant dentistry can be divided into three distinct parts (1) the Pre Branemeark era, (2) Branemark era, (3) Post Branemark era. In pre-Branemark era the goal is to simulate periodontal tissues to obtain fibrointegration in an effort to minimize stresses at the bone implant interface. In the Branemark era, osseointegration without fibrous interposition were introduced. Later on, in post-Branemark era it was found that immediate loading in itself does not interfere with the process of osseointegration. Initially protocol involving two stage surgeries was recognized as providing reproducible and

reliable results. Later a single stage surgical procedure became acceptable. Further, the waiting period for bone healing was shortened; instead of 3 to 8 months, no more than 6 to 8 weeks were deemed necessary.[3] Implant loading, are immediate, early or conventional delayed loading.[4]

It is therefore important to evaluate whether predictable results can also be obtained when loading dental implants immediately or early in more critical situations, such as in the replacement of single teeth.[5] Thus, the aim of this study is to compare the effectiveness of conventional/delayed loading (group I), early loading (group II) and immediate non occlusal loading (group III) of single implants by assessing peri-implant marginal bone level, width of attached gingiva and probing depth.

MATERIAL AND METHODOLOGY

Thirty patients requiring single tooth replacement were selected from the OPD of Department of Prosthodontics & Crown and Bridge, MIDS, Ambala. Ethical clearance was obtained from the Ethical Committee of the institute. Patients irrespective of gender were selected following the inclusion and exclusion criteria of the study.

Inclusion criteria: Patient having age between 18-50 years, having single tooth missing with adjacent and opposing teeth present, having intact adjacent teeth (restored with functionally & esthetically good restorations; restored with prosthesis precluding the addition of the missing tooth) and patients with good periodontal and general health were included in the study.

Exclusion criteria: Patients with history of smoking, active infection in site intended for implant placement, psychoses or dental history of bruxism & parafunctional habits, systemic disease that compromise osseointegration (e.g. uncontrolled diabetes), pregnancy/lactating mother, patients on intravenous bisphosphonates and patients with recent history of radiotherapy.

The procedures to be performed were explained to the patient before including them in the study. The relevant alternatives of restoration of missing teeth were also presented. A written, explained, and informed consent was obtained from the volunteers for implant procedures, to participate in the study, and to attend regular follow up. Detailed medical and dental history was then obtained and documented.

In group I, 10 implants were placed at healed sites following standard two stage procedure of implant placement. In group II, 10 implants were placed at healed sites following which a healing abutment was placed at stage I surgery. Following which a definitive restoration was placed on definitive abutment 3 weeks after surgery. In group III, 10 implants were placed at healed sites following which a definitive abutment was placed at stage I surgery. Following which a provisional restoration was placed on definitive abutment a day after surgery.

INSTRUMENTATION

1. **Diagnosis and Examination:** Diagnostic Instruments (API, India), OPG (PaX-400 C, Vatech Global, Korea), cone beam computed tomography (Galileos-Sirona, CS 9300 Scanner), impression trays (S.S. White Dental Mfg. Co., U.S.A.), irreversible hydrocolloid impression material (Plastalgin, Septodont, France), dental stone (Type III, Kalabhai, India), dental stone (Type IV, Ultrarock, Kalabhai)
2. **Surgical Stent:** Transparent Autopolymerising Acrylic Resin Powder and Liquid (DPI, India), Cold Mould Seal (DPI, India)
3. **Surgical Equipment:** Implants of various sizes (Adin®-Touareg-S, Israel), physiodispenser (Surgic Pro NSK), Bard Parker Handle with Blade no. 12/15(API, India), Local Anaesthetic Agent (Lignox, Indoco remedies Ltd., India), Periosteal Elevator (Hu-Friedy, U.S.A.), Surgical Drills (Adin®-Touareg-S, Israel), Resonance Frequency Analyser (Osstell ISQ), Definitive Abutment Hexed (Adin®-Touareg-S, Israel), Needle Holder (GDC, India) and Vicryl Sutures (3-0, 4-0, Ethicon, Johnson & Johnson Ltd.)
4. **Prosthetic Rehabilitation:** Impression Trays (S.S. White Dental Mfg. Co., U.S.A.), Irreversible Hydrocolloid Impression Material (Plastalgin, Septodont, France), Tooth Coloured Autopolymerising Acrylic Resin (DPI India), Cold Mould Seal (DPI, India), Articulating Paper (Bausch, U.S.A.), Temporary Luting Cement (TempoSil, Switzerland) and Vaseline, Vinyl Polysiloxane Addition Silicone-Putty & Light body(3M ESPE), Dental Stone (Type IV, Ultrarock, Kalabhai), Inlay Wax (Bego, Germany), Zinc-phosphate Cement (Pyrax, India) and Flowable Composite (Filtek™ Z350XT, 3M ESPE)

