Journal Homepage: -www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI:10.21474/IJAR01/16801
DOI URL: http://dx.doi.org/10.21474/IJAR01/16801

RESEARCH ARTICLE

COMPARATIVE EVALUATION OF INITIAL CRESTAL BONE LOSS AROUND DENTAL IMPLANTS USING FLAPLESS OR FLAP METHOD: AN IN VIVO STUDY

Dr. Leena Tomer[1], Dr. Chandani[2], Dr. Puja Maity[2], Dr. Amruthasree V.[2], Dr. Vikas Sharma[2], Dr. Swati Tyagi[2] and Dr. Pravender Kumar[2]

1. HOD & Professor, Department of Prosthodontics, Crown & Bridge and Implantology, Divya Jyoti College of Dental Sciences & Research.
2. Post Graduate student, Department of Prosthodontics, Crown & Bridge and Implantology, Divya Jyoti College of Dental Sciences & Research.

Manuscript Info

Manuscript History
Received: 28 February 2023
Final Accepted: 31 March 2023
Published: April 2023

Keywords:-
Dental Implants, Flapless Implant Insertion, Initial Bone Loss, Transgingival Healing, Transmucosal Healing

Abstract

Purpose: The objective of this study was to compare the effect of flapless implant insertion on initial bone loss with that of conventional placement after elevation of a mucoperiosteal flap.

Materials and Methods: Total of 20 implants were replaced in the edentulous area within the mouth randomly categorized under two groups which differ in flap or flapless surgical placement. Group 1(n=10) Patients with dental implants using flap method. Group 2 (n=10) Patients with dental implants using flapless method. To assess changes in the peri-implant bone level, the height of the mesial and distal peri-implant bone was measuredwith digital radiograph taken at the time of implant placement and 3month and 6month afterward.

Results: The crestal bone loss on mesial side and distal side was higher in the flap elevation methods at baseline, 3month and 6month as compared to the flapless methods and the difference was statistically significant at the 3month.

Conclusion: Within the limitations of this study, it can beconcluded that flapless implant surgery results in lesser lossof marginal bone and also results in better patient comfort;however, proper patient selection and technique is essentialfor a successful flapless implant surgery.

Introduction:-

Although the conventional treatment for replacement of lost teeth has been partial or full dentures, the need for fixed, esthetic and functional restoration makes **dental implants** a reliable alternative.[1]

Thetraditional method for placement of implant involves elevation of full thickness mucoperiosteal flap approach which allows the clinician to directly visualize the alveolar bone and assess bone morphology of the ridge.[2]When soft tissue flaps are reflected for implant placement, blood supply from the soft tissue to the bone is disrupted, thus leaving poorly vascularized bone without a part of its vascular supply, promoting bone resorption during the initial healing phase almost at crestal region.[3]

Corresponding Author:- Dr. Leena Tomer
Address:- HOD & Professor, Department of Prosthodontics, Crown & Bridge and Implantology, Divya Jyoti College of Dental Sciences & Research.

To overcome the limitations, the concept of flapless implant surgery has been introduced by Lederman.[4]With a flapless approach, intact periosteum is left on the buccal and lingual aspects of the ridge which maintains a better blood supply to the site, reducing the likelihood of bone resorption.[5]Reduced surgery time, less patient discomfort and prevention of esthetic complications such as loss of interdental papillae has been reported using this technique.[6]

Despite the above advantages, the flapless technique also has several potential shortcomings. These include the inability of the surgeon to visualize anatomical landmarks and vital structures, an inability to ideally visualize the vertical endpoint of the implant placement (too shallow/too deep) and inability to manipulate the circumferential soft tissues to ensure the ideal dimensions of keratinized mucosa around the implant.[7]

The introduction of cone beam computed tomography, improved access to conventional CT scanning and new dental implant treatment planning software allowsdetermination of underlying osseous anatomy prior to the implant placement and three-dimensional placement in the alveolus.[8]

Null hypothesis for the present study states that clinically and radiographically there is no difference in soft and hard tissue changes at different time intervals around implants placed with flap technique and flapless technique.

