Research Article

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A Clinico-Radiographic Study Assessing the Soft and Hard Tissue Changes Around Immediate Implant

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ABSTRACT

Background: Microbial plaque is the main etiologic factor which causes disease in soft tissue around dental implants. The purpose of this study was to evaluate the bone level around implants using conventional radiography. They were evaluated for radiographic changes in the peri-implant crestal bone at intervals of 1, 4 and 6 months. The radiographic findings were correlated with clinical parameters of mobility, probing depth, bleeding, etc.

Materials and Methods: Seven patients with 12 dental implants were examined clinically for 6 months. Health indices of soft tissue including pocket depth, mobility, bleeding index, and gingival index were measured. Marginal crestal bone loss and peri-implant radiolucency were checked radiographically. The criteria both subjective and objective were used to evaluate the success of the implant process.

Results: The results of this study showed that the values of all clinical criteria under study had significant changes from baseline to 6 months. The vertical crestal bone loss on the mesial and distal side was within the normal range of bone loss given by Brånemark. There was no mobility and no peri-implant radiolucency around any of the implants.

Conclusion: Overall conclusion can be drawn from this study that the implants placed into fresh extraction sites will heal predictably and there are reductions in the number of surgical interventions and in the treatment time required.

Keywords: Crestal bone loss, dental implants, implant loading, osseointegration, peri-implantitis.

INTRODUCTION

The elusive dream of replacing missing teeth with artificial analogs has been part of dentistry for a thousand years. Conventional rehabilitation of partial or complete teeth loss has limitation for many people and such devices can cause eating difficulties, psychological problems and problem related to esthetics, retention and stability of prosthesis. Because of these problems, patients often suffer from decreased self confidence and develop psychological stress.

In 500 BC, The Etruscans, living in what is now modern Italy, replaced missing teeth with artificial teeth carved from the bones of oxen. Man has been searching for ways to replace missing teeth for thousands of years. The first evidence of the use of implants dates back to 600AD in the Mayan population, which was found in 1931 by Dr. and Mrs. Wilson Popenoe, an archeological team, who were excavating in Honduras.

Modern implant dentistry began in the early 19th century. Much experimentation was being done about what material would work best as the replacement tooth. Attempts were first made at

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implanting natural teeth from another person's mouth, but these implants suffered much infection and were rejected by the host. In 1809, Maggiolo fabricated a gold implant which was placed into fresh extraction sockets to which he attached a tooth after a certain healing period.

In 1941, Dr. Gustav Dahl of Sweden provided a retentive mechanism for jaws that were completely edentulous. This was the introduction of the subperiosteal implant.

In 1946, Strock designed a two-stage screw implant that was inserted without permucosal post.

In 1947, Manlio Formiggini of Italy developed an implant made of tantalum.

In 1947, Raphael Chercheve designed a double delinked spiral implant made of chrome-cobalt alloy.

Treatment of tooth loss in the anterior maxilla can involve difficult functional, esthetic and psychological problems, it is need for all with otherwise good dentition. The prosthetic treatments that have been used i.e. removable partial dentures, fixed partial dentures, or composite retained on lay partial dentures, comprises of complications, most of these treatments include the sacrifice of healthy tooth substance of the adjacent teeth. In order to overcome the problems associated with conventional prosthesis, implants came into existence. Throughout history many clinicians have attempted to use dental implants as a solution to complete and partial edentulism. Dental implant is an alloplastic material that is surgically inserted into hard and soft tissue which bears a superstructure for esthetics and function purposes. After loss of teeth, resorption of bone occurs both in width and height resulting into various esthetic and functional complications. The implant supported prosthesis can overcome these problems and has proved to be a significant addition to restorative dentistry[1].

The coincidental discovery by **Dr P-I Branemark** et [2]al of the tenacious affinity between living bone and titanium oxides, termed osseointegration, propelled dental sciences into a new age of reconstructive dentistry. The success of osseointegrated dental implants has revolutionized dentistry. The ability to permanently replace missing teeth with a function and appearance close to that of the natural dentition has never been greater. With more than 3 decades of evidence to support the clinical use of osseointegrated dental implants, it is possible to confidently resolve that implants are predictable and provide patients with long-term functional tooth replacement. This is a remarkable accomplishment, considering the many challenges and stresses that the oral environment and forces of mastication present for dental implants. The success of dental implants has transitioned dentistry into an entirely era compared to just 20 years ago.

Initial implant success and surgical protocols were established primarily in a completely edentulous patient population. The implants and the armamentarium were initially designed for the edentulous patients. Furthermore the patient desires that their lost teeth should be replaced as early as possible in order to continue their normal life without any psychological trauma of being edentulous and to reduce the appointments. Immediate implantation has provided implant dentistry the opportunity to achieve better and faster functional and esthetic results. The present study was therefore undertaken to evaluate the crestal changes around the implants in fresh extraction sites.

MATERIALS AND METHODS

The following standardized materials and equipment/armamentarium was used forthe purpose of study.

A SPI ASSORTED(ALPHA –BIO) Implant, was used. These are two piece implants made of commercially pure titanium. The available length of implant are 10 mm , 11.5 mm,13mm & 16 mm and diameter is 3.3 mm,3.75mm,4.2mm & 5.0mm.

B Surgical Armamentarium for Stage I and Stage II Surgery

1. Surgical Guide Drill: Conventional round bur was generally used to initiate the bone drilling.

2. Surgical Twisted Drills: Surgical twist drills of various diameters ranging from 2.0mm

2.8mm,3.2mm,3.65mm,4.3 mm was used in sequence to prepare the site .

3. Depth Gauge/Paralleling Pins: These gauges was used to obtain parallel preparation and to guide the direction of drilling preparation.

They were used to measure the depth of the surgical preparation for implant placement.