Radiographic evaluation: Cone beam computed tomography (Galileos-Sirona, CS 9300 Scanner).

Assessment: Pre-operative analysis of surgical site was done clinically and by using an OPG. Diagnostic impressions were made of maxillary and mandibular arch using irreversible hydrocolloid material (Plastalgin, Septodont, France) and casts were made using dental stone (Type III). The following parameters were assessed from the diagnostic models:

1. Length of edentulous span (Mesiodistal and buccolingual width)
2. Interocclusal distance.

A wax-up was done on articulated diagnostic models over which a template was fabricated using clear autopolymerising acrylic resin. The purpose of fabrication of surgical template was to provide sufficient

information about the desired crown contour and it facilitated three dimensional fixture placements.

Pre-Surgical care: The patient was put on antibiotic therapy i.e. 500mg amoxicillin+125mg clavulanate potassium (Augmentin 625 mg Duo, GalaxoSmithKline) 24 hours prior to surgery which were to be continued 5 days post-surgery.

Surgical Procedure: The surgical site was prepared following surgical protocol and was anesthetized using 2% lignocaine hydrochloride with epinephrine (1:200,000). A full thickness mucoperiosteal flap was raised at the site of implant placement. Following elevation of flap surgical stent was placed at the site of implant placement and optimal implant location was then marked using a surgical round bur with the guidance of surgical template. After the site was correctly marked, surgical template was used to guide the pilot drill to prepare an osteotomy site of appropriate designated length. After confirmation of depth and angulation, the osteotomy site was prepared by a series of gradually wider drills (D2.8, D3.2, D3.65, D4.3, and D5.2) to the requisite width with a speed of 1200–1400 rpm at 1:20 reduction torque as per the manufacturer instructions. Paralleling pin was placed to check for the parallelism. The implant was placed into the osteotomy site 0.5mm-1mm subcrestally as the implant collar is not polished. For Group I cover screws were placed following implant placement and the site was sutured (4-0 Vicryl Ethicon, Johnson & Johnson).

Prosthetic phase for definitive prosthesis in the recruited groups

a. For group I, the 2nd stage surgery was performed after 3-4 months of implant placement. The cover screw was removed and a healing abutment was placed for the appropriate gingival contouring. This was the first implant-abutment dis/reconnection. Patient was recalled after 4-5 days of placement of healing abutment for final impression procedure. For final impression the healing abutment was removed and the impression coping was tightened over the implant. An IOPAR was taken to confirm the fit of the transfer coping over the implant platform. Following this an implant level impression was made using Vinyl Polysiloxane Addition silicone-Putty & Light body (3M ESPE). The transfer coping was removed and implant analog was attached to it. Healing abutment was placed back in the patient's mouth. Abutments were also removed 3 more times: at the time of metal framework and bisque try-in and at the delivery of the final restoration. The prosthesis was cemented using Zinc Phosphate cement as it is most bio-compatible with the adjoining soft tissues. Hence, there was total 6 times abutment dis/reconnection for delivery of the final restoration by the standard protocol.

