

In Vivo Evaluation of Crestal Bone Level In Two-Piece Implants Placed Following One Stage And Two Stage Surgical Protocol In Single Tooth Implant.

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Abstract

Background: Implant placement can be done by two-stage or one-stage surgical protocol. Traditionally most implants gave good results when two-stage surgical protocol was followed, however, proper bone anchorage can be achieved with one-stage surgical protocol.¹ Studies are available evaluating the implant success rate following these two surgical modalities, but specific data is unavailable regarding short term crestal bone level changes in single tooth implant placed with these two different surgical techniques.

Aim and Objectives:The aim of this study is to evaluate the crestal bone level changes when two-piece implant will be placed following one-stage and two-stage surgical protocol. The objective of this study is to evaluate and compare the changes in crestal bone level when two-piece implants will be placed following one-stage and two-stage surgical protocol in single tooth implant.

Results:After placement of 20 single tooth implants and their radiographic evaluation it was concluded that there is no significant difference in terms of crestal bone loss between two surgical protocols.

Keywords: Crestal Bone, Implants, One stage, Two stage.

Introduction

The success of osseointegrated implants have revolutionarized dentistry.¹Replacement of lost teeth with proper prosthesis, acceptable esthetics and function is the final goal for every implantologist.²

Since the work of Dr. Branemark in the 60's the traditional two stage approach and various implant systems has considerably evolved.^{3,4} The traditional protocol of dental implants has been based on a two stage submerged surgical protocol in which implant supported prosthesis may take up to 7 – 8 months to complete causing less patient satisfaction. So in an attempt to shorten treatment periods, there is a trend towards using one stage non submerged surgical procedure.^{5,6}

Both submerged and non submerged techniques have been used successfully.^{7,3} Every implant system designed for the two stage technique can be used as a single stage surgical procedure with the healing abutment being placed at the time of surgery. The single stage surgical approach reduces cost and time, as well as discomfort. In addition, the implant treatment is psychologically more acceptable

when only one surgery is performed.³ One stage surgical procedures have successfully eliminated two stage surgery with excellent results.⁸

The non submerged approach offers several clinical advantages, like the avoidance of a second surgical procedure, less chair side time and less cost, lack of microgap at crestal level and simplified prosthetic procedures.⁹ Also it is useful when considering early or immediate loading procedures.¹⁰

Crestal bone loss is an early manifestation of wound healing occurs one month after implant placement, and the stability of implant and implant abutment interface play an important role in crestal bone levels.² Hence, maintenance of the initially achieved peri-implant bone level as coronal as possible is a key factor for long term success of any implant treatment.¹¹ One of the methods for evaluating success of an implant is radiography.² With standardized radiographs and a valid reference point crestal bone loss can be monitored with conventional radiography as well as computer assisted radiography.^{12,13}

Materials and Methods

A total number of 20 single tooth implants, 10 implants with one stage and 10 with two stage surgical protocols, were placed. This in-vivo, prospective and double blind study was done on patients selected from the outpatient department of Oxford Dental College, Bengaluru with single missing tooth requiring dental implants for rehabilitation.

All the implants were placed following strict aseptic and manufacture's guide. Group I patients immediately received abutments and surgical site was closed with non resorbable 3.0 black silk sutures and suture removal after 7 days was done. 3 months healing period is essential after implant placement in order to allow undisturbed bone remodeling adjacent to the implant interface. So, patients

were recalled after 3 months for second stage procedure and final restoration.

Post Operative Radiographic Evaluation

Standardized digital radiographs were taken using standard positioning device for digital sensor. Radiographs were taken immediately after implant placement and after 2, 4 and 6 months interval and crestal bone loss was compared (Figure 2 and 3). For this purpose a standard reference point was made. At each observation, bone loss was measured between implant abutment junction and most coronal portion of bone implant contact. Measurements were made on the Carestream digital radiograph software.

Results

Implants were placed in total 18 patients

Group I – 10 single tooth implants were placed in 10 patients by one stage protocol. Group II – 10 single tooth implants were placed in 8 patients by conventional two stage protocol. In all cases ADIN implants (Tourage) were placed following same surgical techniques.

Statistical Analysis

Null hypothesis – there is no significant difference between two groups.

Alternate hypothesis - there is significant difference between two groups.