4. Phisiodispenser and Reduction handpiece with internal irrigation: used for bone drilling.

5. Hex Ratchet: Hex ratchet was used to engage the fixture insertion tools to screw the implant in its proper position.

6. Diagnostic & other surgical instrument ; Mirror, Probe, Tweezers, Tooth tissue holding forceps, needle holder and scissor was used .

METHOD

Patients were accepted into the study based on the following inclusion criteria: The patient must have agreed to inclusion into the study and Patients with tooth avulsion, excessive internal tooth resorption, endodontic failure without periapical pathology, root resorption after reimplantation, or as well as patients with crown loss because of extensive caries and at least 4 mm of bone apical to the extraction socket.

Exclusion criteria was as follows:

- No consent for inclusion into the study.
- Poor oral hygiene with no possibility of improvement.
- Chronic or acute systemic disorders (uncontrolled diabetes, hemorrhagic diatheses, general or autoimmunodeficiency).
- Poor interest and cooperation from the patient.
- Existence of non-treated generalized progressive periodontitis.
- Acute periapical pathology (tooth sensitive to percussion).
- Patient still growing (i.e., a child).
- Unrealistic expectations and psychological problems.

The baseline clinical examination consisted of a thorough medical and dental history, general and oral health status, assessment of future implant site. The available vertical, mesiodistal and labiolingual bone was determined by palpation and radiograph. Orthopentomograph and intraoral periapical radiographs were done to evaluate the volume of remaining bone .

In order to prevent infection all surgical procedures was performed under Strict aseptic conditions with greatest attention paid for preservation of implant. The dental unit, instrument tray, patient, operating assistants were covered with sterile drapes. Sterile surgeon gowns face masks, gloves and instruments were indispensable. The surgical armamentarium including the tool kit was autoclaved. The written and explained consent was taken from the patient for dental procedures and to participate in the study and to attend regular follow-up.

Preparation for surgery was made according to standard protocols. Following administration of local anesthesia (2% xylocaine with 1: 80,000 adrenaline full thickness mucoperiosteal flaps was raised with vertical releasing incisions where necessary. Teeth was carefully luxated with the help of periotome and removed with file or bur. Care was taken not to fracture the labial plate of bone and to retain gingival tissue attachment at the mesial and distal crestal bone. Extraction sockets were debrided with hand instruments to remove granulation tissue and prepared for implantation. The socket depth was measured with the probe and will be confirmed with the extracted root. The apical area was prepared for the placement of implant. Bone drilling was performed at revolutionary rates recommended by company i.e. 800-1500 rpm. To minimize trauma to bone, drilling was performed at low speeds, the area was profusely irrigated with saline solution, to avoid overheating and thus necrosis of alveolar bone and sharp instruments was used in progressively increasing diameters.

The depth and angulations was checked continuously with the help of depth gauge paralleling pins which has depth markings of 8 to 16 mm. After completion of implant socket preparation Titanium implants was then placed with the collar of the implant at the 3 mm below with the level of CEJ of adjacent tooth. All implants was placed with primary stability and were completely housed within the extraction socket. Flap incisions were closed in an attempt to achieve complete closure, applying simple interrupted and/or simple mattress lock sutures, using 3-0 silk suture material. Flaps

were released before wound closure to avoid tension where necessary. After completion of the suturing a large bolus of moist gauze was applied over the surgical site for compression. This helped in providing hemostasis and thus reducing the possibility of formation of hematoma.

Patients were then advised to follow standard post-operative instruction, which includes ice packs, soft high nutrient diet, post-operative medications which consisted of appropriate antibiotic combination (amoxicillin 500 mg,125 mg clauvanic acid 2 times daily) ,analgesic (ibuprofen 800 mg, every 4 to 6 hours as needed for pain) were prescribed. Patients were instructed not to brush the surgical site, but rather to rinse with 0.2% chlorhexidine gluconate. The patients were called for the post-operative checkup after 24 hours. The sutures were removed seven days after the surgery. The patients were then followed-up post-operatively at 1st day, 1st week, 4th week and up to 12th week and thereon any other required investigation was done whenever needed. After completion of the requisite period of 4 to 6 months for bone implant integration, the implant was exposed to remove the cover screw and for the placement of abutment head to carry out suitable prosthodontic rehabilitation. By using the stent, x-ray and clinical examination the implant were located. Under local anesthesia a small incision was made over the implant parallel to the alveolar ridge, the cover screw was exposed. By using the screw driver the cover screw was removed, area irrigated and the healing cap was placed in the implant and was slowly screwed till it made firm contact with the implant surface. After a lapse of two weeks the healing cap was removed and impression post is placed to take the impression. At 2nd stage surgery crestal bone level was determined with periapical radiograph perpendicular to the implant with mm measurements made from the occlusal surface of the implant.

Criteria for Implant Success

The following parameters was evaluated at the level of stage II surgery on the recall Visits to determine the success of the implant

(1) The individual implant was tested clinically by physical manipulation for mobility (Present/ absent).

(2) Peri-implant radiolucency was assessed on an undistorted radiograph (Present/absent)

(3) The probing depth was measured in millimetres with a periodontal∗ probe from the mesial, distal surface of the implant. For each implant, the mean probing depth was calculated.

(4) The inflammation of the gingival that surrounded the implant was assessed using the gingival index of **Loe** and **Silness**. The maximum degree of inflammation of the gingiva that surrounded the implant was assessed with the following criteria:

0- No inflammation

1- Mild inflammation with slight changes in color and surfaces, bleeding on probing.

2- Moderate inflammation, redness and hyperplasia of the gingiva, and bleeding on pressure.

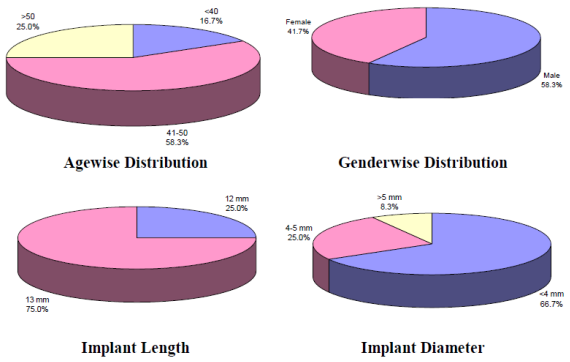
3- Severe inflammation, highly red and hyperplastic gingiva, tendency to spontaneously bleed and ulcerate.

