Papillary Reconstruction: A Hope For Correcting Black Triangle

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**ABSTRACT**

**Aim:** To evaluate modified beagle technique for interdental papilla reconstruction in maxillary anterior teeth region.

**Materials and Methods:** Patient were selected between age group of 20–35 years and having index score ‘1’ or ‘2’ according to Jemt’s classification in the maxillary anterior interdental areas. Patients were treated with modified beagle technique for papilla reconstruction and recalled at 1 week, 1 month, 3 months postoperatively. Parameters including plaque index (PI), Gingival index (GI), Sulcus depth, Contour of interdental tissues were recorded preoperatively and postoperatively.

**Results:** At 3 months followup, there is increase in papillary height which significantly fill open embrasure as compared to baseline. There is increase in GI and PI score at 1 week postoperatively, which reduces on further followup. Crevicular sulcus depth increases at 3 month followup which can be easily maintained. In present study, the interdental papillae completely obliterated the open embrasure.
INTRODUCTION:
In today’s world people are more concern about their esthetic which make them more confident and self-dependent. In esthetic dentistry, smile plays an important role. A smile is an harmonious relationship between the teeth, periodontium and perioral structures. At the point when a disharmony exists between any of these segments, it brings about unaesthetic smile. Periodontitis is the main reason for causing disharmony between these structures. Conventionally, aim of periodontal treatment dependably goes for saving and reestablishing periodontal wellbeing instead of accomplishing aesthetic results. Most surgical modalities performed are directed towards pocket elimination and functional regeneration in the periodontium. Periodontal surgical procedures results in broad loss of gingiva both around the radicular and in addition the interdental regions, prompting extensive, open embrasures. Thus, despite of our achievement in periodontal health, we often fail to deliver cosmetically excellent results in the form of interproximal spacing, open embrasures, elongated crowns and root exposure. This loss of interdental papillae commonly known as “black holes” or “black triangles” may cause functional, phonetic and devastating esthetic problem. These black triangle may further leads to food lodgement and esthetic consciousness. In past, different techniques have been employed to reconstruct the papilla by orthodontic treatments, by the use of prosthesis or by surgical methods. Here in this present case series, we used variant of beagle technique for papilla reconstruction in maxillary anterior teeth region.

MATERIALS AND METHODS
The present case series comprised of 10 sites with open embrasures. The age of the patients ranged from 18-35 years, with the mean of 26 years. The patients were selected from the Out Patient Department of Periodontia, at Govt. Dental College and Hospital, Ahmedabad, India.

SITE SELECTION
Presence of atleast one open embrasure with the contour of interdental tissues having index score ‘1’ or ‘2’ in the maxillary anterior interdental areas [Figure 1] with complain of food lodgment and unaesthetic smile. Adequate zone of attached gingiva with minimal probing depth adjacent to the open embrasure is required. Patients having gingival recession on the labial surface of the teeth adjacent to the open embrasure and having any kind of systemic illness, drug usage allergy, smoking etc., which can alter the healing process are excluded. The patients maintaining proper oral hygiene are included. Patients were explained the procedure and informed consent was taken. A preliminary case history was taken. Surgical procedure was performed only after the patients demonstrated an acceptable oral hygiene standard and restoration of gingival health. Clinical parameters were measured postoperatively at 1 week for Plaque index (Silness and Loe, 1964) and Contour of interdental tissues (Jemt, 1997), while Plaque index (Silness and Loe, 1964), Gingival index (Loe and silness, 1963) and sulcus depth, Contour of interdental tissues (Jemt, 1997) were measured at 1 month and 3 month.
Figure 1: Jemt’s Classification

Surgical procedure:
Local infiltration anesthesia was administered. Two vertical and one horizontal incision is given apical to open embrasure in attached gingiva. Partial thickness flap is elevated which was then folded upon itself to completely obliterate the open embrasure. The free end of the flap was sutured with the adjacent gingiva with a 4-0 silk suture so as to suspend the papilla between adjacent teeth. Periodontal dressing was given. Antibiotics and analgesics were prescribed. The dressing and the sutures were removed after 1 week. Patients were evaluated at 1-week, 1 month, 3 months for Plaque index and contour of interdental tissues. The sulcus depth and gingival index were recorded at 1 month and 3 months, postoperatively [Figures 2-9].

Figure 1. Missing Interdental Papilla

Figure 2. Partial thickness flap is elevated and folded upon the open embrasure with the help of suture
OBSERVATIONS AND RESULTS
The present study included 10 sites with grade ‘1’ and grade ‘2’ type of contour of proximal papillae in the maxillary anterior region. Patients were evaluated at 1 week, 1 month and 3 months for Plaque index and contour of interdental tissues.