(Table 1 and 2)

Discussion

The assessment of the dental implant recipient site has traditionally depended on many tools including visual inspection and palpation, intra oral and panoramic radiographs, tomograms and computed tomography. Each tool has strength and weaknesses inherent to its use.¹⁴

Bone resorption is observed around implants, although the rate tends to reduce after 1-2 years of function.² Success of an implant is defined as less than 1.5 mm of marginal bone loss during the first year after insertion of the

prosthesis and less than 0.2 mm annual bone loss thereafter.^{7,15} Therefore it is important to minimize bone loss from the initial stage.¹⁵

One stage protocol have shown success rate up to 90%. Advantages provided by one stage protocol are; (1) the avoidance of a surgical procedure and less chair time per patient, resulting in overall reduced treatment cost, (2) the lack of micro gap at the bone crest level, leading to less crestal bone during healing and resulting in a more favorable crown to implant length ratio, and (3) a simplified prosthetic procedure, presenting an ideal basis for cemented implant restoration.¹⁶

Dental implants designed for a two stage implantation procedure can also be used in single stage procedure and may be as predictable as when the same implants used as two stage procedures or a one stage implant. Placement of the microgap at the crestal level in two stage protocol did not appear to have an adverse effect on the amount of peri-implant bone loss at 1.5 years in the study population.¹ In accordance to these studies, we also found that placement of microgap has no adverse effect on bone loss; so two stage implant can be used as single staged implant also by connecting abutment instead of cover screw at the time of implant placement.

Various studies showed that the mucosa and bone tissue that formed at implants placed in a one stage or two stage procedure had many features in common.⁹ There are several animal studies done by various authors for comparing peri-implant tissue between implants placed following one stage and two stage protocol (Berghlundh et al. 1991, Buser et al. 1992, Abrahamsson et al. 1996, Berghlundh & Lindhe 1996, Cochrane et al. 1997). The authors stated that with respect to marginal bone loss, both techniques yielded similar results.⁹

Salvi et al. (2004) suggested that radiographic methods are confirmatory rather than exploratory and should only be

considered in conjunction with assessment of the clinical parameters. Also, radiographic evidence of bone to implant contact does not imply osseointegration on a histologic level⁷. However, in our study; we did not find any implant failure, mobility or signs of inflammation, although those were not the part of the study.

The same author suggested that computer assisted image analysis has been shown to improve the diagnostic accuracy (i.e. increased sensitivity) of detecting minimal periodontal tissue change.^{7,17} Consequently, the use of digital image analysis has expanded into implant dentistry to monitor peri-implant bone healing and gain or loss of alveolar bone density.⁷

Accordance with this, in our study we used standardized radiographic technique at all times and also, computer based image analysis was used. i.e. Carestream RVG software, which makes our results reliable and applicable in practical life.

Conclusion

An analysis of data obtained during the course of this study, coupled and compared with data obtained while reviewing literature, suggests that placement of two piece implant by one stage surgical protocol is a predictable procedure. In addition, it has many advantages like, like the avoidance of a second surgical procedure, less chair side time and less cost, lack of microgap at crestal level and simplified prosthetic procedures. Findings of this study suggests that when two piece implant is placed following one stage surgical protocol, it gives as predictable results as when conventional two stage surgical protocol is used.

Compliance with ethical standards: the study was not funded by any organization whatsoever.

Conflict of interest: both the authors don't have any conflict of interests whatsoever.

Ethical approval – the study was conducted on patients ethical committee of The Oxford Dental College, with detailed informed consent and only after approval of Bangalore.

Table 1:-Comparison of mesial crestal bone level between the study groups at each time interval.

Group - Mesial		N	Mean(SD)	Range	Median (Q1-Q3)	Mann Whitney U test	
						U statistic	p-value
Baseline	One stage	10	1.13 (0.99)	0 - 2.8	0.95 (0.35- 2.25)	28.50	0.10(NS)
	Two stage	10	0.65 (1.04)	0 - 2.8	0.20 (0.10- 0.83)		
2 month	One stage	10	1.29 (0.95)	0.2 - 2.8	1.05 (0.45- 2.43)	32.00	0.17(NS)
	Two stage	10	0.82 (0.97)	0.2 - 2.8	0.40 (0.30- 1.08)		
4 month	One stage	10	1.43 (0.90)	0.5 - 2.9	1.15 (0.58- 2.50)	31.50	0.16(NS)
	Two stage	10	1.03 (0.90)	0.4 - 2.9	0.60 (0.50- 1.30)		
6 month	One stage	10	1.52 (0.90)	0.5 - 2.9	1.40 (0.58- 2.50)	39.00	0.40(NS)
	Two stage	10	1.15 (0.84)	0.5 - 2.9	0.90 (0.60- 1.38)		

Table 2:-Comparison of distal crestal bone level between the study groups at each time interval.