RESULTS

A total of 12 implants were used. The demographic and implant characteristics of patients undergoing implantation has been shown in Table 1 below:

Table 1: Demographic and Implant Characteristics (n=12)

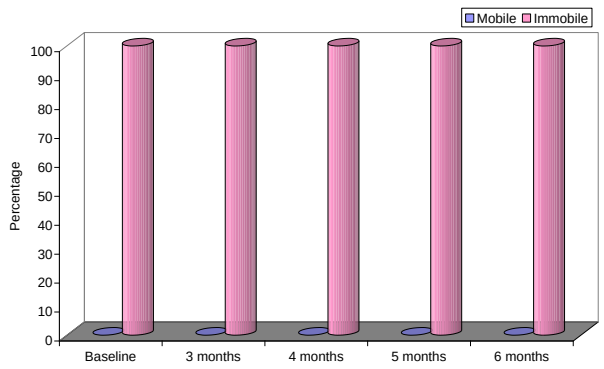
S.No.	Characteristic	Statistic
1.	Mean Age±SD (Range) in years	45.25±5.10 (38-52)
2.	Male:Female	7 (58.3%): 5 (41.7%)
3.	Mean Implant Length±SD (Range) in mm	12.63±0.68 (12-13)
4.	Mean Implant Dia±SD (Range) in mm	3.89±0.46 (3.30-5.00)



The age of patients ranged from 38 to 52 years. Mean age of patients was 42.25±5.10 years. There were 7 (58.3%) males and 5 (41.7%) females. Mean implant length was 12.63±0.68 mm (range 12 to 13 mm). Mean implant diameter was 3.89±0.46 mm (range 3.30 to 5.00 mm). The cases were followed up for soft tissue and hard tissue and soft tissue changes for a period upto 6 months. Among hard tissue changes, mobility, peri-implant radiolucency and bone loss and among soft tissue changes bleeding on probing, gingival index and probing depth were noticed.

Table 2: Mobility Status at various time intervals

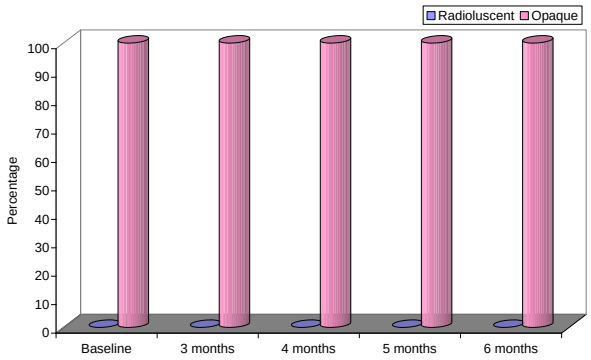
S.No.	Time interval	Mobile		Immobile		Significance of change from baseline	
		No.	%	No.	%	χ^2	p
1.	Baseline	0	0	12	100	–	–
2.	3 months	0	0	12	100	0	1
3.	4 months	0	0	12	100	0	1
4.	5 months	0	0	12	100	0	1
5.	6 months	0	0	12	100	0	1



None of the implants showed mobility at any time interval. No change in mobility status was observed throughout the study period.

Table 3: Peri-implant Radiolucency Status at various time intervals

S.No.	Time interval	Mobile		Immobile		Significance of change from baseline	
		No.	%	No.	%	χ^2	p
1.	Baseline	0	0	12	100	–	–
2.	3 months	0	0	12	100	0	1
3.	4 months	0	0	12	100	0	1
4.	5 months	0	0	12	100	0	1
5.	6 months	0	0	12	100	0	1



None of the subjects showed radioluscency at any time interval. No change in radioluscency status was observed throughout the study period.

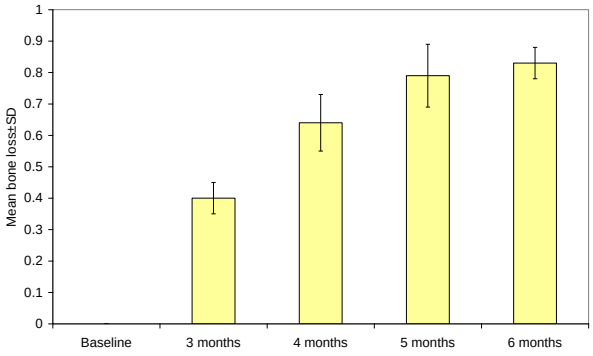
Bone Loss

Bone loss was measured at mesial and distal locations. Overall bone loss was measured as a mean of mesial and distal locations.

Table 4: Mean Bone loss at mesial location at different time intervals.

S.No.	Time interval	Bone loss at mesial location		Change from baseline		Significance of change from baseline (Wilcoxon signed rank test)	
		Mean	SD	Mean	SD	z	p
1.	Baseline	0	0				
2.	3	0.40	0.0	0.40	0.0	3.07	0.00

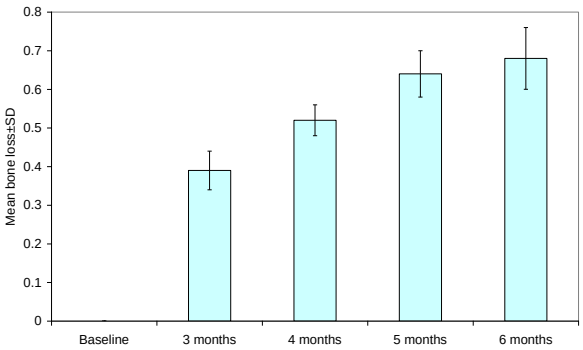
	months		5		5	1	2
3.	4 months	0.64	0.09	0.64	0.09	3.071	0.002
4.	5 months	0.79	0.10	0.79	0.10	3.070	0.002
5.	6 months	0.83	0.05	0.83	0.05	3.077	0.002



At baseline, no bone loss was observed at mesial location. The bone loss was observed to be increasing by the passage of time. Statistically, the difference from baseline was significant at all time intervals. Maximum bone loss was 0.83±0.05 mm at 6 months (p=0.002).

