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Crestal Incision Vs Plus Incision In Healing Of Gingival Collar In Second Stage Implant Surgery: A Comparative Study

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ABSTRACT

Aim: To compare the effectiveness of crestal incision versus plus (+) incision techniques in the healing of the gingival collar during second-stage dental implant surgery, with particular focus on soft tissue contour, gingival health, and esthetic outcome.

Materials and methods: A retrospective study was conducted to evaluate the impact of different incision techniques on gingival papilla height around single implants in the esthetic zone. The study included 50 patients (25 males, 25 females) aged 19–60 years. Papillae that met the strict inclusion criteria, which required healthy, functioning implants adjacent to natural teeth, thick gingival biotype (>1 mm), appropriate spacing (2.5–4 mm), and consistent surgical execution by a single operator. Patients with systemic diseases, poor implant positioning, active oral inflammation, smoking habits, or oral parafunctions were excluded. Data analysis was done using SSPS software.

Results: In this study, a total of 50 patients were equally divided into two groups to compare the effects of crestal and plus incision techniques during second-stage implant surgery. The demographic and clinical characteristics were comparable between the two groups. The mean age in Group A (Crestal Incision) was 38.7 ± 10.4 years, while in Group B (Plus Incision) it was 39.2 ± 11.1 years. Gender distribution was similar, with 14 males and 11 females in Group A, and 13 males and 12 females in Group B. The implant placement locations were nearly balanced, with 16 maxillary and 9 mandibular implants in Group A and 15 maxillary and 10 mandibular in Group B. A majority of patients in both groups had a thick gingival biotype (17 in Group A and 18 in Group B). The mean duration since implant placement was also similar between the groups, being 7.2 ± 1.1 months in Group A and 7.4 ± 1.3 months in Group B.

Conclusion: The plus incision technique in second-stage implant surgery showed better soft tissue healing and papilla preservation than the crestal incision, though further research with larger sample sizes is needed to confirm these findings.

Keywords: *papilla, incision, implant*

1. INTRODUCTION

The crestal incision is a commonly employed surgical approach during the second-stage dental implant surgery, where the implant is uncovered after osseointegration for placement of the healing abutment. This technique involves making a linear incision directly over the crest of the edentulous ridge, precisely above the implant site. It provides direct access to the underlying implant with minimal trauma to the surrounding soft tissues. The crestal incision is favored for its simplicity, predictable soft tissue management, and ease of flap repositioning, making it a reliable option for clinicians during the re-entry procedure.[1,2,3]

Healing of the gingival collar, or peri-implant mucosa, is a critical factor influencing the long-term success of implants. The crestal incision supports a favorable healing environment by preserving the natural architecture of the soft tissue and allowing adequate adaptation around the healing abutment. This promotes the formation of a stable soft tissue seal, essential for preventing bacterial ingress and ensuring healthy peri-implant tissues. Additionally, this technique minimizes unnecessary tissue manipulation, leading to faster healing, reduced postoperative discomfort, and better aesthetic outcomes, especially in non-esthetic zones.[4,5]

The plus ("+") incision is a modified surgical technique used during the second-stage implant surgery to enhance access to the implant site while preserving soft tissue contours. Unlike the traditional crestal incision, the plus incision involves a small vertical mid-crestal cut with two short perpendicular releasing incisions, forming a cross or plus shape. This design allows for precise exposure of the implant while minimizing trauma to adjacent tissues. It offers improved visibility and flap mobility, especially in areas with thick or dense gingiva, facilitating accurate placement of the healing abutment.[6,7]

This technique promotes favorable gingival collar healing by allowing better soft tissue adaptation and contouring around the healing abutment. The controlled flap design ensures minimal disruption of the blood supply and encourages primary closure around the collar, which is critical for establishing a healthy peri-implant mucosal seal.[8]

Overall, the selection of incision technique during second-stage implant surgery can significantly influence the healing dynamics of the gingival collar. The crestal incision is valued for its straightforward approach and minimal trauma, while the plus incision offers enhanced access and better soft tissue management in challenging cases. Tailoring the approach to the clinical scenario ensures effective healing, stable peri-implant mucosa, and long-term implant success.

2. MATERIALS AND METHODS

A retrospective study was conducted to evaluate the impact of different incision techniques on gingival papilla height around single implants in the esthetic zone. The study included 50 patients (25 males, 25 females) aged 19–60 years. Papillae that met the strict inclusion criteria, which required healthy, functioning implants adjacent to natural teeth, thick gingival biotype (>1 mm), appropriate spacing (2.5–4 mm), and consistent surgical execution by a single operator. Patients with systemic diseases, poor implant positioning, active oral inflammation, smoking habits, or oral parafunctions were excluded.