Group - Distal		N	Mean(SD)	Range	Median (Q1-Q3)	Mann Whitney U test	
						U statistic	p-value
Baseline	One stage	10	0.90 (1.00)	0.10 - 2.50	0.25 (0.18 - 2.20)	35.00	0.25(NS)
	Two stage	10	1.06 (0.75)	0.20 - 2.50	1.00 (0.40 - 1.30)		
2 month	One stage	10	1.00 (0.93)	0.20 - 2.50	0.50 (0.30 - 2.20)	35.50	0.27(NS)
	Two stage	10	1.19 (0.69)	0.30 - 2.50	1.10 (0.73 - 1.53)		
4 month	One stage	10	1.21 (0.83)	0.40 - 2.50	0.90 (0.50 - 2.30)	37.50	0.34(NS)
	Two stage	10	1.32 (0.65)	0.50 - 2.50	1.25 (0.90 - 1.70)		
6 month	One stage	10	1.34 (0.85)	0.50 - 2.60	1.00 (0.60 - 2.50)	40.00	0.45(NS)
	Two stage	10	1.47 (0.71)	0.50 - 2.60	1.40 (0.90 - 2.05)		

*P<0.05 statistically significant

p>0.05 Non significant, NS

Figure 1: Clinical Picture Of Placed Immediate Implant



Figure 2: Post Operative Radiograph Of Implant After 2 Months

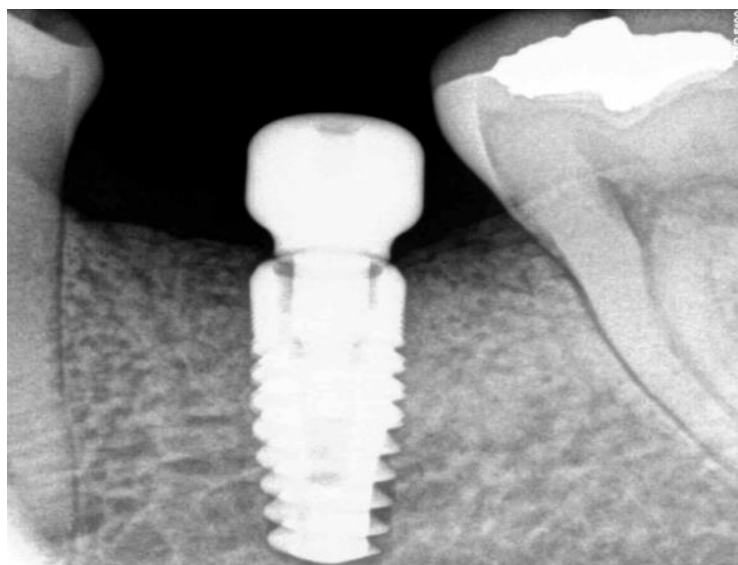
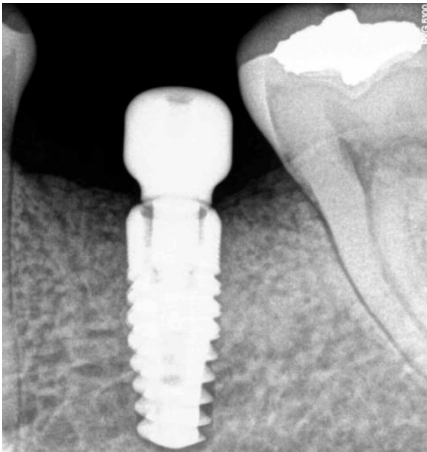
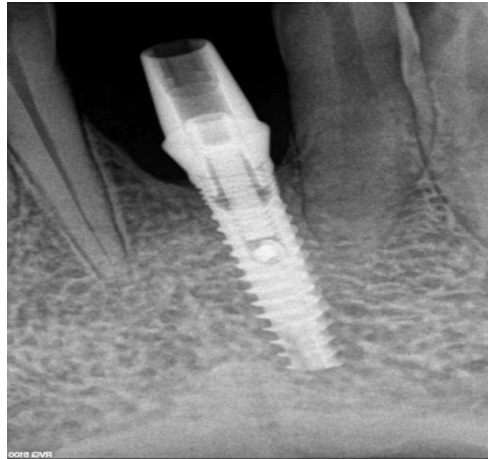


Figure 3: Post-Operative Follow- Up Radiograph After 4 Months And 6 Months



After 4 Months



After 6 Months

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