

ORIGINAL RESEARCH

To evaluate the comparison of marginal bone loss between one stage versus two stage dental implant surgery- An in vivo study

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Background: Dental implants are widely used for oral prosthetic rehabilitation in case of partially (single or more missing teeth), as well as fully edentulous patients. The present study was conducted to compare the Marginal Bone Loss in One-stage versus Two-stage Implant Surgery. **Material & methods:** The present study was conducted among 40 patients with the age range, 18-65 years. The cases were randomly divided into two groups as one-stage and two-stage surgical approach. Implants were placed in all patients. MBL was calculated and data were statistically analyzed by SPSS software (version PASW 18). Independent test was used to compare the mean value of MBL between the two groups. P value less than 0.05 was considered as significant. **Results:** In the present study a total no. of 40 patients with the age group ranging from 18-65 years old were given implants. Among total 15 participants were male whereas 25 were females. *p* Value for MBL was 0.421 indicating no notable difference between both the one-stage and two-stage surgical approaches on the basis of gender. *p* Value for MBL was 0.002 and there was a significant difference between age groups in the average distal and mesial bone loss between both the one-stage and two-stage surgical approaches. The length and diameter of the implants had no significant association between mesial and distal bone loss. **Conclusion:** The present study concluded that there was no notable difference between both the one-stage and two-stage surgical approaches on the basis of gender, length and diameter of the implant. There was a significant difference between age groups in the average distal and mesial bone loss between both the one-stage and two-stage surgical approaches.

Keywords: marginal bone loss, one stage implant surgery, two stage implant surgery

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Corresponding Author: Auroosa Hamid Mirza, PG Student, Department of Crown and Bridges, Himachal Dental College Sunder Nagar, Mandi, Himachal Pradesh, India**This article may be cited as:** Mirza AH, Thakur A, Ahmed A, Kanwar R. To evaluate the comparison of marginal bone loss between one stage versus two stage dental implant surgery- An in vivo study. J Adv Med Dent Scie Res 2021;9(7):204-210.**INTRODUCTION**

Dental implants were traditionally inserted into the bone by means of a two-stage surgical protocol ad modum Brånemark, in order to reduce the risk of failure. Primary stability of the implant in the bone and the absence of its mobility during the healing period were considered two key factors essential to success.¹ According to the original protocol for osseointegrated dental implants, the second stage surgery consists of uncovering the implant that was inserted a few months earlier in a submerged mode as prescribed by the Swedish founders of osseointegrated implantology.² In the early 1990s, our Swiss colleagues from the ITI team proposed a protocol for implant placement in non-submerged mode with tissue-level implants;³ they demonstrated

the effectiveness of this one-step surgical approach without reducing the chances of osseointegration of the implants.⁴ Simultaneously, Straumann AG. (Basel, Switzerland) developed an implant system using a single surgical stage.⁵ that system had an implant neck around 3 mm longer than the implants used for the two-stage system. In this one-stage method, the surgical flap was sutured around the implant neck, thus avoiding the need for a second surgical intervention.^{6,7} One of the main purposes of implant placement is to preserve the peri-implant tissue in long-term at the extracted tooth area, since its stability is crucial for dental implant outcome.^{8,9} Long-term implant success depends on peri-implant tissue stability.¹⁰⁻¹² Hence, preserving the marginal bone as much as possible and osseointegration are

mandatory.¹³⁻¹⁵ Based on current clinical recommendations, the one-stage approach might be preferable to shorten treatment times, while a two-stage submerged approach could be indicated when the implant is not expected to obtain optimal primary stability or in association with GBR.¹⁶The present study was conducted to compare the Marginal Bone Loss in One-stage versus Two-stage Implant Surgery.

MATERIAL & METHODS

The present study was conducted among 40 patients with the age range, 18-65 years old. Before the commencement of the study ethical clearance was obtained and written consent was obtained from the patients. All the patients were in good general health

(American Society of Anesthesiologists physical status I), nonsmokers, and non-addicts, besides being cooperative with the study and postoperative follow-up. There was no local problem such as gingival or periodontal diseases, nor any need for soft tissue or hard tissue regeneration and graft. They all had fixed prosthesis treatment plan. The surgical procedures were all performed by the same operator. The cases were randomly divided into two groups. 20 patients were included in first group as one-stage surgical approach and rest 20 in two-stage surgical approach. The subjects received (2gr Amoxicillin and 400mg Ibuprofen one hour prior to the surgery), as well as 0.12% Chlorhexidine mouthwash as the preoperational prophylactic protocol.

