Immediate Placement of Endosseous Implant in Esthetic Zone in Extraction Socket

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Abstract

The maintenance of existing anatomical structures is easier than their recreation. Hence in this study it has been advocated to perform provisionalization with a non-functional prosthesis immediately following stage-1 surgery in immediate tooth replacement. Based on the results of this 6 months study immediate placement and provisionalization of anterior, single, rough surface, threaded implants can optimize peri-implant esthetics by maintaining the existing hard and soft tissue architecture of the tooth indicated for extraction. More long term prospective and controlled clinical studies with a large sample and rough coated and threaded implants are mandatory to document the effective outcome of this treatment technique.

Keywords: Endosseous implant, aesthetic zone, peri-implant space, bone levels, soft tissue levels.

Introduction

In order to overcome the disadvantages associated with the conventional techniques like fixed partial dentures and removable partial dentures the concept of dental implants has been introduced. This implant concept has been developed over a period of time with the introduction of modifications in implant design and surface treatments. But there are certain disadvantages associated with this treatment protocol like extended treatment period, need for removable denture during initial healing period, need for multiple surgeries, post extraction resorption of bone, loss of soft tissue and compromised aesthetics, therefore in order to overcome the problems associated with this conventional implant treatment protocol the concept of immediate placement and provisionalization of implants has been introduced.The aim of this present study is to

determine the versatility of an endosseous implant placed immediately after the extraction of the tooth.

Methodology

This study was conducted on 10 patients with age group ranging from 18 – 50 years who reported to the department of oral and maxillofacial surgery presenting with a single anterior tooth affected by trauma, caries, root resorption, endodontic failure and with the presence of adjacent dentition. The inclusion criteria were adequate and harmonious gingival architecture with adjacent dentition, good oral hygiene and adequate amount of bone to accommodate an implant of minimum dimensions of 3.3mm diameter and 13mm length without the necessity of bone graft. The exclusion criteria are patients with the presence of active infection around the tooth, any medical history that could complicate the outcome of this study, any deleterious habits, loss of labial bony plate following tooth removal. After tooth extraction the socket was irrigated with normal saline. An informed consent was taken from all the patients.

Materials And Implant Placement

Conical dental implants with internal hex connection with diameters of 3.8mm, 4.3mm and lengths of 11mm,13mm,14mm and their corresponding prosthetic components were placed. The implant placement was performed in line with the manufacturer's instructions for use of the implant system and the treatment was done according to the study centres standard and the patients indications. After the atraumatic extraction of the tooth implants were placed in the extraction socket after preparation of the osteotomy site and the implant is covered with healing screw after 2 weeks of implant placement provisionalization is done by fixing the abutment to the implant. Patients were scheduled to follow ups at first, third and six months post provisionalization for the assessment of study parameters. Regular oral maintenance care was performed during the entire study period, follow up x-rays taken for all the patients, And the patients filed a questionnaire asking for their satisfaction regarding comfort, aesthetic, chewing ability with their restoration at each visit.

Figure 1

Study Outcomes

The primary outcome was to assess survival of the implants six months post loading. Secondary outcomes were changes of bone level over time, evaluation of peri implant soft tissue and evaluation of patients related outcome measures.

Assessments

Changes in soft tissue levels were assessed measuring the mid facial gingival level, mesial papilla level and distal papilla level from the standard reference line from the study models at each visit during the study period.

Reference line: the line drawn connecting facial gingival level of the 2 adjacent teeth is taken as the reference line.

Changes in mesial marginal bone level and distil marginal bone level were calculated measuring mesial and distil marginal bone levels from reference points taken from the IOPA radiographs at each visit during the study period

Reference point: Is the apical corner of the implant shoulder. IOPA radio graphs are standardized through long cone technique with the use of IOPA grid.

Statistical Analysis

MINITAB-14 was used to administer the statistical tests and to draw the graphic representations. ANOVA test is conducted to know the significant mean difference

between the timing points of bone levels and gingival levels. Inorder to know the multiple comparisons between each and every pair of timing points. SCHEFEES POST HOC test is conducted. Time of loading was the study base line as per protocol and the statistical unit was the dental implant.