Materials and Method:-

This study was conductedfrom time period of February'21 to March'22 in the Department of Prosthodontics & Implantology, DJ College of Dental Sciences & Research Modinagar (IEC NO.- DJC/IEC/2020/38). Those patients presented with missing tooth and choose the option of restoration with implant support were selected and written consent from each patient was taken in the prescribed form. The inclusion criteria for patient selection include good periodontal status, adequate bone height and width, acceptance of the conditions of the study and exclusion criteria includeparafunctional habits, immunocompromised medical condition, irradiation in the head or neck region, myocardial infarction within 6 months, uncontrolled diabetes mellitus, blood dyscariasis, neuromuscular disorders, smoking, pregnancy.

Total of 20 implants were replaced in the edentulous area within the mouth randomly categorized under two groups which differ in flap or flapless surgical placement.

Surgical Procedure

In flap group,a midcrestal incision was made on the edentulous site along with sulcular incision on the mesial and/or distal aspects of the adjacent teeth and a full thickness flapwas elevated andin flapless group, a round tissue punch was used to remove the soft tissue overlying the underlying bone.All implants were placed equicrestally and primary stability was achieved. Cover screw was placed over the implant and the surgical site was sutured using 3-0 non resorbable sutures. Post operative RVG was taken to verify the correct angulation/placement.Patients were given both verbal and written instructions about post-operative care for operative site and were prescribed antibiotics and non-steroidal anti-inflammatory agents for 5 days to combat any post-operative discomfort.

Fig 1:- Flap Group; a. Preoperative site for implant placement (36), b. Full thickness flap elevation, c. Site after implant placement.

Fig 2:- Flapless Group; a. Preoperative site for implant placement (46), b. Exposed underlying bone after soft tissue removal, c. Site after implant placement.

Clinical Examination

All implant sites were evaluated for bleeding index and probing depth at 3month and 6month.

Bleeding index is an indicator of sulcus health. The most common bleeding gingival index used for implants is the SULCUS BLEEDING INDEX and was followed in this study.It was assessed at 4 sites around each implant i.e., on the buccal, lingual, mesial and distal surfaces of the implant by using the blunt end of the plastic probe. By adding the implant scores together & dividing by the number of teeth examined, an individual score can be obtained.

Probing depth reveals tissue consistency, bleeding and exudates. Ideal implant sulcus should be maintained at less than 5 mm. Titanium /plastic instrument i.e., plastic probe was used to evaluate the probing depth at different time intervals to evaluate the success of implants (i.e., at 3month and 6month).

Radiographic Examination

All patients were subjected to radiographic examination of the implant site with RVG (Sidexis software) using paralleling technique to evaluate the bone loss at the interval of baseline, 3month,6month in which a line was traced from the most upper point adjacent to the implant on the crest of alveolar bone to implant shoulder as the reference point. This helps to assess the amount of bone loss over follow-up periods.

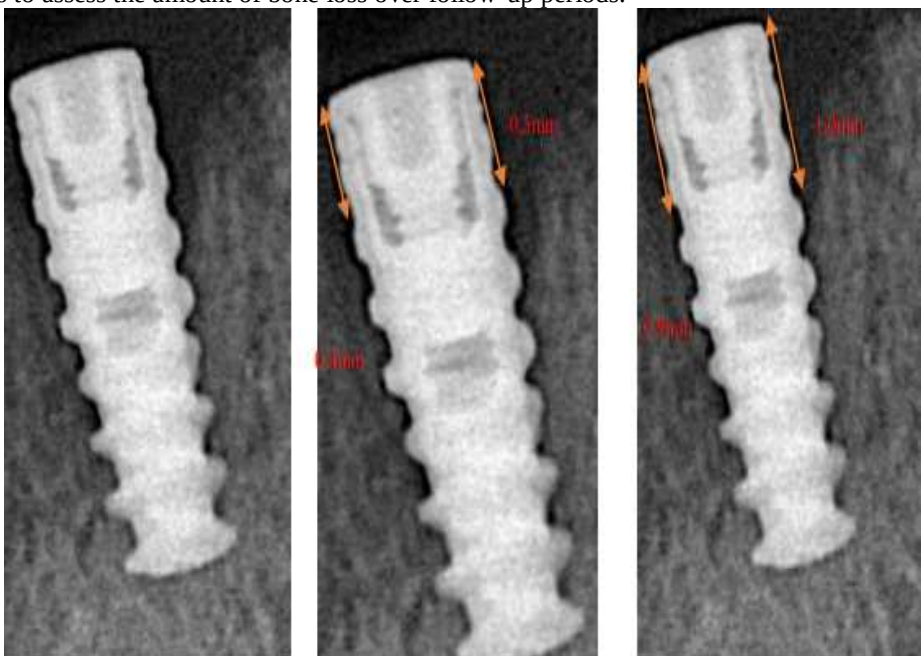


Fig 3:- RVG showing implant site 36 on follow up period a. baseline, b. 3month, c. 6month.