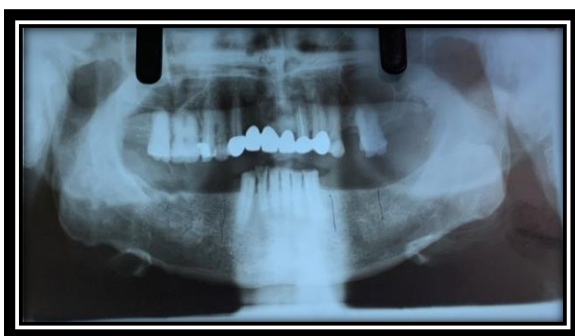


Fig 1: Preoperative OPG



Fig 2: Preoperative Intraoral Picture Showing Bilateral Edentulous Spaces

Surgical procedures started by anesthetizing with 2% Lidocaine and epinephrine 1/100000, followed by crestal mucoperiosteal incision and envelope flap reflection. Then, the fixtures were installed at specified sites. In one-stage surgical group, desired site of implant insertion was marked with probe through surgical splint (fig. no.3 and 4)and tissue

punch instrument was used to punch the tissue over desired site as shown in fig no 5. Bone was exposed and osteotomy was done to desired diameter. Implants were inserted (fig.no.6) and healing abutments were placed on the same day of surgery as shown in fig.no. 7.



Fig 3: Surgical Stent With Approximate Marking For Drilling



Fig 4: Stent Was Placement In Mouth And Marks On Desired Sites Was Made



Fig 5: Tissue Punch Used To Eliminate tissue Over Bone (Flapless Technique) And Osteotomy Was Done

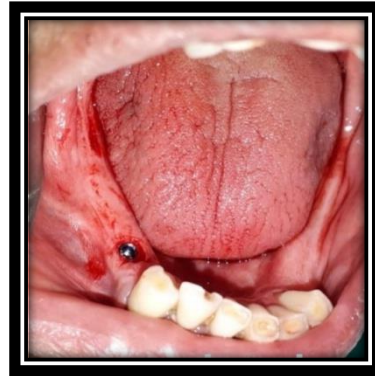


Fig 6: Implant Placed

In the two-stage group, mucoperiosteal flap was raised and implants were placed as shown in figures 8, 9 and 10. The fixtures were closed with cover screw prior to replacement of the mucoperiosteal flap and closing with resorbable suture material.



Fig 7: Gingival Former Placed Immediately After Implant Placement



Fig 8: Incision Given On The Opposite Side



Fig 9: Osteotomy Done



Fig 10: Implants Placed

All patients received routine postoperative instructions protocol. Parallel periapical radiography was performed for all patients immediately after

surgery, recorded as the baseline. Three months later, prosthetic treatment was done as shown in figures 11,12,13,14,15 and 16. Six months after loading and

prosthetic treatment, parallel periapical radiography was done by the same technique and machine as used previously. MBL was calculated along with the help

of an oral and maxillofacial radiologist using Adobe Photoshop CS5 software.



Fig 11: Gingival Formers Placed After 4 Months On Site Where Flap Was Raised



Fig 12: Gingival Formers Removed After 20 Days



Fig 13: Abutments In Place



Fig 14: Impression Recorded



Fig 15: Crown Cemented



Fig 16: Post Operative



Fig. no 17- Post operative OPG after 4 months of implants placement

The MBL was calculated on the basis of age, gender, implant diameter, implant length. The fixtures length was used as a reference measurement for magnification of recorded radiographs. The data were

statistically analyzed by SPSS software (version PASW 18). Independent test was used to compare the mean value of MBL between the two groups. P value less than 0.05 was considered as significant.

RESULTS

In the present study a total no. of 40 patients with the age group ranging from 18-65 years old were given

implants. Among total 15 participants were male whereas 25 were females.

Table 1: The mean ± SD of marginal bone loss on the basis of gender

Surgical approach		Mean ± SD of marginal bone loss on the basis of gender		p-value
		Male	Female	
One stage	Distal	0.740±0.06mm	0.743±0.05mm	0.421
	Mesial	0.738±0.12mm	0.739±0.09mm	
Two stage	Distal	0.851±0.08 mm	0.852±0.02 mm	
	Mesial	0.849±0.12 mm	0.850±0.02 mm	

The mean distal bone loss was detected to be 0.740mm in one stage approach in males and in females it was 0.743mm whereas the mean distal bone loss was detected to be 0.851mm in the two stage approach in males whereas it was 0.852 in females. The mean mesial bone loss was detected to be 0.738 mm in one stage approach in males and in females it

was 0.739 mm whereas the mean distal bone loss was detected to be 0.849 mm in the two stage approach in males whereas it was 0.850 in females. *p* Value for MBL was 0.421 indicating no notable difference between both the one-stage and two-stage surgical approaches on the basis of gender.