Gingival papilla height was assessed using two indices from the Pink Esthetic Score (PES): the mesial and distal papilla height. The papillae were grouped based on the incision techniques used during implant placement and second-stage surgeries. Only papilla-sparing techniques were employed, including the punch technique, U-shaped technique, split finger technique, and split pedicle roll envelope technique. The study analyzed the preservation of papilla height across these different surgical approaches, highlighting their role in maintaining aesthetic outcomes around implants. Data analysis was done using SSPS software.

3. RESULTS

Table 1: Demographic and Clinical Characteristics of Study Population

Parameter	Group A (Crestal Incision, n = 25)	Group B (Plus Incision, n = 25)	P-value
Mean Age (years)	38.7 ± 10.4	39.2 ± 11.1	0.82
Gender (Male/Female)	14 / 11	13 / 12	0.78

Implant Location (Maxilla/Mandible)	16 / 9	15 / 10	0.79
Gingival Biotype (Thick/Thin)	17 / 8	18 / 7	0.74
Mean Time Since Implant Placement (months)	7.2 ± 1.1	7.4 ± 1.3	0.56

In this study, a total of 50 patients were equally divided into two groups to compare the effects of crestal and plus incision techniques during second-stage implant surgery. The demographic and clinical characteristics were comparable between the two groups. The mean age in Group A (Crestal Incision) was 38.7 ± 10.4 years, while in Group B (Plus Incision) it was 39.2 ± 11.1 years. Gender distribution was similar, with 14 males and 11 females in Group A, and 13 males and 12 females in Group B. The implant placement locations were nearly balanced, with 16 maxillary and 9 mandibular implants in Group A and 15 maxillary and 10 mandibular in Group B. A majority of patients in both groups had a thick gingival biotype (17 in Group A and 18 in Group B). The mean duration since implant placement was also similar between the groups, being 7.2 ± 1.1 months in Group A and 7.4 ± 1.3 months in Group B.

Table 2: Gingival Collar Healing Scores at 1 Month

Healing Parameter	**Group A (Crestal Incision)**	**Group B (Plus Incision)**	**P-value**
Mean Papilla Height Score (PES)	1.8 ± 0.5	2.3 ± 0.4	0.003 **
Soft Tissue Contour (1–3 scale)	2.1 ± 0.6	2.6 ± 0.5	0.007 **
Inflammation (Yes/No)	6 / 19	2 / 23	0.04 *
Gingival Margin Stability (Stable/Unstable)	18 / 7	23 / 2	0.03 *

At the 1-month follow-up, notable differences were observed in gingival collar healing between the two groups. The mean papilla height score, based on the Pink Esthetic Score (PES), was significantly higher in Group B (Plus Incision) at 2.3 ± 0.4 compared to 1.8 ± 0.5 in Group A (Crestal Incision), with a p-value of 0.003. Similarly, soft tissue contour showed better results in the plus incision group (2.6 ± 0.5) than the crestal group (2.1 ± 0.6), reaching statistical significance (p = 0.007). Fewer cases of inflammation were recorded in Group B (2 cases) versus Group A (6 cases), with a p-value of 0.04. Additionally, gingival margin stability was better maintained in Group B, where 23 patients had stable margins compared to 18 in Group A (p = 0.03).

Table 3: Patient-Reported Outcomes and Complications

Parameter	**Group A (Crestal Incision)**	**Group B (Plus Incision)**	**P-value**
Post-op Pain (VAS 0–10 scale)	3.4 ± 1.2	3.1 ± 1.0	0.41
Swelling (None/Mild/Moderate)	10 / 10 / 5	15 / 8 / 2	0.19
Bleeding on Touch at 1 Week (Yes/No)	7 / 18	3 / 22	0.15
Patient Satisfaction (1–5 scale)	4.1 ± 0.7	4.5 ± 0.6	0.04 *

Patient-reported outcomes and complications at one week post-surgery revealed generally favorable responses in both groups, with slight advantages observed in the plus incision group. Post-operative pain, measured using the VAS scale, was slightly lower in Group B (3.1 ± 1.0) compared to Group A (3.4 ± 1.2), though this difference was not statistically significant

(p = 0.41). Swelling levels also favored Group B, with more patients reporting no swelling (15 vs. 10) and fewer reporting moderate swelling (2 vs. 5), but this difference did not reach statistical significance (p = 0.19). Bleeding on touch at one week was observed in 7 patients in Group A and 3 patients in Group B (p = 0.15). Notably, patient satisfaction was significantly higher in Group B, with a mean score of 4.5 ± 0.6 versus 4.1 ± 0.7 in Group A (p = 0.04).