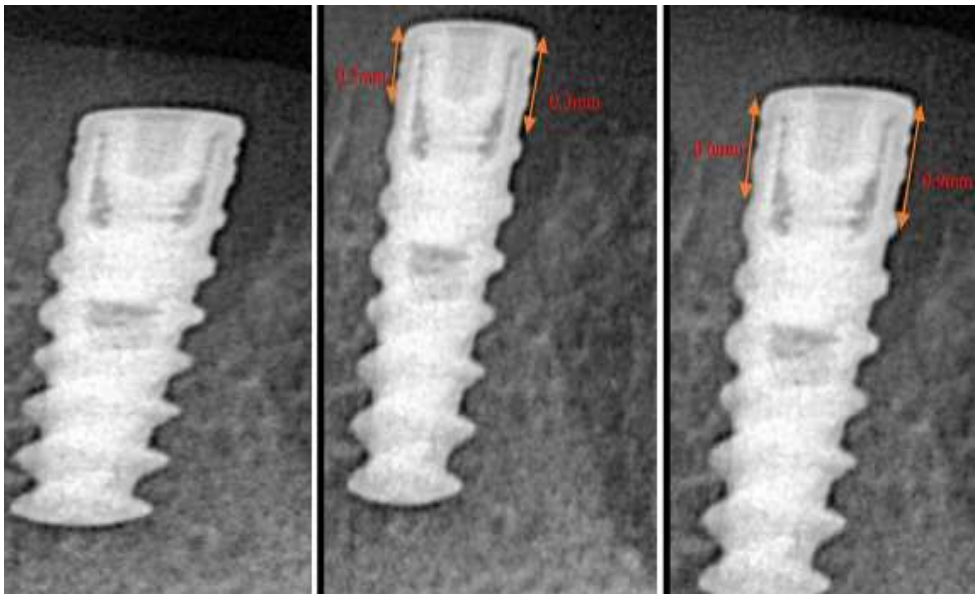


Fig 4:- RVG showing implant site 46 on follow up period a. baseline, b. 3month, c. 6month.

Statistical Analysis

The Statistical software IBM SPSS statistics 20.0 (IBM Corporation, Armonk, NY, USA) was used for the analyses of the data and Microsoft word and Excel were used to generate graphs, tables etc**.**

Descriptive and inferential statistical analyses were carried out in the present study. Results on continuous measurements were presented on Mean ± SD. Level of significance was fixed at p=0.05 and any value less than or equal to 0.05 was considered to be statistically significant.

Student t tests (two tailed, paired and unpaired) were used to find the significance of study parameters on continuous scale within and between two groups (Intra and Intergroup analysis). Repeated measures Analysis of variance (RM - ANOVA) was used to find the significance of study parameters within the group at different time intervals (Intra group analysis).

Results:-

Table 1:- Comparison of bleeding index values in terms of {Mean (SD)} at different time intervals among both the groups using unpaired t test.

Bleeding index	Group	N	Mean	Std. Deviation	t value	p value
3 months	Flap elevation	10	.8000	.15811	0.612	0.548
	Flapless	10	.7500	.20412		
6 months	Flap elevation	10	.6250	.17678	0.739	0.470
	Flapless	10	.5750	.12076		

($p < 0.05$ - Significant*, $p < 0.001$ - Highly significant**)

Graph 1:- Comparison of bleeding index values in terms of {Mean (SD)} at different time intervals among both the groups using unpaired t test.

