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# Tissue Response Under The Ridgelap And Modified Ridgelap Pontic Regarding Plaque Accumulation And Food Impaction

[*]Dr. Md. Ali Afzal Khan[1], Dr. Kazi Ziaul Islam[2], Dr. Newaz Mohsina[3]
[1]*Associate Professor and Head, Department of Prosthodontics, Update Dental College and Hospital, Dhaka, Bangladesh*
[2]*Professor And Principal, Saphena Women's Dental College and Hospital, Dhaka, Bangladesh*
[3]*Dental Surgeon and In-Charge, Casualty Department, Department of Oral and Maxillofacial Surgery, Dhaka Dental College and Hospital, Dhaka, Bangladesh*

***Abstract***
***Background:*** *The pontic, a crucial part of a fixed partial denture, is designed to restore function, esthetics, and support hygiene while minimizing trauma to underlying tissues. This study aimed to evaluate the tissue response and hygiene outcomes beneath ridgelap and modified ridgelap pontics over time.*
***Aim of the study:*** *The aim of the study was to evaluate tissue response under ridgelap and modified ridgelap pontics in relation to plaque accumulation and food impaction.*
***Methods:*** *This observational study was conducted at the Department of Prosthodontics, Faculty of Dentistry, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, from January 2007 to December 2008. Forty patients with missing mandibular first molars were divided into two groups: Group A (n=20) received fixed partial dentures with conventional ridgelap pontics, and Group B (n=20) received modified ridgelap pontics. Patients underwent tooth preparation, impressions, and temporary cementation for follow-up evaluations.*
***Results:*** *The study compared plaque accumulation and food impaction between ridge lap (Group A) and modified ridge lap pontics (Group B) over 6 weeks, 12 weeks, and 6 months. Group B showed significantly better outcomes, with higher proportions of Grade I (no plaque/food impaction) and no Grade IV cases, indicating superior hygiene and food entrapment control. Statistically significant differences were found at all intervals (p = 0.001), confirming that modified ridge lap pontics performed better than ridge lap pontics in both plaque accumulation and food impaction.*
***Conclusion:*** *Modified ridgelap pontic design improves soft tissue outcomes, mucosal health, and biocompatibility in fixed partial dentures for missing mandibular first molars.*
***Keywords:*** *Ridgelap Pontic, Modified Ridgelap Pontic, Tissue Response, Plaque Accumulation, Food Impaction.*
***Corresponding Author:*** Dr. Md. Ali Afzal Khan, Associate Professor and Head, Department of Prosthodontics, Update Dental College and Hospital, Dhaka, Bangladesh

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## I. Introduction

The pontic, a component of a fixed partial denture, is designed to replace missing teeth and must fulfill several essential criteria. It should restore functional efficiency, be easy to clean, remain biologically and esthetically acceptable, and provide comfort to the patient. Ridgelap pontics typically make contact with and compress the underlying tissue, whereas modified ridgelap pontics are designed to avoid direct tissue contact.

The primary role of a pontic includes withstanding masticatory forces, supporting effective oral hygiene practices, preserving the underlying soft tissue and adjacent abutment teeth, and restoring both function and esthetics [1,2]. Multiple pontic designs are employed in fixed prosthodontics. Based on shape, pontics can be categorized into ridge lap, modified ridge lap, sanitary, modified sanitary, and bar-shaped designs. From the perspective of the tissue-facing surface, types include saddle, modified saddle, conical, egg-shaped, bullet, and heart-shaped pontics. Classification based on material includes all-metal, metal-ceramic, and metal-resin combinations [3].

The ridgelap pontic features a concave surface that overlaps the alveolar ridge buccolingually, replicating the contours and emergence profile of the missing tooth across both facial and lingual aspects [4,5]. However, the saddle or full ridgelap design is generally discouraged due to its concave tissue surface, which hinders proper cleaning with dental floss. The modified ridge lap pontic combines the esthetic advantage of the saddle design

with improved hygiene, as it only contacts the ridge facially to simulate natural emergence but avoids contact on the lingual side. For optimal plaque control, the gingival surface of a pontic must be free from depressions or hollows. Proper tissue contact is crucial in pontic design [5–7].

However, excessive pressure on the alveolar mucosa should be avoided as it may result in ulceration [8,9]. While maintaining some tissue contact remains necessary, recent approaches no longer emphasize close tissue adaptation. Importantly, patient compliance with hygiene practices, particularly flossing, is often more critical than the specific pontic design itself [10,11].

Both ridgelap and modified ridgelap pontics are designed so that they do not contact the soft tissue on the lingual side of the ridge [12,13,14]. Ridgelap pontics usually have a broader area of tissue contact and are more prone to developing concavities at the interface [15-17], while the modified ridgelap pontic typically features a flatter or slightly convex surface in areas where it contacts the tissue [18,19].