Results

The study was started with 10 patients and ten implants at the end of the study (6 months post loading) 10 patients with 10 implants were considered for analysis. Changes in facial gingival level, mesial papilla levels , distil papilla levels are evaluated using study models for a follow up period of 6 months at 1st ,3rd and 6 months intervals. Changes in mesial marginal bone levels and distil marginal bone levels are evaluated using IOPA radiographs taken with paralleling technique and with IOPA grid , which were taken at the time of implant placement and provisionalization, 1st month ,3rd month and 6th month post operatively. The soft tissue parameters and hard tissue parameters have been described in detail in tables 1-10 and graphs 1-5.

Table 1 : Evaluation of Mesial Marginal Bone levels

Factor(I)	Factor(J)	Mean Difference (I-J)	P-Value
First day	1st Month	.1814	.843
	3rd Month	.2929	.551
	6th Month	.4071	.271
1st Month	First day	-.1814	.843
	3rd Month	.1114	.957
	6th Month	.2257	.736
3rd Month	First day	-.2929	.551
	1st Month	-.1114	.957
	6th Month	.1143	.954
6th Month	First day	-.4071	.271
	1st Month	-.2257	.736
	3rd Month	-.1143	.954

To know the significant difference between the four timing points ANOVA test is conducted. The above table depicts that there is no significant difference between the timing points at 5% level of significance for the mesial marginal bone levels.

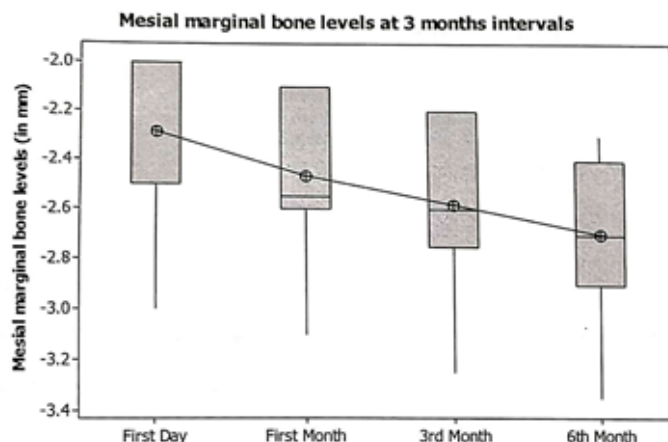The graphic representation is shown below.

Graph 1

Mesial marginal bone levels at 3 months intervals

Table 2: Multiple Comparisons of Mesial marginal bone levels:-

Factor(I)	Factor(J)	Mean Difference (I-J)	P-Value
First day	1st Month	.1814	.843
	3rd Month	.2929	.551
	6th Month	.4071	.271
1st Month	First day	-.1814	.843
	3rd Month	.1114	.957
	6th Month	.2257	.736
3rd Month	First day	-.2929	.551
	1st Month	-.1114	.957
	6th Month	.1143	.954
6th Month	First day	-.4071	.271
	1st Month	-.2257	.736
	3rd Month	-.1143	.954

Dependent variable: Mesial Marginal bone levels Scheffe.

To know the multiple comparisons between each pair of timing points Scheffe's Post hoc test is conducted. The above table demonstrates that there is no significant difference between each and every pair of the timing points.