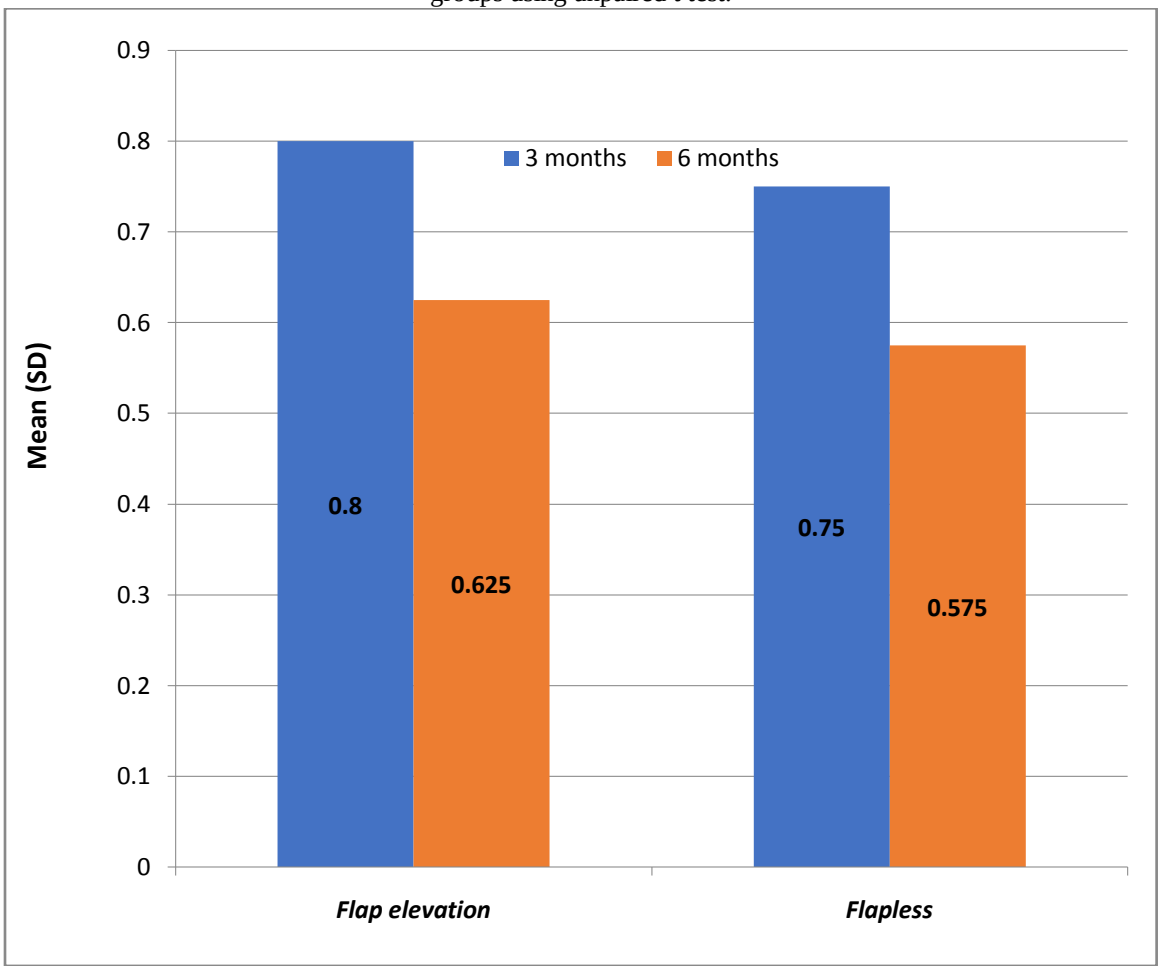


Table 2:- Comparison of probing index values in terms of {Mean (SD)} at different time intervals among both the groups using unpaired t test.

Probing index	Group	N	Mean	Std. Deviation	t value	p value
3 months Average	Flap elevation	10	3.4250	.28988	2.621	0.017*
	Flapless	10	3.1375	.19049		
3 months Average	Flap elevation	10	3.4250	.28988	2.621	0.017*
	Flapless	10	3.1375	.19049		

($p < 0.05$ - Significant*, $p < 0.001$ - Highly significant**)

Graph 2:- Comparison of probing index values in terms of {Mean (SD)} at different time intervals among both the groups using unpaired t test.