This study aimed to evaluate the tissue response beneath ridgelap and modified ridgelap pontics [20,21], assess the condition of the mucous membrane in contact with the pontic's tissue surface, observe the status of the interdental papilla beneath the connector area of fixed partial dentures, and examine the periodontal health of the abutment teeth supporting the prosthesis [22,23,24].

**Objective**

The aim of the study was to evaluate tissue response under ridgelap and modified ridgelap pontics in relation to plaque accumulation and food impaction.

## II. Methodology & Materials

This observational comparative study was conducted at the Department of Prosthodontics, Faculty of Dentistry, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, from January 2007 to December 2008. We enrolled 40 consecutive patients seeking treatment for a missing mandibular first molar, dividing them equally into two groups: Group A (n=20) receiving fixed partial dentures with conventional ridgelap pontics and Group B (n=20) receiving modified ridgelap pontics with reduced mucosal contact and convex contour.

**Inclusion Criteria**

- Patients with a missing mandibular first molar.
- Ideal abutment teeth on both sides.
- Class I edentulous ridge.

**Exclusion Criteria**

- Periodontally compromised abutment teeth.
- Tilted abutment teeth.
- Deformed ridge.
- Edentulous area with recently extracted socket.

Temporary cement was used for the cementation of all prostheses, and patients were given thorough instructions on prosthesis maintenance following delivery. Tooth preparation for metal-ceramic crowns was carried out using specific armamentarium, including football or wheel-shaped diamonds for lingual reduction of anterior teeth, flat-ended tapered diamonds for shoulder preparation, and additional instruments such as finishing stones, explorers, periodontal probes, hatchets, and chisels. The preparation process followed five key steps: creating guiding grooves for occlusal reduction, performing buccal reduction in areas designated for porcelain veneering, axial reduction of proximal and lingual surfaces, and final smoothing of all prepared surfaces. Three depth grooves were made on the facial surface—one centrally and two at the mesiofacial and distofacial line angles—with reductions executed in two planes: cervical cuts parallel to the tooth's long axis and occlusal cuts conforming to the natural facial curvature. For posterior teeth, approximately 1.5 mm of reduction was performed, prioritizing structural integrity over esthetics. Buccal reduction was standardized at 1.5 mm to maintain consistency. A chamfer finish line of around 0.5 mm was created, and margins were refined using diamond or carbide instruments. Unsupported enamel was trimmed using a sharp chisel, and the rotary instrument was carefully oriented along the tooth surface. Gingival retraction cords were placed to expose the preparation margins, and hemostasis was achieved before impressions were taken using silicone impression material. Impressions were examined for defects, and satisfactory ones were used to pour models for the fabrication of the final prosthesis. Prior to final glazing, prostheses were tried in the patient's mouth to allow for any necessary adjustments. After completing the corrections, glazing was done with special attention to the interface between the ridgelap surface and the gingiva to ensure proper fit. All fixed partial dentures were initially cemented using temporary luting agents to facilitate follow-up evaluation.

## III. Results

**Table 1:** Distribution of Patients in Group A and Group B Based on Plaque Accumulation Between the Ridgelap Surface of the Pontic and the Mucosa Overlying the Edentulous Ridge at 6 Weeks, 12 Weeks, and 6 Months Follow-Up

| Grades | 6 weeks | | 12 weeks | | 6 months | |
|---|---|---|---|---|---|---|
| | Group A | Group B | Group A | Group B | Group A | Group B |
| Grade I | 3 (15%) | 15 (75%) | 1 (5%) | 14 (70%) | 1 (5%) | 17 (85%) |
| Grade II | 5 (25%) | 5 (25%) | 3 (15%) | 5 (25%) | 3 (15%) | 3 (15%) |
| Grade III | 7 (35%) | 0 (0%) | 9 (45%) | 1 (5%) | 11 (55%) | 0 (0%) |
| Grade IV | 5 (25%) | 0 (0%) | 7 (35%) | 0 (0%) | 5 (25%) | 0 (0%) |
| $\chi^2$ | 20.000 | | 24.167 | | 32.000 | |
| **p-value** | 0.001 | | 0.001 | | 0.001 | |

The study evaluated plaque accumulation between the ridge lap surface of the pontic and the mucosa overlying the edentulous ridge in two groups—Group A (ridge lap pontic) and Group B (modified ridge lap pontic). Plaque was assessed at 6 weeks, 12 weeks, and 6 months postoperatively. Grades were assigned based on Caranza et al. [4]: Grade I indicated no plaque in the gingival area; Grade II, a film of plaque adhering to the free gingival margin; Grade III, moderate soft deposits visible to the naked eye; and Grade IV, abundant soft matter within the gingival pocket or on the margin. Over time, Group B consistently showed higher proportions of Grade I cases and no Grade IV cases, indicating better hygiene outcomes. Chi-square values at each follow-up interval were statistically significant ($p = 0.001$), confirming a notable difference in plaque accumulation between the two pontic designs.