Table 3: **Evaluation of Distal Marginal Bone Level**

Distal marginal bone level	Mean	S.D	F-value	P-value	Decision
First Day	-1.7857	0.3934	1.16	0.345	Not Significant
1st Month	-1.9171	0.3961			
3rd Month	-2.0429	0.4363			
6th Month	-2.1786	0.4261			

The above table illustrates that there is no significant difference between the timing points at 5% level of significance for the distal marginal bone levels. The graphical representation shown here.
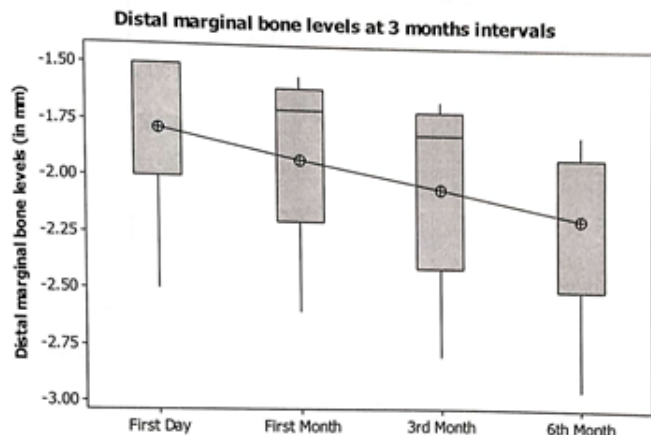
Graph 2

Graph 3

Distal marginal bone levels at 3 months intervals

Mid-Facial Gingival levels at 3 months intervals

Table 4: Multiple Comparisons of Distal Marginal Bone Levels

Dependent variable : Distal Marginal Bone Levels Seheffe

(I) FACTOR	(J) FACTOR	Mean Difference (I-J)	P - Value
1St Day	1st Month	.1314	.949
	3rd Month	.2571	.719
	6th Month	.3929	.387
1st Month	1st Day	-.1314	.949
	3rd Month	.1257	.955
	6th Month	.2614	.708
3rd Month	1st Day	-.2571	.719
	3rd Month	.-1257	.955
	6th Month	.1357	.944
6th Month	1st Day	-.3929	.387
	3rd Month	-.2614	.708
	6th Month	-.1357	.944

The above table revels that there is no significant difference between each and every pair of the timing points.

Table 5: Evaluation of Mid – Facial gingival levels

Mid- Facial gingival level	Mean	S. D	F- Value	P-Value	Decision
First Day	1.2857	0.3934	2.49	0.085	Not Significant
First Month	1.4714	0.4009			
Third Month	1.6357	0.3891			
Sixth Month	1.8357	0.3891			

The above table illustrates that there is no significant difference between the timing points at 5% level of significance further the mid facial gingival level.
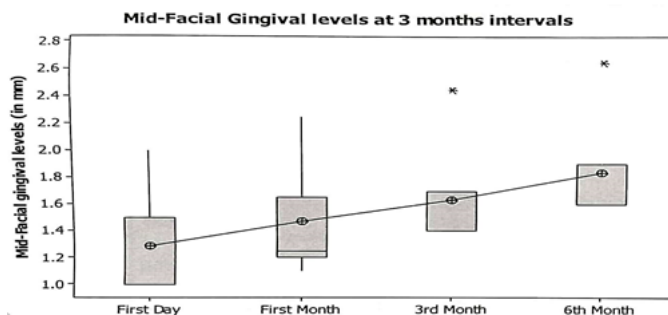
Table 6: Multiple comparisons of Mid – Facial gingival levels

Dependent Variable.. Mid – Facial gingival levels Scheffe

(I) FACTOR	(J) FACTOR	Mean Difference (I-J)	P - Value
1St Day	1st Month	-.18571	.853
	3rd Month	-.35000	.444
	6th Month	-.55000	.105
1st Month	1st Day	.18671	.853
	3rd Month	-.16429	.893
	6th Month	-.36429	.409
3rd Month	1st Day	.35000	.444
	3rd Month	.16429	.893
	6th Month	-.20000	.824
6th Month	1st Day	.55000	.105
	3rd Month	.36429	.409
	6th Month	.20000	.824

The above table depicts that there is no significant difference between each and every pair of the timing points

Table 7: Evaluation of Mesial papilla levels

Mesial Papilla Levels	Mean	S. D	F – Value	P – Value	Decision
1st Day	6.8571	0.6901	1.22	0.323	Not Significant
1st Month	6.6214	0.6707			
3rd Month	6.4429	0.6661			
6th Month	6.2	0.6318			