Table 5: Mean Bone loss at distal location at different time intervals

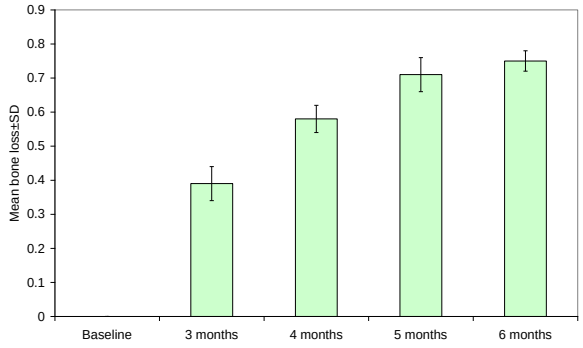
S.No.	Time interval	Bone loss at distal location		Change from baseline		Significance of change from baseline (Wilcoxon signed rank test)	
		Mean	SD	Mean	SD	z	p
1.	Baseline	0	0				
2.	3 months	0.39	0.05	0.39	0.05	3.078	0.002
3.	4 months	0.52	0.04	0.52	0.04	3.165	0.002
4.	5 months	0.64	0.06	0.64	0.06	3.077	0.002
5.	6 months	0.68	0.08	0.68	0.08	3.070	0.002



At baseline, no bone loss was observed at distal location. The bone loss was observed to be increasing by the passage of time. Statistically, the difference from baseline was significant at all time intervals. Maximum bone loss was 0.68±0.08 mm at 6 months (p=0.002).

Table 6: Mean Mean Bone loss at different time intervals

S.No.	Time interval	Mean Bone loss		Change from baseline		Significance of change from baseline (Wilcoxon signed rank test)	
		Mean	SD	Mean	SD	z	p
1.	Baseline	0	0				
2.	3 months	0.39	0.05	0.39	0.05	3.075	0.002
3.	4 months	0.58	0.04	0.58	0.04	3.089	0.002
4.	5 months	0.71	0.05	0.71	0.05	3.070	0.002
5.	6 months	0.75	0.03	0.75	0.03	3.075	0.002



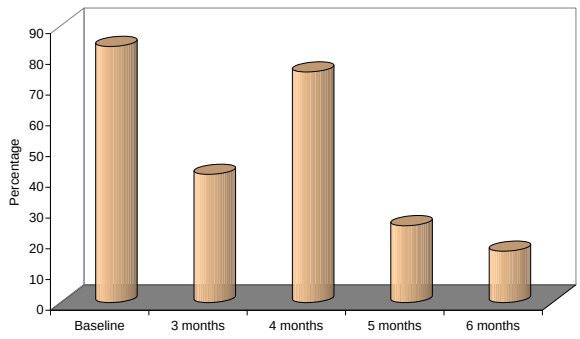
At baseline, no bone loss was observed. The bone loss was observed to be increasing by the passage of time. Statistically, the difference from baseline was significant at all time intervals. Maximum bone loss was 0.75±0.03 mm at 6 months (p=0.002).

Soft Tissue Changes

Table 7: BOP Status at various time intervals.

S.No.	Time interval	No BOP		BOP		Significance of change from baseline	
		No.	%	No.	%	χ^2	p*
1.	Baseline	2	16.7	10	83.3	–	–
2.	3 months	7	58.3	5	41.7	4.444	0.089
3.	4 months	3	25	9	75	0.253	1.000
4.	5 months	9	75	3	25	8.224	0.012
5.	6 months	10	83.3	2	16.7	10.667	0.003

*Fisher exact test

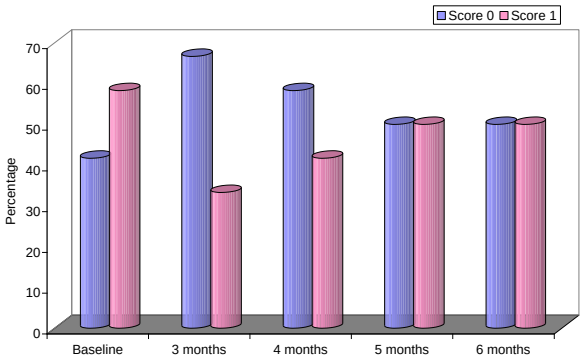


At baseline, a total of 10 (83.3%) cases showed bleeding on probing. The incidence of BOP decreased with passage of time. From 5 months onwards a significant change in BOP status was observed (p=0.012). At 6 months only 2 (16.7%) patients showed BOP, thereby showing a significant change from baseline (p=0.003).

Table 8: Gingival Status at various time intervals.

S.No.	Time interval	Score 0		Score 1		Significance of change from baseline (Wilcoxon Signed rank test)	
		No.	%	No.	%	z	p*
1.	Baseline	5	41.7	7	58.3	–	–
2.	3 months	8	66.7	4	33.3	1.732	0.083
3.	4 months	7	58.3	5	41.7	0.632	0.527
4.	5 months	6	50.0	6	50.0	0.447	0.655
5.	6 months	6	50.0	6	50.0	1.000	0.317

*Fisher exact test



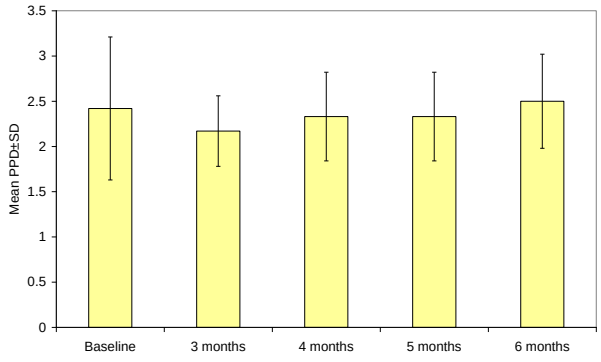
At baseline, majority of patients had GI of 1. At 3 months only 4 (33.3%) patients had GI of 1. Statistically, difference from baseline was not significant statistically. At 4 months, 5 (41.7%) patients had score 1, once again not showing a significant difference from baseline (p=0.527). At 5 and 6 months, half the patients had GI score of 1, but the difference from baseline was not significant statistically at either of the two intervals (p=0.655).