**Table 2:** Distribution of Patients in Group A and Group B Based on the Condition of Food Impaction Between the Ridgelap Surface of the Pontic and the Mucosa Overlying the Edentulous Ridge at 6 Weeks, 12 Weeks, and 6 Months Follow-Up

| Grades | 6 weeks | | 12 weeks | | 6 months | |
|---|---|---|---|---|---|---|
| | Group A | Group B | Group A | Group B | Group A | Group B |
| Grade I | 3 (15%) | 15 (75%) | 2 (10%) | 15 (75%) | 1 (5%) | 17 (85%) |
| Grade II | 5 (25%) | 5 (25%) | 4 (20%) | 5 (25%) | 3 (15%) | 3 (15%) |
| Grade III | 7 (35%) | 0 (0%) | 9 (45%) | 0 (0%) | 11 (55%) | 0 (0%) |
| Grade IV | 5 (25%) | 0 (0%) | 5 (25%) | 0 (0%) | 5 (25%) | 0 (0%) |
| $\chi^2$ | 20.000 | | 24.052 | | 27.467 | |
| **p-value** | 0.001 | | 0.001 | | 0.001 | |

The condition of food impaction between the ridge lap surface of the pontic and the underlying edentulous mucosa was examined at 6 weeks, 12 weeks, and 6 months postoperatively in Group A (ridge lap pontic) and Group B (modified ridge lap pontic). The grading was based on Caranza et al.[4]: Grade I indicated no food impaction in the gingival area; Grade II, slight impaction requiring little effort to remove; Grade III, moderate impaction needing some effort; and Grade IV, severe food entrapment requiring considerable effort for removal. Group B showed a significantly higher number of Grade I cases across all time points, with complete absence of Grades III and IV, reflecting superior design in minimizing food entrapment. In contrast, Group A had a higher frequency of severe impaction grades. The chi-square test showed statistically significant differences at all intervals ($p = 0.001$), confirming that modified ridge lap pontics resulted in significantly less food impaction compared to ridge lap pontics.

## IV. Discussion

This comparative study aimed to assess the condition of the mucosal tissue in patients fitted with either ridgelap or modified ridgelap pontics. Conducted at the Department of Prosthodontics, BSM Medical University, Shahbag, Dhaka, the study spanned from January 2007 to December 2008 and involved patients who sought treatment for missing teeth.

In Group A, the pontic design did not extend lingually beyond the ridge crest, but the undersurface showed more pronounced concavity with a comparatively larger tissue contact area. Conversely, in Group B, the pontic's contact was limited to the midline of the edentulous ridge, with the tissue-facing surface shaped to be either flat or slightly convex.

When evaluating mucosal tissue response beneath the pontic surface, Group B patients exhibited better tissue adaptation and tolerance than those in Group A. Based on these observations, the modified ridgelap pontic appeared to offer more favorable results than the traditional ridgelap design.

A related investigation by Stein et al.[12] reported that, at a two-week follow-up, 20.8% of ridgelap pontic cases were graded as Grade II and 13.8% as Grade IV. Similarly, Crispin et al.[9] documented a positive

tissue response to denture base pontics after one month, with mucosa remaining healthy and free from signs of ulceration or inflammation.

Hirshberg et al.[21] observed that, following a 12-month review, patients with ridgelap pontics presented varying levels of mucosal response—8 were in Grade I, 46 in Grade II, 18 in Grade III, and 4 in Grade IV. He noted that although ridgelap pontics were initially tolerated, inflammation developed over time. Transitioning to modified ridgelap pontics helped resolve the inflammation, indicating the superiority of the modified design for maintaining soft tissue health.

In terms of abutment tooth condition relative to the pontic's tissue contact, no significant differences were noted between Group A and Group B at the six-week mark. However, follow-ups at 12 weeks and six months revealed better results in Group B. Thus, both pontic designs may be considered acceptable for short-term use.

In a supporting study, Tolboe et al.[24] reported that five patients developed soft tissue indentations accompanied by hypertrophy and pocket formation near the pontic sites. Using the modified gingival index and mucosal exudation index, they identified mild to moderate inflammation, particularly in cases where oral hygiene in the pontic region was insufficient.

**Limitations of the study**

This study had some limitations:

- The study was conducted in a selected tertiary-level hospital.
- The sample was not randomly selected.
- The study's limited geographic scope may introduce sample bias, potentially affecting the broader applicability of the findings.

## V. Conclusion

This observational comparative study concludes that the modified ridgelap pontic design in fixed partial dentures for missing mandibular first molars results in improved soft tissue outcomes. Specifically, it demonstrated enhanced mucosal health beneath the pontic, better preservation of interdental papillae, and improved condition of the abutment teeth. The interface between the pontic's ridge surface and the mucosa overlying the edentulous ridge showed superior adaptation and tissue response, suggesting greater clinical success and biocompatibility with this pontic design in fixed prosthodontic rehabilitation.

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