b. For Group II, the implant was placed into the osteotomy site at least 0.5mm-1mm subcrestally
RFA values were recorded using OSTELL ISQ following implant placement. Healing abutments were placed only if the ISQ values where more than 60 ISQ. Healing abutments were not placed if any of the implants met one of the following exclusion criteria (1) insertion torque ≤25Ncm, and (2) an ISQ of ≤ 60. The flaps were then sutured (4-0 Vicryl Ethicon, Johnson & Johnson) and IOPAR was taken. Patient was recalled after 3 weeks of placement of healing abutment for final impression procedure. For final impression the healing abutment was removed and the impression coping was tightened over the implant. An IOPAR was taken to confirm the fit of the transfer coping over the implant platform. Following this an implant level impression was made using Vinyl Polysiloxane Addition silicone-Putty & Light body (3M ESPE). The transfer coping was removed and implant analog was attached to it. Healing abutment was placed back in the patient's mouth. Abutments were also removed 3 more times: at the metal framework and bisque try-in and at the delivery of the final restoration. The prosthesis was cemented using zinc phosphate cement.

c. For Group III, the implant was placed into the osteotomy site atleast 0.5mm-1mm subcrestally
RFA values were recorded using OSTELL ISQ following implant placement. Defintive abutments were placed only if the ISQ values where more than 60 ISQ. Definitive abutment were not placed if any of the implants met one of the following exclusion criteria (1) insertion torque ≤25Ncm, and (2) an ISQ of ≤ 60. The flaps were then sutured keeping the margins of the abutment exposed (4-0 Vicryl Ethicon, Johnson & Johnson). Following surgery abutment level impression was made using irreversible hydrocolloid for fabrication of provisional restorartion. The cast was made using dental stone (type IV).The provisional restoration was fabricated using tooth coloured autopolymerising acrylic resin. The provisional restoration was then checked in the patient, adjusted, relined and kept at least 0.5mm-1mm in infraoclussion. The well finished and polished provisional restoration was cemented using temporary cement (TempoSil, Switzerland), 24-72 hours after surgery. Intraoral periapical radiographs (IOPAR) were taken after cementation of the temporary prosthesis to check for excess cement. An abutment level final impression was made three months following surgery using Vinyl Polysiloxane Addition silicone-Putty & Light body (3M ESPE). The cast was made in dental stone (type IV). Cement retained prosthesis was fabricated over it. The final prosthesis was then checked in patient's mouth and occlusion was adjusted using 30-40 microns articulation paper (Bausch, U.S.A.). The prosthesis was then cemented using zinc phosphate cement.

Evaluation of Crestal Bone: The crestal bone was evaluated around the definitive abutment after placement

of provisional/definitive restoration, at baseline (after loading) and 6 months using CBCT.
T0: After loading
T1: After 6 months of implant loading

The radiographic measurements were performed to assess the vertical crestal bone level around the implants in all the three groups on the scans stored as CBCT Dicom data using dedicated manufacturer software (OnDemand3D software, Cybermed Inc., U.S.A.). Vertical distance of bone from the implant abutment junction to the first contact of bone were recorded using a CBCT at baseline on the day of implant loading in group I and group II and after cementation of provisional restoration in group III. These measurements became the baseline levels to measure crestal bone level change, and after 6 months of loading.

Evaluation of Soft Tissue: The soft tissue evaluation was done after 6 months in all the three groups. The soft tissue evaluation included width of attached gingiva and probing pocket depth (PPD) measured at four points (mesio-buccal, mid-buccal, disto-buccal and mid-lingual) of each implant to be recorded.

1. Width of Attached Gingiva: This is the distance from the ginigival margin to MGJ measured with the help of UNC-15 at baseline and at 6 months.
2. Probing depth: This was measured with Plastic Periodontal Probe (Hu-Friedy) from the crest of gingival margin to base of pocket at baseline, and after 6 months. The value lower than the mid-point of two divisions were rounded off to a lower limit and values higher than the mid-points of two divisions were rounded off to a higher limit.

