

Comparative Evaluation Of Crestal Bone Levels Following Implant Placement With Flap And Flapless Techniques In Posterior Edentulous Areas Of The Mandible-An In Vivo Study

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Abstract:

Aim of the study: To evaluate the changes in crestal bone level around implants placed with flapless surgery in comparison with flap surgery in bilateral posterior edentulous area of the same patient

Objective;

- 1) To measure the crestal bone level around implants immediately, 1 3 and 6 months after placement and evaluate the amount of bone level changes
- 2) To compare the change in bone level around implants placed using flapless surgery with that of around implants placed with flap surgery

Material and methods

Study design: Experimental randomized controlled clinical trial

Study setting-department of prosthodontics, Govt.dentalCollege, Calicut

Study period- conducted for 18 months after getting the approval

Study methodology

Sample size-15 bilaterally edentulous patients

15 implants placed in mandibular molar region with flapless surgery on one side and 15 implants placed on other side of the same patient by reflecting the flap

Results: The present study showed that on the mesial side the mean change from month 0-1, month 1-3 ,month 3-6 and month 0-6 for flapless technique was significantly lower than with flap technique(0.120 to 0.520 mm for flapless technique and 0.213 to 0.720mm for with flap technique)similarly on distal side mean change from month 0-1,month 1-3 ,month 3-6 and month 0-6 for flapless technique was significantly lower than with flap technique (0.127 to 0.527 mm for flapless technique and 0.186 to 0.707mm for with flap technique)..

Conclusion

- During the observational period of six months that the mean crestal bone changes from month 0-1,month 1-3,month 3-6 and month 0-6 for flapless method was significantly lower than with flap method. This shows that the crestal bone loss on the implants placed with flapless method was significantly lower compared to those placed using conventional flap method

Keywords: flapless,dental implants,crestal bone loss

I. Introduction

The surgical protocol of dental implants has undergone changes since beginning of usage of dental implants. In the surgical protocol of implant placement an incision is made in the mucosa then flap is reflected to expose underlying bone, after implant placement flap is sutured back^{1,2}.It has been found that dental implants that placed after reflecting flaps shows some bone resorption .During the initial phase of healing bone resorption of varying degree almost always occur in crestal region³. The extent of alveolar height reduction is related to the bone thickness at each specific site. In a flapless procedure, a dental implant is installed through the mucosal tissues without reflecting a flap. This approach has advantages for soft tissue healing and patient comfort because it is less traumatic and less time consuming compared to an open-flap approach. With less postoperative bleeding and swelling, it offers the possibility to adjust the provisional appliance immediately. A disadvantage of flapless surgery is that the true topography of the underlying available bone cannot be observed because the mucogingival tissues are not raised. Another concern regarding flapless technique is the presumption that some amount of epithelial tissue could be carried to the osteotomy site⁴. Such situation is highly undesirable because it might affect the complete osseointegration on to the implant surface and thereby resulting in implant failure.

Considering the advantages and disadvantages of each type of surgical techniques it would be appropriate to study the effect of two techniques on crestal bone loss as the amount and quality of bone are essential factor in long term success of implant prosthesis

II. Materials & Methodology

Study methodology

Sample size-15 bilaterally mandibular molar missing patients

15 implants placed with flapless surgery on one side and 15 implants placed on other side of the same patient by reflecting the flap

Study design- Experimental randomized controlled clinical trial

Study setting-department of prosthodontics, Govt.dentalCollege, Calicut

Study period-study conducted for 18 months after getting the approval

Inclusion criteria

1. Healthy patients aged 20-45 years
2. Need for implant supported prosthesis in mandibular posterior region
3. Willingness to participate in the study
4. Well healed ridges and sufficient bone volume in the implant site and favorable bone quality

Exclusion criteria

- 1) General health conditions for which implant surgery is contraindicated.
- 2) Pregnancy
- 3) Alcohol abuse or smoking

Diagnostic aids

1. Routine blood investigation
2. Diagnostic casts

Diagnostic impressions were made in irreversible hydrocolloid using perforated stock trays. The impressions were poured in type III dental stone. Second impression is poured with type IV stone which is used for bone mapping

3. Radiographs

The radiographs used for assessing the implant site were panoramic radiographs and digital periapical radiographs.. The implant size selection was based on radiographs and bone mapping

3. Bone mapping

Bone mapping was done to assess the soft tissue thickness, bone width and ridge contour . 5. **Surgical stent**

The stent was fabricated on the sectioned cast following bone mapping. The favorable area in the ridge contour of the sectioned cast is drilled corresponding the pilot drill insertion.

Implant selection

Titanium root form implants were were selected based on bone mapping and radiographs

Implant surgery

Routine presurgical protocol was followed for every patients.