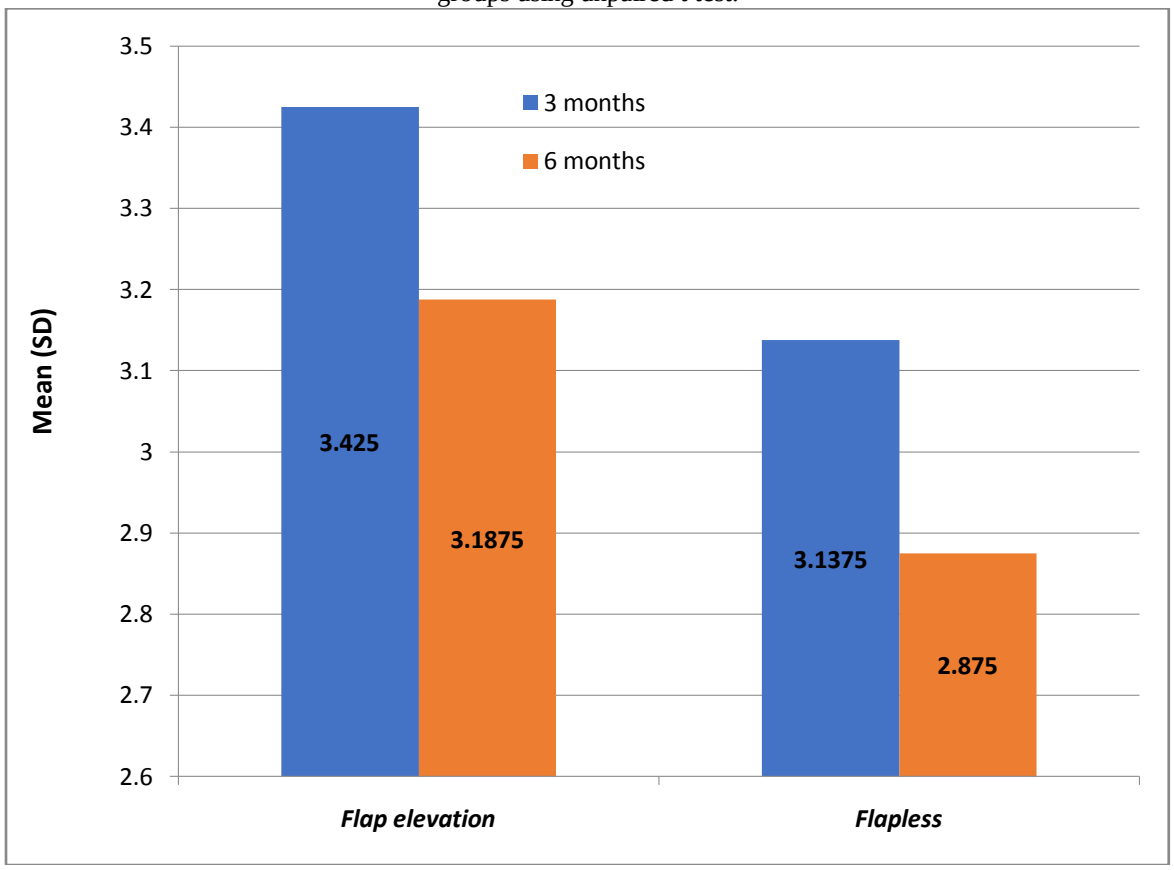


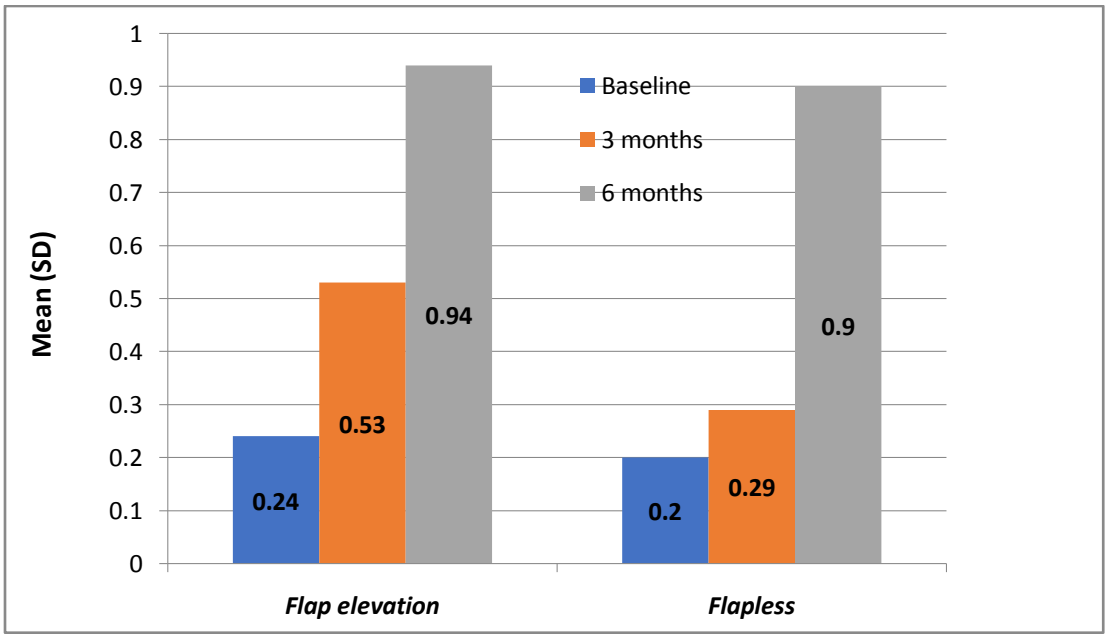
Table 3:- Comparison of bone loss values in terms of {Mean (SD)} at different time intervals among both the groups using unpaired t test.