Statistical analysis: Statistical analysis was carried out using SPSS (statistical package for social sciences) software version 22.0. The data regarding the radiographic and clinical parameters i.e. pocket probing depth and width of attached gingiva were recorded at baseline, and 6 months was tabulated and subjected to statistical analyses. All the values were expressed in the form of mean and standard deviation. The statistical tests used to compare for intergroup comparison was One-way ANOVA test and for intragroup comparison was paired t-test. The level of significance (p value) was set at <0.05.

RESULTS

The mean crestal bone level change for group I at buccal, lingual, mesial and distal sites at the time of loading were 0.30±0.12mm, 0.30±0.13mm, 0.30±0.13mm and 0.30±0.12mm respectively and after 6 months -0.18±0.13mm, -0.19±0.13mm, -0.20±0.13mm and -0.20±0.13mm respectively, for group II the same was 0.32±0.13mm, -0.32±0.13mm, 0.32±0.12mm and 0.32±0.12mm respectively and after 6 months -0.17±0.08mm, -0.11±0.09mm, -0.13±0.07mm and -0.12±0.08mm respectively and for group III, the same was 0.31±0.04mm, 0.31±0.04mm, 0.31±0.04mm and 0.30±0.04mm respectively and after 6 months -0.12±0.08mm, -0.12±0.06mm, -0.08±0.05mm and -0.15±0.09mm respectively (table 1).

In group I the change in mean crestal bone level change from baseline to 6 months on buccal, lingual, mesial and distal sites were 0.47±0.14mm, 0.49±0.15mm, 0.49±0.14mm and 0.49±0.14mm respectively, in group II 0.50±0.09mm, 0.43±0.07mm, 0.45±0.08mm and 0.44±0.06mm respectively and in group III 0.43±0.08mm, 0.43±0.06mm, 0.39±0.06mm and 0.46±0.08mm respectively (table 2).

An intragroup comparison for crestal bone level was tabulated from baseline to 6 months for group I, group II and group III at buccal, lingual, mesial and distal sites (table 3).

Probing depth change from baseline to 6 months the mean ± SD for group I was -0.25±0.59 mm, for group II -0.35±0.24 mm and for group III -0.35±0.34 mm was observed. Statistically non-significant difference was observed (table 4).

Change in width of attached gingiva from baseline to 6 months the mean ± SD for group I was 0.45±0.15 mm, for group II 0.45±0.15 mm and for group III 0.40±0.21 mm was observed. Statistically non-significant difference was observed (table 5).

Table 1: Evaluation of vertical distance between the perpendicular projection of the peak point on the implant and the top of the bone crest at baseline and after 6 months in Group I, II, III.

Variables	T_0 (B)	T_0 (L)	T_0 (M)	T_0 (D)	T_1 (B)	T_1 (L)	T_1 (M)	T_1 (D)
Group I								
MEAN	0.30	0.30	0.30	0.30	-0.18	-0.19	-0.20	-0.20
S.D.	0.12	0.13	0.13	0.12	0.13	0.13	0.13	0.13
Group II								
MEAN	0.326	0.324	0.324	0.323	-0.176	-0.113	-0.13	-0.121
S.D.	0.130	0.129	0.127	0.127	0.086	0.092	0.078	0.089
Group III								
MEAN	0.312	0.31	0.311	0.308	-0.123	-0.119	-0.082	-0.15
S.D.	0.043	0.039	0.040	0.043	0.088	0.067	0.059	0.095

-ve: bone loss, +ve: bone overgrowth

Table 2: Evaluation of Intergroup Comparision Of Crestal Bone Levels Between Group I, Group II And Group III At Baseline, 6 Months And Change From Baseline To 6 Months.