Edentulous area with adequate bone width and without any undercuts was selected for flapless implant placement. Once the required drilling was achieved, implant with the mount was slowly driven in to the osteotomy site first using hand , followed by wrench. Implant mount was replaced by implant driver and implant was driven to its desired position.A digital periapical radiograph was taken to confirm the complete placement of implant and to check its parallelism with adjacent teeth.

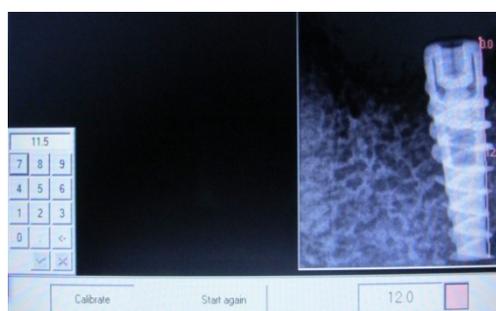
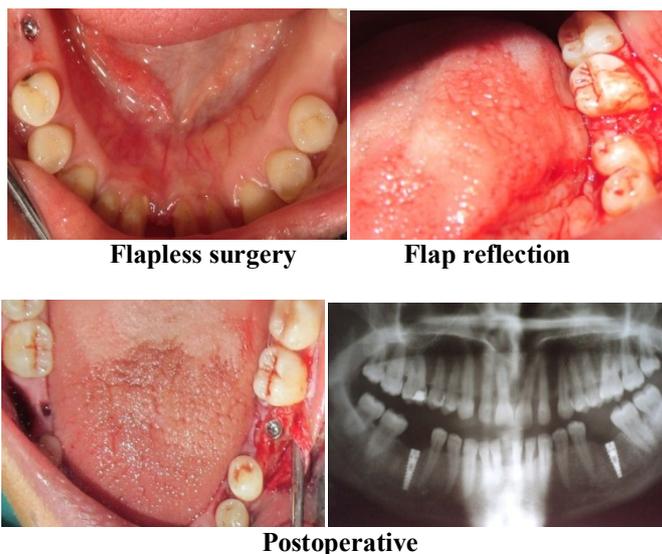
In the other edentulous area of the same patient (control site) implant placement was done by elevating mucoperiosteal flap. Prosthetic phase of the implants were done after 3 months.

Radiographic evaluation of crestal bone level

After implant placement digital periapical radiographs were taken at 0,1,3 and 6 months duration to study changes in crestal bone level. Digital radiographs were taken because of its improved image quality and less radiation exposure. Kodak dental imaging software was used to analyze the bone changes. The dimensional changes were nullified by calibrating the radiographic implant length to the original implant length.



Preoperative



Assessment of radiographic implant length



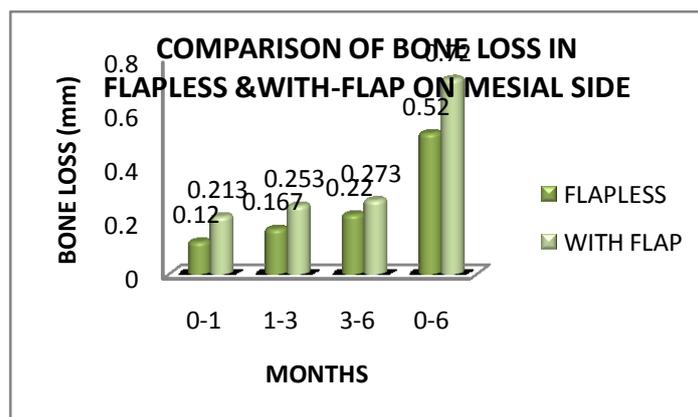
Comparative evaluation of crestal bone changes using digital radiographs

III. Results

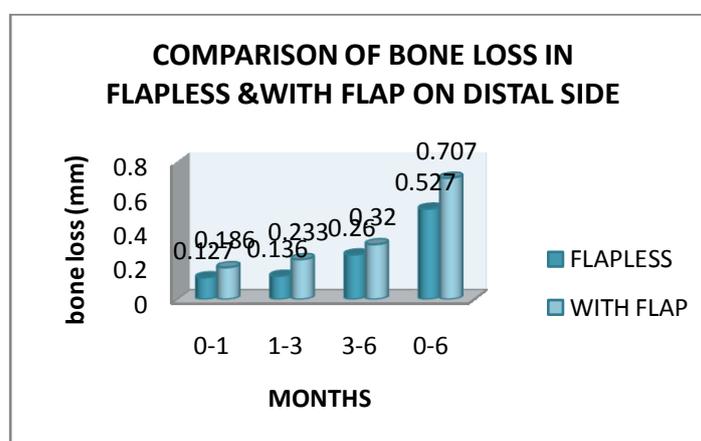
Fifteen patients with missing mandibular molar bilaterally were selected and thirty implants were placed in ,fifteen implants placed in one side using flapless technique and fifteen implants placed in the other side reflecting mucoperiosteal flap. Digital periapical radiographs were taken and crestal bone changes were analysed using Kodak dental imaging software. The patients were recalled at 1month , 3months and six months interval for the assessment of crestal bone level radiographically.the crestal bone levels were measured at mesial and distal aspect of each implant.