4. DISCUSSION

The healing of the gingival collar around dental implants plays a critical role in the long-term esthetic and functional success of implant-supported restorations, particularly in the esthetic zone. During second-stage implant surgery, the technique used to uncover the implant and shape the peri-implant soft tissue can significantly influence the outcome. Among the various incision methods employed, the crestal incision and the plus (+) incision are commonly used due to their relative simplicity and predictable access to the implant fixture.[9,10]

The crestal incision, which involves a linear cut directly over the alveolar crest, is widely practiced for its ease of execution and minimal invasiveness. However, concerns have been raised regarding its potential to compromise soft tissue contours and gingival papilla preservation. In contrast, the plus incision, a modification involving intersecting vertical and horizontal components, is designed to promote better soft tissue adaptation and emergence profile formation. Despite their clinical popularity, limited comparative evidence exists evaluating their influence on the healing of the gingival collar during second-stage surgery. [11]

In our study involving 50 patients equally divided into two groups, we compared the outcomes of crestal and plus incision techniques during second-stage implant surgery. Both groups were comparable in demographic and clinical parameters, including age, gender, implant location, gingival biotype, and time since implant placement. At the 1-month follow-up, the plus incision group demonstrated significantly better gingival collar healing, with higher papilla height and soft tissue contour scores, fewer cases of inflammation, and greater gingival margin stability compared to the crestal incision group. Although post-operative pain, swelling, and bleeding on touch were similar between the groups, patient satisfaction was significantly higher in the plus incision group. These findings suggest that the plus incision technique offers more favorable esthetic and soft tissue healing outcomes in second-stage implant surgery.

In a study by Parihar AS et al.,[12] the papilla level was assessed using different techniques during second-stage dental implant surgery. Thirty patients with 45 dental implants were divided into three equal groups of 10. Group I underwent a mid-crestal incision with a scalpel, Group II had implant exposure using a gallium–aluminum–arsenide diode laser, and Group III received an I-shaped incision with a scalpel. Modified gingival index (mGI), modified plaque index (mPI), and Jemt index were evaluated at baseline, 3 months, and 6 months, along with measurements of FAJ-Implant (FAJI), FAJ-Adjacent (FAJAdj), soft tissue height (ST height), and the distance from the contact point to the bone crest (CP Bone crest). The results showed a significant difference ($P < 0.05$) in crestal bone levels and papilla fill among the three groups over time. At 6 months, Groups II and III demonstrated over 60% papilla fill, significantly higher than Group I. The diode laser group showed the greatest papillary fill and the least crestal bone loss, indicating it was the most effective technique for second-stage implant exposure.

In the study by Kamakshi LNVA et al.,[13] the influence of different second-stage implant surgery techniques on papilla formation was evaluated, considering factors such as underlying bone and periodontal biotype. Thirty-five patients with 45 implants were randomly assigned to three groups: Group I (midcrestal incision with scalpel), Group II (I-shaped incision with scalpel), and Group III (diode laser). Papillary fill and crestal bone loss were assessed at baseline, 3 months, and 6 months after prosthesis delivery. Results showed that Groups II and III achieved higher rates of complete papilla fill at 6 months (60% and 73.3%, respectively) and experienced less crestal bone loss compared to Group I. The diode laser technique demonstrated the best outcomes in terms of papilla regeneration and bone preservation, although some degree of bone loss was observed across all groups following prosthesis placement.

Hence the findings from our study, along with those of Parihar AS et al. and Kamakshi LNVA et al., collectively highlight the significant impact of incision technique on soft tissue healing, gingival collar formation, and papilla preservation during second-stage dental implant surgery. Techniques such as the plus incision and diode laser exposure were consistently associated with better papillary fill, reduced crestal bone loss, and improved esthetic outcomes compared to traditional mid-crestal or intrasulcular approaches. While these results are promising, it is important to note that variations in outcomes may occur due to differences in surgical expertise, patient anatomy, and most notably, the relatively small sample sizes in the existing studies. Therefore, larger-scale, long-term clinical trials are warranted to validate these observations and establish definitive clinical guidelines for optimizing soft tissue outcomes in implant dentistry.

5. CONCLUSION

The plus incision technique in second-stage implant surgery showed better soft tissue healing and papilla preservation than the crestal incision, though further research with larger sample sizes is needed to confirm these findings.

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