TIME	LEVEL	GROUP I		GROUP II		GROUP III		p-VALUE
		MEAN	S.D.	MEAN	S.D.	MEAN	S.D.	
Baseline (At The Time Of Loading)	Buccal	.30	.12	.326	.130	.312	.043	0.809
	Lingual	.30	.13	.324	.129	.31	.039	0.880
	Mesial	.30	.13	.324	.127	.311	.040	0.789
	Distal	.30	.12	.323	.127	.308	.043	0.859
6 Months (After Loading)	Buccal	-.18	.13	-.176	.086	-.123	.088	0.393
	Lingual	-.19	.13	-.113	.092	-.119	.066	0.163
	Mesial	-.20	.13	-.13	.078	-.082	.059	0.03*
	Distal	-.20	.13	-.121	.089	-.15	.094	0.275
Change From Baseline To 6 Months	Buccal	.475	.144	.502	.095	.435	.088	0.418
	Lingual	.493	.154	.437	.075	.429	.067	0.357
	Mesial	.497	.140	.454	.085	.393	.062	0.087
	Distal	.495	.144	.444	.061	.458	.089	0.535

*statistically significant

Table 3: Intragroup comparison between base line - 6 months in bone level change at different sites for the three groups.

Time Interval Groups	SITE	At the base line		After 6 Months		P Value (Paired 't' test)
		MEAN	S.D.	MEAN	S.D.	
GROUP I	Buccal	.30	.12	-.18	.13	**.0001***
	Lingual	.30	.13	-.19	.13	**<0.01***
	Mesial	.30	.13	-.20	.13	**.0002***
	Distal	.30	.12	-.20	.13	**.0001***
GROUP II	Buccal	.326	.130	-.176	.086	**.0002***
	Lingual	.324	.129	-.113	.092	**.0001***
	Mesial	.324	.127	-.13	.078	**<0.01***
	Distal	.323	.127	-.121	.089	**<0.01***
GROUP III	Buccal	.312	.043	-.123	.088	**<0.01***
	Lingual	.31	.039	-.119	.066	**<0.01***
	Mesial	.311	.040	-.082	.059	**<0.01***
	Distal	.308	.043	-.15	.094	**<0.01***

*statistically significant

Table 4: Intergroup comparison of pocket probing depth between group i, group ii and group iii at baseline, 6 months and change from baseline to 6 months.

Time	Level	Group i		Group ii		Group iii		P-value
		Mean	S.d.	Mean	S.d.	Mean	S.d.	
Baseline (at the time of loading)	Pocket Probing Depth	1.10	.32	1.3	.350	1.75	.540	0.103
6 months (after loading)	Pocket Probing Depth	1.35	.41	1.65	.242	2.1	.510	0.094
Change from baseline to 6 months	Pocket Probing Depth	-.25	.589	-.35	.242	-.35	.337	0.826

Table 5: Intergroup Comparison of Width of Attached Gingiva Between Group I, Group Ii And Group Iii At Baseline, 6 Months And Change From Baseline To 6 Months.

Time	Level	Group i		Group ii		Group iii		P-value
		Mean	S.d.	Mean	S.d.	Mean	S.d.	
Baseline (at the time of loading)	Width of attached gingiva	1.80	.48	1.7	.422	1.8	.483	0.857
6 months (after loading)	Width of attached gingiva	1.35	.41	1.25	.354	1.4	.394	0.681
Change from baseline to 6 months	Width of attached gingiva	.45	.158	.45	.158	.4	.211	0.769

DISCUSSION

The present study was carried out to compare and evaluate the clinical outcome of single implants which underwent immediate non-occlusal loading, early loading, and delayed loading on crestal bone and soft tissue around single tooth implant. During the course of the study, wound healing was uneventful in all the three groups. All 30 implants remained stable and showed no signs of pain, suppuration or peri-implant infection throughout the study. For the measurement of the crestal bone, patients of all the three groups were subjected to CBCT and the radiographic measurements were performed to assess the vertical crestal bone level around the implants in group I, group II and group III on the CBCT Dicom data using dedicated manufacturer software (OnDemand3D software, Cybermed Inc., U.S.A.). The radiographic analyses were performed in accordance with the ALARA principles.[6]