To measure crestal bone level , a fixed reference point had to be selected.The shoulder of the implant was taken as the reference point in the study. The distance from the point to the crest of the bone where it contacted the implant on mesial and distal sides was measured. The first point was selected on the shoulder of the implant. The second point was measured on the crest of the bone where it contacted the bone. The distance between the points was displayed. On each recall the distance was measured and changes in crestal bone levels were analysed

Mean and standard deviations were estimated from the samples of each study group. Mean values were compared between the groups by paired t-test. P value <0.05 was considered as the level of significance



Comparison of mean values between flap and flapless methods on mesial side shows that the mean crestal bone changes from month 0-1, month 1-3, month 3-6 and month 0-6 for flapless method was significantly lower than with flap method. This shows that the crestal bone loss on the mesial side of implants placed with flapless method was significantly lower compared to those placed using conventional flap method



Comparison of mean values between flap and flapless methods on distal side shows that the mean crestal bone changes from month 0-1, month 1-3, month 3-6 and month 0-6 for flapless method was significantly lower than with flap method. This shows that the crestal bone loss on the distal side of implants placed with flapless method was significantly lower compared to those placed using conventional flap method

IV. Discussion

Flapless surgery can be done either by punching a small amount of soft tissue or directly drilling through the soft tissue. Avoiding the mucoperiosteal flap results in less bleeding, postoperative swelling and discomfort³. The second stage surgery requires less adjustment for healing abutment placement. Moreover since the periosteum is not reflected, it maintains better blood supply to the site reducing the amount of bone resorption. Yaffe et al⁶ concluded that most of the resorption occurs in early healing phase. In addition flapless surgery maintains the soft tissue architecture and decreases the operating time.

The present study showed that on the mesial side the mean change from month 0-1, month 1-3, month 3-6 and month 0-6 for flapless technique was significantly lower than with flap technique (0.120 to 0.520 mm for flapless technique and 0.213 to 0.720 mm for with flap technique) similarly on distal side mean change from month 0-1, month 1-3, month 3-6 and month 0-6 for flapless technique was significantly lower than with flap technique (0.127 to 0.527 mm for flapless technique and 0.186 to 0.707 mm for with flap technique). This shows that loss of bone during the 6 months period on the mesial and distal side of the implant placed with flapless method was significantly lower compared to those placed using with flap method.

Roman GG³ stated that the interproximal crestal bone loss was of practical importance and statistically significantly less following the use of a limited flap design versus the widely mobilized flap procedure. Rousseau P⁷ advocated that flapless approach is a predictable procedure when patient selection and surgical technique are appropriate. Blanco J, Alves CC⁸, concluded that after 3 months of healing buccal soft tissue retraction was lower in the flapless method. Sanna AM, Molly L, van Steenberghe⁹ concluded that the present

findings indicate that the flapless treatment protocol described results in good implant survival rate even after several years. Jeong et al⁵ found that flapless implant surgery has improved crestal bone levels and osseointegration compared with conventional technique.

The study is having its own limitations. The main limitation was short observational period. Although osteoblasts may die from the initial trauma of flap reflection, blood supply is reestablished once periosteum regenerates. Osteoblasts is then able to remodel the crestal bone anatomy. This fact has a positive effect on bone response at a later stage and further research in this field is required to provide more data. The second limitation was smaller number of samples. The third limitation was difficulty in standardizing selection of subjects. To obtain findings of more accuracy by comparing the parameters in the study the variables like bone density, bone thickness, age and sex have to be standardized. Future long term studies with higher sample size and better standardization procedure for patient selection is recommended. Within the limitations of study, it can be concluded that crestal bone loss is seen in both flapless and with flap techniques. When the crestal bone levels were compared in both groups flapless approach showed lesser crestal bone loss which was statistically significant compared to that of flap approach, indicated benefits of flapless procedure. This experimental study within the probability value, it can be safely concluded that null hypothesis is proved to have statistical and clinical significance

V. Summary & conclusion

Within the limitations of the study, following conclusions were drawn after the analysis of results

- During the observational period of six months that the mean crestal bone changes from month 0-1, month 1-3, month 3-6 and month 0-6 for flapless method was significantly lower than with flap method. This shows that the crestal bone loss on the implants placed with flapless method was significantly lower compared those placed using conventional flap method

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