Probing Pocket Depth

Probing pocket depth was measured at mesial, distal, buccal and lingual locations respectively.

Table 9: Mean Probing Pocket Depth at mesial location at different time intervals.

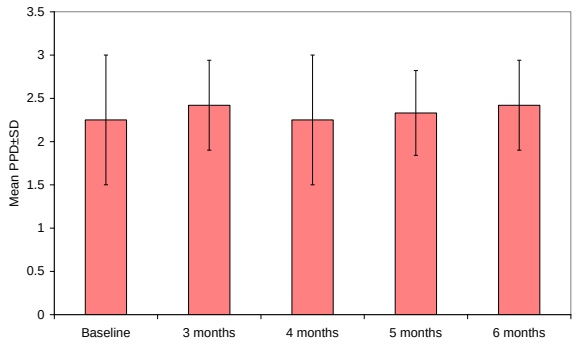
S.No.	Time interval	Probing Pocket Depth		Change from baseline		Significance of change from baseline (Wilcoxon signed rank test)	
		Mean	SD	Mean	SD	Z	p
1.	Baseline	2.42	0.79				
2.	3 months	2.17	0.39	0.25	0.75	1.134	0.257
3.	4 months	2.33	0.49	0.08	1.08	0.176	0.860
4.	5 months	2.33	0.49	0.08	0.90	0.333	0.739
5.	6 months	2.50	0.52	0.08	1.08	0.351	0.725



Mean PPD ranged from 2.17±0.39 to 2.50±0.52 mm at different time intervals. None of the changes from baseline were found to be significant statistically (p>0.05).

Table 10: Mean Probing Pocket Depth at distal location at different time intervals.

S.No.	Time interval	Probing Pocket Depth		Change from baseline		Significance of change from baseline (Wilcoxon signed rank test)	
		Mean	SD	Mean	SD	Z	P
1.	Baseline	2.25	0.75				
2.	3 months	2.42	0.52	0.17	0.84	0.707	0.480
3.	4 months	2.25	0.75	0	0	0	1
4.	5 months	2.33	0.49	0.08	1.00	0.414	0.679
5.	6 months	2.42	0.52	0.17	1.03	0.649	0.516

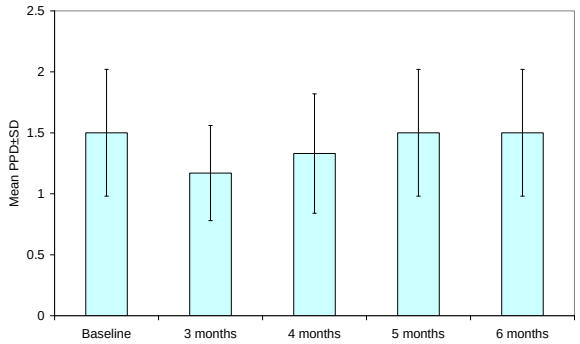


Mean PPD ranged from 2.25±0.75 (baseline) to 2.42±0.52 mm (3 months and 6 months intervals) at different time intervals. None of the changes from baseline were found to be significant statistically (p>0.05).

Table 11: Mean Probing Pocket Depth at buccal location at different time intervals

S.No.	Time interval	Probing Pocket Depth		Change from baseline		Significance of change from baseline (Wilcoxon signed rank test)	
		Mean	SD	Mean	SD	Z	P
1.	Baseline	1.50	0.52				
2.	3 months	1.17	0.39	0.33	0.65	1.633	0.102
3.	4 months	1.33	0.49	0.17	0.58	1.000	0.317
4.	5 month	1.50	0.52	0	0	0	1

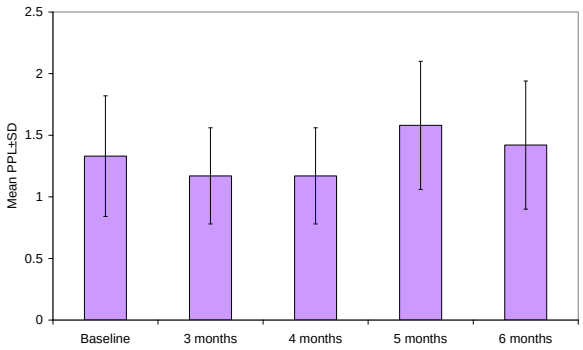
	s						
5.	6 months	1.50	0.52	0	0	0	1



Mean PPB ranged from 1.50±0.52 (baseline, 5 months and 6 months) to 1.17±0.39 mm (3 months) at different time intervals. None of the changes from baseline were found to be significant statistically (p>0.05).

Table 12: Mean Probing Pocket Depth at lingual location at different time intervals

S.No.	Time interval	Probing Pocket Depth		Change from baseline		Significance of change from baseline (Wilcoxon signed rank test)	
		Mean	SD	Mean	SD	Z	P
1.	Baseline	1.33	0.49				
2.	3 months	1.17	0.39	0.17	0.72	0.816	0.414
3.	4 months	1.17	0.39	0.17	0.39	1.414	0.157
4.	5 months	1.58	0.52	0.25	0.62	1.342	0.180
5.	6 months	1.42	0.52	0.08	0.67	0.447	0.655



Mean PPL ranged from 1.17±0.39 (3 months and 4 months) to 1.58±0.52 mm (5 months) at different time intervals. None of the changes from baseline were found to be significant statistically (p>0.05).