Bone loss	Group	N	Mean	Std. Deviation	t value	p value
3 months Mesial	Flap elevation	10	.5300	.11595	5.522	<0.001**
	Flapless	10	.2900	.07379		
3 months Distal	Flap elevation	10	.5600	.12649	5.422	<0.001**
	Flapless	10	.2800	.10328		
6 months Mesial	Flap elevation	10	.9400	.16465	0.647	0.526
	Flapless	10	.9000	.10541		
6 months Distal	Flap elevation	10	.7400	.20111	1.152	0.264
	Flapless	10	.6500	.14337		

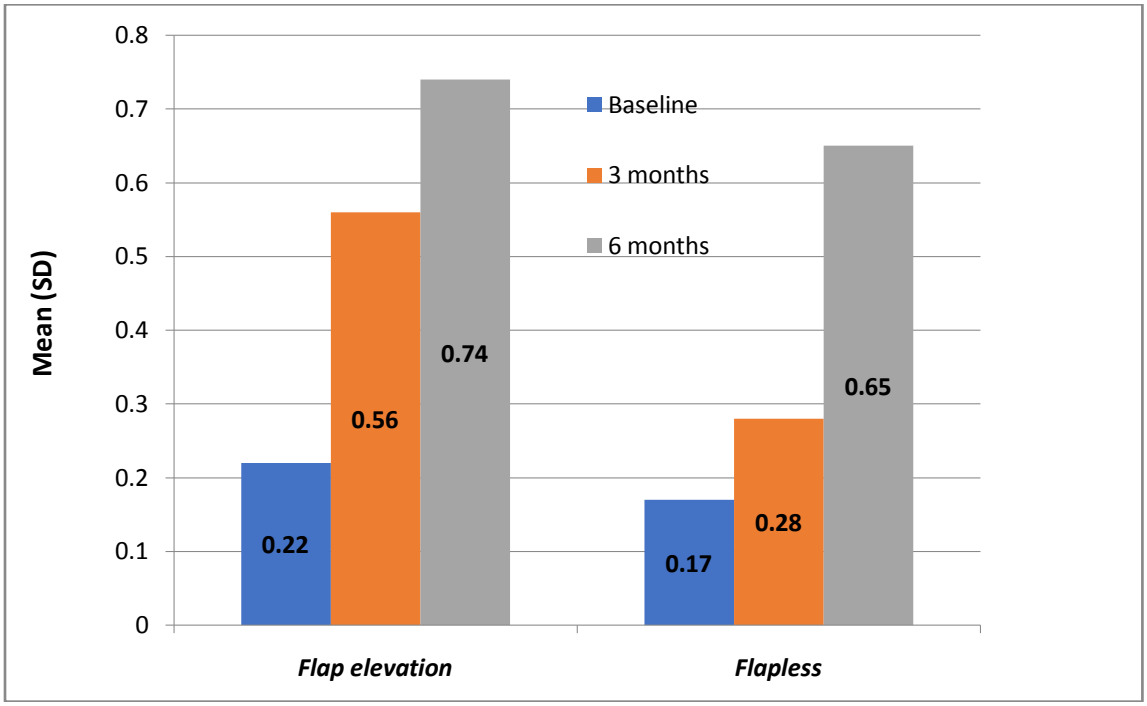
($p < 0.05$ - Significant*, $p < 0.001$ - Highly significant**)

Graph 3:- Comparison of bone loss values in terms of {Mean (SD)} at different time intervals among both the groups using unpaired t test

Mesial Bone Loss



Distal Bone Loss



1. The **bleeding index** scores based on the Sulcular Bleeding Index were higher in the flap elevation groups at 3month and 6month as compared to the flapless method group but the difference was statistically non - significant. (Table 1, Graph 1).
2. The **probing depth** was higher in the flap elevation method as compared to the flapless method at the3month and 6month. The difference between the groups was statistically significant at 3month and 6month. (Table 2, Graph 2).