The above table depicts that there is no significant difference between the timing points at 5% level of significance for mesial papilla levels. The graphic representation is shown below.
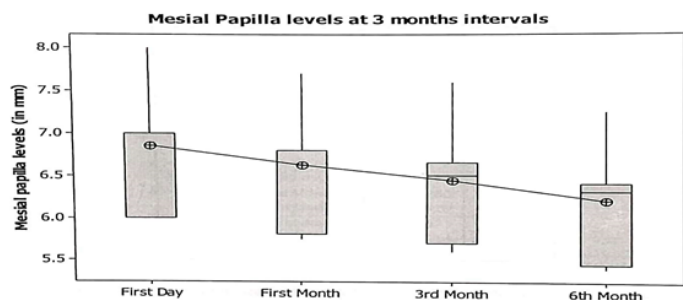
Graph 4

Table 8: Multiple comparisons of mesial papilla levels

Dependent variable. mesial papilla levels Scheffe

(I) FACTOR	(J) FACTOR	Mean Difference (I-J)	P - Value
1st Day	1st Month	.2357	.931
	3rd Month	.4143	.718
	6th Month	.6571	.353
1st Month	1 st Day	-.2357	.931
	3rd Month	.1786	.968
	6th Month	.4214	.707
3rd Month	1st Day	-.4143	.718
	3rd Month	-.1786	.968
	6th Month	-.2429	.925
6th Month	1st Day	-.6571	.353
	3rd Month	-.4214	.707
	6th Month	-.2429	.925

The above table depicts that there is no significant difference between each and every pair of the timing points.

Table 9: Evaluation of Distal Papilla levels.

Distal papill level	Mean	S.D	F-value	P-value	Decision
1st Day	6.8571	0.6901	0.80	0.505	Not Significant
1st Month	6.6500	0.7147			
3rd Month	6.4571	0.7208			
6th Month	6.3071	0.6919			

The above table depicts that there is no significant difference between the timing points at 5% level of significance for the distal papilla levels.

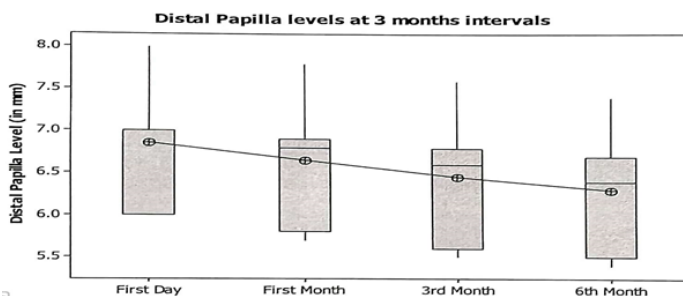The graphic representation is shown below.

Graph 5

Table 10: Multiple comparisons of distal papilla levels

Dependent variable. Distal pailla levels Scheffe

(I) FACTOR	(J) FACTOR	Mean Difference (I-J)	P - Value
1st Day	1st Month	.2071	.959
	3rd Month	.4000	.771
	6th Month	.5500	.555
1st Month	1 st Day	-.2071	.959
	3rd Month	.1929	.966
	6th Month	.3429	,842
3rd Month	1st Day	-.4000	.771
	3rd Month	-.1929	.966
	6th Month	.1500	.984
6th Month	1st Day	-.5500	.555
	3rd Month	-.3429	.842
	6th Month	-.1500	.984

The above table depicts that there is no significant difference between each and every pair of timing points.

Implants were placed immediately after the tooth extraction following one stage surgery .In this study the implant failure for one patient was due to poor oral hygiene maintenance which ultimately led to peri – implantitis. In another patient the implant failure can be attributed to the restart of the smoking habit which he actually stopped one year prior to our treatment. In another patient the failure of the implant can be attributed to low patient compliance and poor oral hygiene maintenance. In our study the cumulative implant success rate was 70% after 6 months of function with a follow up period of 6 months.