(7) Marginal bone loss (in mm) of each implant will be assessed by periapical radiograph examination. The marginal bone level of each implant will be from the standardized periapical radiographs and will be measured as the distance in 0.1 mm increments from the implant shoulder to the most coronal point where the marginal bone met the implant. From those measurements the mean horizontal bone reduction will be assessed for each implant.

DISCUSSION

Dental implant therapy is one of the pioneering treatment modality for replacement of missing teeth. This has gained popularity and acceptance among the patients, as well as among dentists. It is understandable that, patients are more satisfied with implant supported prosthetic rehabilitation in terms of comfort, stability and esthetics compared to conventional prosthesis. Patients usually consider implant supported prosthesis as an integral part of their body that clearly enhanced their daily lives.

Osseointegration represents a direct connection between bone and implant without soft tissue layer. Researchers have demonstrated that, during the first few weeks after implant insertion there were no signs of proper osseointegration. Three months after implant insertion there was relatively higher proportion of bone to implant direct contact and a clearly increased resistance to torque removal. This indicates osseointegration may be a time related phenomenon .[3]

Much of the experimental and clinical data published by the authors [4] have provided the dental profession with safe methods and predictable outcomes of implant dentistry. Their traditional protocol recommends a 12 month healing period between tooth extraction and placement of implant. Because tooth retention in the dentulous patient is bone dependent, implant placement in the completely or partially edentulous patient is also bone dependent. Bone loss after tooth extraction remains an important issue in dentistry.

Anatomically, bone resorption occurs both buccolingually and apicocoronally, and the first 6 months post extraction are critical, carrying the highest rate of bone resorption in either direction. Resorption of the buccal wall of the extraction socket may lead to significant disadvantages, especially in the anterior part of the maxilla. A buccal concavity in the alveolar process or an implant that is placed more lingually than the adjacent teeth can result in poor esthetics. In addition, with increasing resorption, the incisive canal is positioned relatively farther buccally, which forces the surgeon to place implants replacing the central incisors too close to the laterals. Eventually, the alveolar process may become too narrow to allow implant placement [5].

To fulfill both functional and esthetic requirements for implant placement in the lingually resorbed ridge, it may be necessary to plan implant placement in concert with ridge expansion procedures, ridge-lap prosthesis, or the use of angulated abutments.

Esthetic appearance may still be compromised in the presence of less than ideal implant placement and soft tissue anatomy. Bone augmentation procedures at the time of tooth extraction contribute to preservation of ridge width, ridge height, and soft tissue dimensions. This approach requires an interim healing period with a secondary surgical procedure for implant placement [6].

To reduce the problems resulting from this loss of bone, dental implants have been placed into fresh extraction sockets.]Dental implantation has provided treatment planning opportunities that have revolutionized dentistry and immediate implant insertion after extraction is one such realistic solution, because bone loss around osseointegrated implants is minimal.

Rationale of immediate implants:

The installation of implants immediately following tooth extraction offers obvious advantages over alternative treatment modalities. Usually a healing period of 9-12 months after tooth extraction is observed. However, during this time, extensive bone resorption , especially of the buccal plate, is often observed, resulting in a collapse of the bone width of the alveolar ridge.

In cases with too narrow alveolar ridges, the treatment of choice would consist of guided tissue regeneration or ridge enlargement and secondary placement of implants into the newly created bone. This treatment modality, however, would demand a healing period of 6-8 months for bone regeneration and 3-6 months for osseointegration before a prosthetic suprastructure can be inserted, and hence imposes unnecessary discomfort to the patient for prolonged periods of time[5]. Placement of an implant directly into a prepared extraction socket at the time of extraction has several advantages that have the potential to improve patient acceptance of the procedure.

The advantages are elimination of the waiting period for socket ossification, fewer surgical sessions required, shortened edentulous time period, reduced overall cost, preservation of alveolar bone height and width, decreased operatory time with less trauma to the tissues and less discomfort to the patient, by using the extraction site that follows the natural long axis of the tooth, easier implant orientation and better prosthodontic rehabilitation can be achieved, crestal bone loss can be minimized while still maintaining the implant in the central region of the alveolar crest, through the use of a longer implant, the long-term prognosis can be increased and greater support can be obtained for the guided tissue membrane in cases of bone implant deficiency to maintain or enhance the osseous width and height better[7]. Several authors reported placement of implants into extraction sockets [8,9,10].

Indications for immediate placement of implants are where extraction is advised in case of failed endodontically treated teeth, teeth with advanced

periodontal disease root fractures and advanced caries beneath the gingival margin. It utilizes the potential new bone formation in the extraction socket to obtain osseointegration. The entire concept of immediate implants depends heavily on maintaining integrity of buccal cortical plates. Implants immediately placed into extraction sockets have predictable healing in a submerged environment.

Preoperative radiographic evaluation helps to determine the height and width of the bone available for implant insertion. Ideally the bone width should allow complete coverage of all the implant threads on both the buccal and lingual sites. Available bone height must be estimated from that part of the alveolar bone in which a sufficient bone width is found to a site specific anatomic border in the vertical direction. Radiographically, lack of osseointegration and the lack of stability of the implant are indicated by radiolucent line along the implant surface.

In our study we have made an effort to determine the survival rate of alpha- bio SPI ® dental implants placed immediately into fresh extraction sockets in 11 patients with a mean age of 45.25±5.10 years in the age group of 38-52 yrs. Our results of the study may be interpreted as follows. Colonization with microorganisms lead to infection in wound areas and to prevent this, patients were placed on systemic antibiotics (Cap. Amoxycillin 500 mg,clavunic acid 125mg) for 5 days and also on oral rinse twice daily with chlorhexidine gluconate solution for atleast 3 weeks after placement of implants. Indicated teeth were extracted without damaging the buccal cortical plate.