Table 2: The mean ± SD of marginal bone loss on the basis of age group

Age group (years)	Mean ± SD of marginal bone loss on the basis of age group				p-value
	One stage		Two stage		
	Distal	Mesial	Distal	Mesial	
18-25	0.724±0.02mm	0.723±0.04mm	0.732±0.05mm	0.731±0.04mm	0.002
26-45	0.726±0.01mm	0.725±0.05mm	0.750±0.02mm	0.752±0.02mm	
46-65	0.734±0.05mm	0.732±0.03mm	0.754±0.04mm	0.751±0.03mm	
66-85	0.734±0.05mm	0.732±0.03mm	0.754±0.04mm	0.751±0.03mm	

The mean distal bone loss was detected to be 0.724mm in one stage approach in age group 18-25years, 0.726mm in age group 26-45years, 0.734mm in age group 46-65years and 0.734mm in age group 66-85years whereas in two stage approach it was 0.732mm in age group 18-25years, 0.750mm in age group 26-45years, 0.754mm in age group 46-65years and 0.754mm in age group 66-85years. The mean mesial bone loss was detected to be 0.723 mm in one stage approach in age group 18-25years,

0.725mm in age group 26-45years, 0.732mm in age group 46-65years and 0.732mm in age group 66-85years whereas in two stage approach it was 0.731mm in age group 18-25years, 0.752mm in age group 26-45years, 0.751mm in age group 46-65years and 0.751mm in age group 66-85years. *p* Value for MBL was 0.002 and there was a significant difference between age groups in the average distal and mesial bone loss between both the one-stage and two-stage surgical approaches.

Table 3: The mean ± SD of marginal bone loss on the basis of implant diameter

Implant diameter (mm)	Mean ± SD of marginal bone loss on the basis of implant diameter				p-value
	One stage		Two stage		
	Distal	Mesial	Distal	Mesial	
<4	0.744±0.11mm	0.742±0.08mm	0.745±0.08m	0.744±0.03mm	0.401
4-4.5	0.747±0.08mm	0.749±0.12mm	0.746±0.09mm	0.748±0.06mm	
>4.5	0.747±0.08mm	0.7423±0.07mm	0.748±0.07mm	0.749±0.07mm	

Table 4: The mean ± SD of marginal bone loss on the basis of implant length

Implant length (mm)	Mean ± SD of marginal bone loss on the basis of implant length				p-value
	One stage		Two stage		
	Distal	Mesial	Distal	Mesial	
≤10	0.844±0.11mm	0.843±0.05mm	0.846±0.08mm	0.844±0.04mm	0.543
>10	0.842±0.09mm	0.840±0.03mm	0.845±0.07mm	0.842±0.05mm	

The length and diameter of the implants had no significant association between mesial and distal bone loss.

DISCUSSION

According to the criteria suggested by Brånemark et al, implants are considered successful when they

present a mean marginal bone loss of less than 1.5 mm during the first year after insertion.¹⁴

The mean bone loss was detected to be 0.742mm in one stage approach and 0.853 in the two stage approach. *p* Value for MBL was greater than 0.05 indicating no notable difference between both the one-stage and two-stage surgical approaches.

Brånemark et al reported that one factor that can contribute to marginal bone loss is the occurrence of surgical trauma during the detachment of the periosteum.¹⁴

Siadat *et al.* compared the crestal bone loss around implants placed through either one-stage or two-stage installation and found no significant differences between the approaches one year after functional loading.¹⁵

In another study, they used screw-shaped tapered implants for patients needing fixed partial dentures while we used cylindrical implants. Less bone loss was seen for one-stage approach, but after six and twelve months of functional loading, no significant differences were noted in MBL.¹⁶

Gheisari R et al found that the mean Bone loss on the mesial and distal surfaces of implants inserted through one-stage surgery and two-stage surgery was 0.76 ± 0.04 and 0.842 ± 0.04 mm respectively. No notable marginal bone change was observed between the maxilla (0.860mm) and mandible (0.729mm). Moreover, *p* Value was >0.05 in all samples, indicating no significant difference in the crestal bone loss.¹⁷

Crestal bone loss in association with one- vs. two-stage surgery was tested in several studies and the results showed no significant differences between the two methods.¹⁸⁻²⁰ It is important to keep in mind that the patient's smoking status is a risk factor for bone level alterations.²¹

CONCLUSION

The present study concluded that there was no notable difference between both the one-stage and two-stage surgical approaches on the basis of gender, length and diameter of the implant. There was a significant difference between age groups in the average distal and mesial bone loss between both the one-stage and two-stage surgical approaches.

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