3. The **crestal bone loss** on mesial side and distal side was higher in the flap elevation methods at Baseline, 3month and 6month as compared to the flapless methods and the difference was statistically significant at the 3month. (Table 3, Graph 3).

Discussion:-

In the present study, the **Bleeding Index** was recorded using the index described by **Mombelli A et al**.[9]The bleeding index scores based on the Sulcular Bleeding Index were higher in the flap elevation groups at 3month and 6month as compared to the flapless method group but the difference was statistically non - significant. The result of the present study is in accordance with the study conducted by **Rajpal et al**[10]whoshowed thatthe mean modified bleeding index was higher for the flap technique than the flapless technique from baseline to 6 months, and it was statisticallysignificant at different periods.

The **Probing depth** was higher in the flap elevation method as compared to the flapless method at the 3rd month and 6th month. The difference between the groups was statistically significant at 3month and 6month. According to the study of **Vikhe DM**[11] **et al**, peri-implant probing depth up to 3 mm around implants was considered "healthy." In our study, at all time periods, the peri-implant probing depth was between 1-3 mm, indicating that the implant mucosa was kept in a healthy condition from the beginning of the present study.

The bone loss on mesial side and distal side was higher in the flap elevation methods at 3month and 6month as compared to the flapless methods and the difference was statistically significant at the 3month.According to **Singh P et al**[12] crestal bone loss of upto 1mm during first year of implant service and thereafter annual bone loss of 0.1 mm, has been accepted.

Shibu et al[13] found that flapless implant surgery has improved crestal bone levels and osseointegration compared with the conventional technique. A study by **Abdul-Saheb et al**[14] concluded that the flapless implant placement ensures less bone level reduction when compared with the flap technique. The findings of the present study demonstrate that the mean bone loss was less after flapless implant surgery and that no implants failed to osseointegrate. The lower rate of crestal bone loss in the present study may be due to use of a tissue punch that was narrower than the implant itself. Another explanation for the high success rate may be that when flaps are not reflected, the periosteum is preserved, which may help to optimize the healing of the peri-implant tissue. Therefore, the flapless technique can be considered as a better treatment approach for the placement of implants. **Shamsan et al**[15] reported that mean crestal bone loss was less in flapless technique than inthe conventional flap group. **Job et al**[16] and **Divakar et al**[17]concluded that flapless implant surgery results in lesser loss of marginal bone and results in better patient comfort when compared with the flap technique, provided that proper patient selection is essential for carrying out flapless implant surgery. **Cannizzaro et al**[18]reported that peri-implant crestal bone loss in both flap and flapless techniques had no statistically significant differences at baseline and 1 year after loaded. **Becker et al**[19] also noted non-significant bone loss around implants placed with flapless technique until 2 years. **De Bruyn et al**[20] observed that there was a significant difference in bone loss between flap and flapless groups.

Gomez and Roman[21] supported the results of the present study by reporting that whenever it comes to marginal bone, higher bone loss rates usually occur with widely mobilized surgical flap sites where the interdental bone in the proximity to the implant is denuded from the periosteum thus affecting the nutrition of the bone and papillae, thus resulting in unpredictable degree of resorption of the interproximal marginal bone.

Crestal bone loss not just depends upon the flap or flapless technique of implant placement but there are numerous other factors which plays an important role in crestal bone loss. However, further trials involving a larger sample size, longer follow-up period, comparative evaluation and more standardization and protocols are necessary before this implant placement protocol can be decisively declared superior to the conventional flap procedure.

Conclusion:-

According to the results of thisstudy, the null hypothesis for the present study was partially accepted as radiographically bone loss on mesial side and distal side was higher in the flap elevation methods at 3month and 6month as compared to the flapless methods and the difference was statistically significant at the 3month.