If surgery is adequately performed and proper preoperative and post-operative care is provided, immediate implants can be placed successfully into chronically infected sites. It should be emphasized that the cause of the infection must be the diseased tooth – be it periodontally or endodontically involved, or the result of fracture and that during surgical treatment the cause of the infection, i.e. the tooth, is removed. In addition the patient must be placed on antibiotics before the procedure and maintained on the medication for 10 days, so that bacterial contamination is eliminated or reduced and the host cells can deal with the residual situation. Another important part of the surgical treatment is the complete, thorough debridement and rinsing of the alveolus[11].

During preparation of the implant bed, care was taken to prevent damage to buccal cortical plate by angulating the drill towards the palatal plate. In immediate implant cases even though drilling is minimal, care was taken to minimize the thermal damage by using cool saline irrigation. Selected implants were placed into the prepared socket. After implant placement, in all cases primary stability was achieved. Certain implants are designed for immediate placement. These are usually **root shaped and screw type implants.** In our study we have used alfe bio dental implants which are **screw shaped and root form implants.**

When implants are placed into extraction sockets, a partial incongruency between the outer surface of the implant and the bony walls of the socket often results in a bone deficit in the peri-implant area. This space is known as **jumping distance or critical space.**[12] In the anterior maxilla, during immediate implants wide diameter implants are preferred than the standard diameter implants[13]. In our study out of 12 implants, 1 implants were wide diameter implants (5 mm wide) . these wide use of these wide diameter implants helped in obliterating the jumping distance.

In our case study out of 12 cases none of cases showed existence of space between implant and socket wall at the coronal ends. In addition to a natural looking restoration, single anterior implant esthetics is also governed by the presence of harmonious gingival architecture. Unfortunately, facial gingival recession is a common occurrence with implant restorations, and approximately 1 mm of tissue loss can be expected upto 1 year following definitive prosthesis placement[64]. The results of our study seemed to support the efficacy of this procedure in maintaining the gingival architecture of the failing tooth. Complete soft tissue healing, with minimal discomfort to the patient, usually occurs in 5 weeks. Clinical osseointegration is achieved with minimal gingival recession and papillae preservation. Complete bone healing was achieved with papilla preservation and minimal gingival recession.

Gingival Index:

Bleeding occurring following the application of a probe reveals a presence of an inflammatory lesion around the teeth. Although it may have a limited value for progression of periodontal disease, its absence indicates periodontal stability. With regard to mucosa around implant, diagnostic accuracy of bleeding on probing appears to be better. In case of a peri-implant sites absence of bleeding on probing is considered healthy and stable[15].

At baseline, majority of patients(60%) had GI of 1. At 3 months only 4 (33.3%) patients had GI of 1. Difference from baseline was not statistically significant. At 4 months, 5 (41.7%) patients had score 1, once again not showing a significant difference from baseline (p=0.527). At 5 and 6 months, half the patients had GI score of 1, but the difference from baseline was not significant statistically at either of the two intervals (p=0.655),which is similar to the earlier studies conducted by German Gomez-Roman[16]& Rismanchian[17].

Probing depth-

In a study by G.R. Bauman,probing proved to be the most accurate means of detecting peri-implant destruction. He suggested using radiographic & probing measurement together to facilitate the accuracy & variability of comprehensive peri-implant assessment[18].The principal resistance to probe penetration is probably due to the fibers associated with the periosteum of the alveolar crest or the crest itself. This relationship should allow probing measurement that closely approximate the actual bone levels[18].

Investigators have debated the diagnostic & prognostic value of crevicular probing depth.Because the epithelial attachment adheres only weakly ,some would consider probing to be invasive ,allowing penetration of the probe close to the bony crest.However ,probing does provide a means for assessing clinical attachment loss over time ,which may be an indicator of a failing implant.Probing should be avoidedduring the first 3 months after connection so that progressive healing is not disturbed.[18]

Probing technique should include measurement of attachment levels relative to a fixed reference point on the abutment or prosthesis.Probing depth alone may not accurately reflect peri-implant bone loss (attachment loss)if a concomitant gingival recession parallels the bone resorption. The location of the fixed reference point should be recorded on the patient chart. It is recommended that sulcular probing around metal implantsbe accomplished with available periodontal probes of similar metal or plastic. This will prevent scratching and electrochemical interaction between dissimilar metals,which could be detrimental to the biocompactibility of the implant.[18]**So** , the probing technique in the present syudy was in accordance with the above mentioned method. We used a plastic probe for probing.The implant shoulder was taken as the reference point & the probe was gently directed parallel to the long axis of the implant ,between the mucosa.The probing depth was measured from the gingival margin to the apical advancement of the probe's tip on the four aspect around each implant (to the nearest 0.5 mm) (mesial,distal,buccal,lingual).The probing depth were measured at baseline ,3rd month,4th month,5th month ,6th month and the analysis was done. Probing pocket depth was measured at mesial, distal, buccal and lingual locations respectively.

Table 9 shows probing pocket depth at mesial location surface at different time intervals: Mean PPD ranged from 2.17±0.39 to 2.50±0.52 mm at different time intervals(baseline,3rd month,4th month 5th month, 6th month). None of the changes from baseline were found to be significant statistically (p>0.05).

Table 10 shows probing pocket depth at distal location surface at different time intervals Mean PPD ranged from 2.25±0.75 (baseline) to 2.42±0.52 mm (3 months and 6 months intervals) at different time intervals. None of the changes from baseline were found to be significant statistically (p>0.05).

Table 11 shows probing pocket depth at buccal location surface at different time intervals Mean PPB ranged from 1.50±0.52 (baseline, 5 months and 6 months) to 1.17±0.39 mm (3 months) at different time intervals. None of the changes from baseline were found to be significant statistically (p>0.05).