Case 1

first post-op day   first post-op month

third post-op month   sixth post-op month
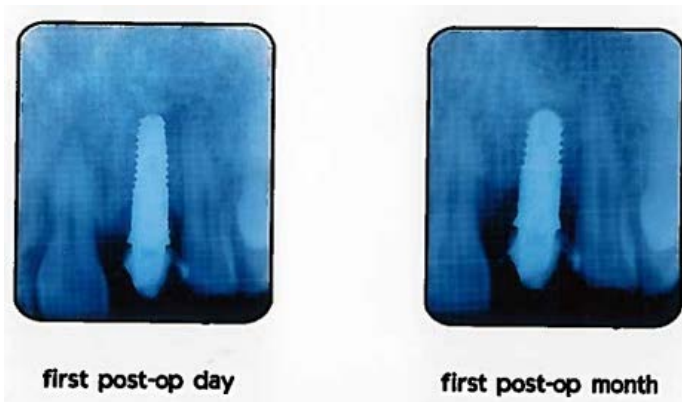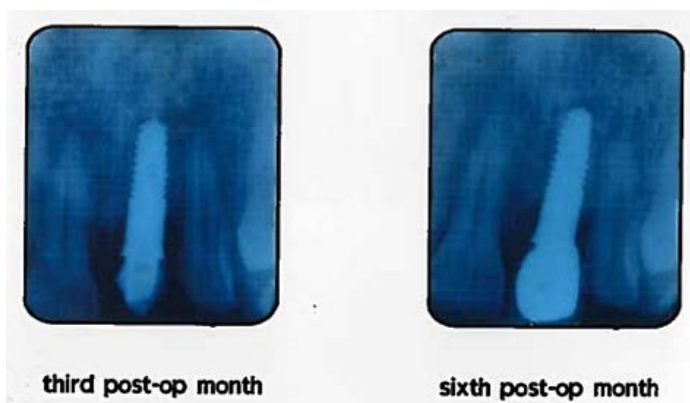
Discussion

In this study statistically significant marginal bone changes were noted at 6 months after immediate provisionalization at the mesial (-0.4mm) and distal (0.39mm) aspects of the implants, but they were smaller than the mean marginal bone loss of range (0-6mm) observed in implants loaded in the usual delayed protocol after the 1st year of function the low mean marginal bone loss observed after 6 months in the present study maybe because of the gradual bone formation in the gaps between the implant and the extraction socket following immediate implant placement. A prospective 5 year study of Anderson et al reported bone gain in 88% of immediately loaded implants. The mean facial gingival recession was 0.5mm 6 months after the temporary prosthesis placement in a study by another author a greater mean mid facial gingival recession of 0.85mm was observed 6 months after prosthesis placement. In addition 0.47mm mesial and 0.78mm distal tissue losses were also reported at 12 months. In this study the overall mean facial gingival level (-0.55mm) and overall mean mesial papilla level (0.65mm) and overall mean distal papilla level (0.55mm) following 6 months of follow up and this is comparable to previously reported amount of changes. Further more these gingival tissue changes were within clinical expectations as confirmed by the patients response to the questionnaires wherein a overall satisfaction of good was recorded and no patient had noticed any changes in the gingival architecture around the implant crown throughout the study. The results of this study support that efficacy of this procedure in maintaining the gingival architecture of the tooth indicated for extraction.

CONCLUSION:

The maintenance of the existing anatomical structures is easier than the recreation, hence it has been advocated to perform provisionalization with a non functional prosthesis immediately following stage 1 surgery in immediate tooth replacement.Based on the results of the 6 month study immediate placement and provisionalization of anterior, single , rough surface and threaded implants can optimize peri implant aesthetics by maintaining the existing hard and soft tissue architecture of the tooth indicated for extraction.In addition this can minimise the psychological trauma of losing anterior teeth and eliminates the need for removable prosthesis.More long term, prospective and controlled clinical studies with a large sample and rough and coated surface of the implant with threads are mandatory to document the effective outcome of this treatment technique.

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