References:-

1. C. A. A. Lemos, F. R. Verri, R. S. Cruz, J. M. L. Gomes, D. M. dos Santos, M. C. Goiato, E. P. Pellizzer: Comparison between flapless and open-flap implant placement: a systematic review and meta-analysis, Int. J. Oral Maxillofac. Surg. 2020; 49: 1220– 1231.
2. Al-juboori. Flap procedures for implant related surgical procedures: A review. Implant dentistry 2016;25:845-54.
3. Job S, Bhat V. An insight into flapless implant placement technique. J Indian Prosthodont Soc 2008;8:140-3.
4. Tarnow DP, Magner AW, Fletcher P. The effect of the distance from the contact point to the crest of bone on the presence or absence of the interproximal dental papilla. J Periodontol1992;63:995-6.
5. Asadollahi R, Khan M, Yahyazadehfar N, Kaouhestani, Tehrani Z. Dental implant placement with flapless and flapped technique: A systemic review. J Oral Res 2018;7:324-35.
6. Brodala N. Flapless surgery and its effect on dental implant outcomes. Int J Oral Maxillofac Implants 2009;24 Suppl:118-25.
7. Brodala N. Flapless surgery and its effect on dental implant outcomes. Int J Oral Maxillofac Implants 2009;24 Suppl:118-25.
8. Fortin T, Bosson JL, Isidori M, Blanchet E. Effect of flapless surgery on pain experienced in implant placement using an image-guided system. Int J Oral Maxillofac Implants 2006;21:298–304.
9. Mombelli A, Van Oosten MAC, Schürch E, Lang NP. The microbiota associated with successful or failing osseointegrated titanium implants. Oral Microbiol Immunol 1987;2:145–51.
10. Rajpal J, Gupta KK, Tandon P, Srivastava A, Chandra C. Assessment of hard and soft tissue changes around implants: a clinico-radiographic in vivo study. J Dent Implant 2014;4:126-34.
11. Vikhe DM, Tambe SD, Mascarenhas R, Bawane S, Jadhav R, Kathariya R. Assessment of Crestal Bone Loss Surrounding the Implant before Prosthetic Loading of Dental Implant Systems: A Pilot Study. Journal of International Oral Health. 2016 Dec 1;8(12):1110.
12. Singh P, Garge H G, Parmar V S, Viswambaran M, Goswami M M. Evaluation of implant stability and crestal bone loss around the implant prior to prosthetic loading: A six month study. J Indian Prosthodont Soc 2006;6:33-7.
13. Job S, Bhat V, Naidu EM. In vivo evaluation of crestal bone heights following implant placement with flapless and with flap techniques in sites of immediately loaded implants. Indian J Dent Res 2008;19:320-3.
14. Abdul-Saheb A, Abdul-Saheb R, Fatihallah A. Comparison Between Flapped and Flapless Implant Techniques by Measuring Crestal Bone Level: A Prospective Radiographical Trial. Iraqi Dent. J. 2015; 37(2):51-55.
15. Shamsan YA, Eldibany RM, Halawani GN, Fahmy RA. Flapless versus conventional flap approach for dental implant placement in the maxillary esthetic zone. Alex Dent J 2018;43:80-5.
16. Job S, Bhat V, Naidu EM. In vivo evaluation of crestal bone heights following implant placement with flapless and with flap techniques in sites of immediately loaded implants. Indian J Dent Res 2008;19:320-3.
17. Divakar TK, Arularasan SG, Baskaran M, Packiaraj I, Kumar ND. Clinical evaluation of placement of implant by flapless technique over conventional flap technique. J Maxillofac Oral Surg 2019;11:301-19.
18. Cannizzaro G, Felice P, Leone M, Checchi V, Esposito M. Flapless versus open flap implant surgery in partially edentulous patients subjected to immediate loading: 1-year results from a split-mouth randomised controlled trial. Eur J Oral Implantol. 2011 Autumn;4(3):177-88.
19. Becker W, Goldstein M, Becker BE, Sennerby L. Minimally Invasive Flapless Implant Surgery:A Prospective Multicenter Study. Clin Implant Dent Relat Res 2005;7:21-7.
20. Bruyn D, Atashkadeh M, Cosyn J, Velde TV. Clinical outcome and bone preservation of single Ti Unite implants installed with flapless or flap surgery. Clin Implant Dent Relat Res 2009;13:175-83.
21. Gomez-Roman G. Influence of flap design on peri-implant interproximal crestal bone loss around single-tooth implants. Int J Oral Maxillofac Implants 2001;16:61–67.