Table 12 shows probing pocket depth at lingual location surface at different time intervals Mean PPL ranged from 1.17±0.39 (3 months and 4 months) to 1.58±0.52 mm (5 months) at different

time intervals. None of the changes from baseline were found to be significant statistically (p>0.05).Giovanni E.Salvi[19] in his report indicated that probing depth of approximately 3 mm can be detected around successful implants. In our study although the value of probing depth have increased,the value stayed within physiologic levels of 3 mm throught the entire observation period. Same result is also observed in another study[67] in which the probing pocket depth increased with time, at time t he time delivery of prosthesis it was 2.46mm,after one year it reached to 2.76mm & 2.90 mm in second year.

Assessment of bleeding on probing

Bleeding occurring following the application of a probe reveals the presence of an inflammatory lesion around teeth. Although it mayhave a limited value for progression of periodontal disease,its absence indicated periodontal stability[20].With regard to mucosa around the implant ,diagnostic accuracy of bleeding on probing appears to be a better predictor. In case of a peri-implant sites absence of bleeding on probing is considered healthy & stable[21].Thus periodic recording of this parameter with light probing force(0.2-0.25 N) can be recommended to measure peri implant soft tissue conditions[22]. Therefore , in our study BOP was measured using the Mombelli et.al. index[23].

BOP is one of the periodontal parameter used to evaluate the presence of an inflammatory process at the base of a periodontal pocket.It should not be confused with the sulcus bleeding index,which is meant to evaluate the condition of the superficial periodontium.[24]

Table 7 shows the BOP status at different time intervals

At baseline, a total of 10 (83.3%) cases showed bleeding on probing. The incidence of BOP decreased with passage of time. From 5 months onwards a significant change in BOP status was observed (p=0.012). At 6 months only 2 (16.7%) patients showed BOP, thereby showing a significant change from baseline (p=0.003). This can attributed to the fact that after loading the implant hygiene could not be well maintained in the subgingival regions but later when the repeated reinforcement of oral hygiene measures were given to the patient the inflammation subsided.Same result were observed in study conducted by Blanes et al[25] & Lekhlom[26].

Assessment of Mobility

Primary stability at the time of implant placement has been recoginzed as an important prerequisite for the achievement of osseointegration[r].The establishment & maintenance of direct contact at the bone implant interface are requirement for long term implant success.Implant mobility is an indication of lack of osseointegration.Even if peri-implant disease has progressed relatively far,implant may still appear immobile because of some residual direct bone to implant contact. The recording of implant mobility may be a very specific but not at all sensitive clinical parameter in detecting loss of osseointegration.This parameter more likely detects the final stage of osseo-integration and ,therefore,represents a late implant loss. Furthermore,pain or discofort may be associated with increased implant mobility & could be one of the first sign indicating a failing sign[26].

Thus ,in our study mobility assessment was considered to evaluate the success of our implants. The clinical mobility scale given by Misch[26] was use for scoring.The result was depicted in table 2. None of the implants showed mobility at any time interval. No change in mobility status was observed throughout the study period. This is in accordance to the studies[27,28] conducted by researcher.

However some studies[29] have recorded mobility being observed. In a study[30] one implant (out of 32 implants) was lost and the concerned patient was a heavy smoker. In another study[31], wherein 5% of implants were lost, mobility was noted in 5% of cases at second stage surgery.

Assessment of peri-implant radiolucency

In the present study there was no evidence of peri-implant radiolucency at any given interval time. The result was depicted in table 3. Dale E Smith (1989)[32] also proposed that there should be no peri-implant radiolucency on undistorted radiograph for success of implant. Sullivan DY. et al. (1984)[33]quoted that clinical symptoms such as spontaneous pain bleeding on probing and per implant infection are signs of failing implant during the maintenance period.

Radiographic Assessment of Mesial & Distal bone loss

Long term preservation of crestal bone height around osseointegrated implants is often used as primary success criterion for different implant system.

Originally , a mean crestal bone loss ≥1.5 mm during the first year after loading & ≥0.2 mm/year thereafter had been proposed as one of major success criteria[34].

Conventional radiography represents a widely accepted technique for long term evaluation of marginal bone changes at inter-proximal sites of osseointegrated implants. In general,the long –cone paralleling technique supported by positioning device is used[85].The same technique of evaluation has been used in our study.

The result of our study are depicited in table 4,5&6. Bone loss was measured at mesial and distal locations. Overall bone loss was measured as a mean of mesial and distal locations. Table 4 shows mean bone loss at mesial location at different time intervals.

At baseline, no bone loss was observed at mesial location. The bone loss was observed to be increasing by the passage of time. Statistically, the difference from baseline was significant at all time intervals. Maximum bone loss was 0.83±0.05 mm at 6 months (p=0.002).

Table 5 shows mean bone loss at distal location at different time intervals. At baseline, no bone loss was observed at distal location. The bone loss was observed to be increasing by the passage of time. Statistically, the difference from baseline was significant at all time intervals. Maximum bone loss was 0.68±0.08 mm at 6 months (p=0.002).

Table 6 shows mean mean bone loss at different time intervals. At baseline, no bone loss was observed. The bone loss was observed to be increasing by the passage of time. Statistically, the difference from baseline was significant at all time intervals. Maximum bone loss was 0.75±0.03 mm at 6 months (p=0.002).

In a study conducted by **Adell et al[36,37] & lekholm et al[38],** approximately 1mm marginal bone loss may be expected during the first year post insertion of enosseous implants.

In another study conducted **by Joseph Y.K.Khan[39]** ,shown bone loss of .26 mm mesially,& .22 mm distally after 1 year.

Crestal bone changes were not dependent on the surgical technique. It has been observed that dentascan provides an outstanding view of jaws with or without implant and unravel the finding that intra-oral peri-apical radiograph does not, but due to cost factor it was not carried out in all patients. However it has a better edge enhancement for the assessment of marginal bone loss and peri-implant radiolucency.

Implant loading was done after 3 to 4 months in all the cases and it was observed that there was no change in stability, peri-implant radiolucency and marginal bone loss of the implant.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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