In this study, in group I the mean crestal bone level at baseline on buccal, lingual, mesial and distal sites were 0.30±0.12mm, 0.30±0.13mm, 0.30±0.13mm and 0.30±0.12mm respectively, in group II 0.32±0.13mm, 0.32±0.13mm, 0.32±0.12mm and 0.32±0.12mm respectively and in group III 0.31±0.04mm, 0.31±0.04mm, 0.31±0.04mm and 0.30±0.04mm respectively. The statistical analysis shows non-significant difference with p-value more than 0.05. This result was in accordance with the the study done by Tomasso Grandi and coworkers in 2015.[7]

In this study, in group I the mean crestal bone level after 6 months on buccal, lingual, mesial and distal sites were -0.18±0.13mm, -0.19±0.13mm, -0.20±0.13mm and -0.20±0.13mm respectively, in group II -0.17±0.08mm, -0.11±0.92mm, -0.13±0.08mm and -0.12±0.09mm respectively and in group III -0.12±0.08mm, -0.12±0.06mm, -0.82±0.59mm and -0.15±0.94mm respectively. In group III at mesial side bone level was higher as compare to other sites and in between different groups. The statistical analysis for this site shows significant value i.e. p-value less than 0.05. Many possible etiologies of early implant bone loss includes any surgical trauma, occlusal overload, peri-implantitis may be the reason for the bone loss in this particular site.[8] The statistical analyses for other sites were non-significant difference with p-value more than 0.05 in between all the groups at 6 months.

Grandi et al[7] in his randomized controlled study with 1 year follow-up after loading showed no significant differences for marginal bone level change between immediately, early and conventionally loaded implants, except for slight significant difference in mandible.

In this study, in group I the change in mean crestal bone level from baseline to 6 months on buccal, lingual, mesial and distal sites were 0.47±0.14mm, 0.49±0.15mm, 0.49±0.14mm and 0.49±0.14mm respectively, in group II 0.50±0.09mm, 0.43±0.07mm, 0.45±0.08mm and 0.44±0.06mm respectively and in group III 0.43±0.08mm, 0.43±0.06mm, 0.39±0.06mm and 0.46±0.08mm respectively. The statistical analysis shows non-significant difference with p-value more than 0.05. The mean statistical difference of all the sites between group I, group II and group III are 0.42mm, 0.45mmand 0.49mm respectively. The difference in bone level change between group I and group III is 0.07 which is statistically non significant. This statistical result was in accordance with the study carried out by Francesco P et al in 2009[8], Degidi et al in 2011[9], and Jacob H et al in 2012[10]

Immediately loaded implants showed approximately 0.6 mm bone loss in the first 12-month period, and the same amount or more in the second year. In contrast, conventionally loaded implants exhibited almost the same loss as immediately loaded implants in the first year but smaller magnitudes of loss in the second year. Early-loaded implants showed the least amount of bone loss in the first and second 12-month periods.[12]

In the last, it can be said from the results of the current study that immediate loading of implant shows least crestal bone loss followed by early loading and then delayed loading of implant in 6 months follow-up. While if soft tissue is taken into consideration, there is no significant difference in pocket probing depth and width of attached gingiva between all the three groups. Additionally, the result of our study is seem to suggest that if implant abutment unit is not altered or modified over time, the favorable healing of hard and soft tissue were observed. Similar studies were carried out and concluded immediate loading may impose a greater risk for implant failure when compared to conventional loading, although the survival rates were very high for both the groups.[13,14]

CONCLUSION

The results are conclusive of the fact that the placement of definitive abutment at stage I surgery i.e. immediate loading results in a lesser vertical bone loss around implants followed by early loading and then by delayed loading i.e. by standard two stage procedure of implant placement after 6 months from the time of loading.

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