The sulcus depth and gingival index were recorded only at 1 and 3 months postoperatively. The data collected was then subjected to statistical analysis: For comparing the measurements of each patient at each observation period. There was an increase in the Plaque index score at 1 week postoperatively by 2.4±0.52, after which there was a steady fall in the values to 0.37±0.32 at 3 months. Both the initial increase and the subsequent fall in the Plaque index score, as compared to the baseline was statistically highly significant (P<0.001) [Table 1]. There was significant increase in the gingival index score at 1 month after surgery (1.6 ±0.51) which decrease gradually on follow up visits. This decrease in the score was statistically significant (P<0.001) when compared to baseline score [Table 2] and there was significant decrease in gingival index score (0.5±0.52) at 3 months, which was statistically significant from baseline. [Table 2]. There was increase in sulcus depth (2.5±0.52) at 3 months postoperatively which was statistically significant from baseline (P<0.001). [Table 3].

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<thead>
<tr>
<th>Table 1: Plaque index</th>
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<tbody>
<tr>
<td>Mean</td>
<td>0.5</td>
<td>0.7</td>
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<tr>
<td>Baseline</td>
<td>1.08</td>
<td>0.67</td>
</tr>
<tr>
<td>1 Month</td>
<td>1.02</td>
<td>0.41</td>
</tr>
<tr>
<td>3 Months</td>
<td>0.37</td>
<td>0.32</td>
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<tr>
<th>Table 2: Gingival index</th>
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<tbody>
<tr>
<td>Mean</td>
<td>0.5</td>
<td>0.52</td>
</tr>
<tr>
<td>Baseline</td>
<td>1.6</td>
<td>0.51</td>
</tr>
<tr>
<td>3 Months</td>
<td>0.5</td>
<td>0.52</td>
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<th>Table 3: sulcus depth</th>
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<tr>
<td>Mean</td>
<td>0.5</td>
<td>0.52</td>
</tr>
<tr>
<td>Baseline</td>
<td>1.4</td>
<td>0.5</td>
</tr>
<tr>
<td>1 Month</td>
<td>2.2</td>
<td>0.42</td>
</tr>
<tr>
<td>3 Months</td>
<td>2.5</td>
<td>0.52</td>
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The average contour of interdental tissues, over the time intervals in both Grade ‘1’ and Grade ‘2’ cases along with their standard errors is shown in the table 4. It shows that both in grade ‘1’ and ‘2’, there was an increase in mean contour of interdental tissues i.e., 2.66 ±0.51 for grade ‘1’ and 3 ± 0.70 for grade ‘2’ cases at 1 month. These values decreased over 3 months to 2.33 ±1.03 for grade ‘1’ cases and 2.75 ±0.43 for grade ‘2’ indicating that there was some shrinkage in the interdental tissues [Table 4].

When the contour of interdental tissues preoperatively was compared to 1 month and 3 months postoperative score, it was found that in grade ‘1’ cases, there was statistically highly significant increase (P<0.001) in the contour of interdental papilla. Grade ‘2’ cases showed statistically highly significant increase (P<0.001) in the contours postoperatively. When compared with the preoperative contour of the interdental papilla there was statistically significant increase in contour at 3 months postoperatively (P<0.01). In present study, the interdental papillae completely obliterated the open embrasure in 66.66% cases and 75 % cases in grade “1’ and grade ‘2’ respectively. [Table 5]

**DISCUSSION**

In periodontal health, interdental gingiva completely fills the embrasure space created by two adjacent teeth. With the beginning of gingival inflammation, shape, consistency, contour of interdental papilla change. These inflammation causes interdental papilla to swell which overfills the embrasure area creating pseudo-pockets, a perfect vicinity for plaque accumulation and further inflammatory changes(Cohen 1959)\(^\text{11}\). It further leads to migration of junctional epithelium in the interdental area and simultaneously breakdown in attachment apparatus occurs.

At this stage, traditional periodontal therapy i.e. non-surgical therapy or surgical therapy both can lead to gingival shrinkage which is more pronounced in the interdental areas, thus black triangle is formed in interdental area. Most patients complains about the open embrasures after periodontal treatment in upper maxillary region, which gives unaesthetic appearance. Even patient complains of food lodgment in anterior region which can further hamper oral hygiene maintenances. There are various treatment protocol proposed such as, orthodontic, repeated subgingival curettage, prosthetic veneers, papilla preservation techniques etc., which were used to change the contour of interdental tissues. Han and Takie,\(^\text{12}\) Azzi et al.\(^\text{4}\) etc., proposed different surgical techniques for reconstruction of missing interdental papilla but all these techniques required a second surgical donor site to obtain the connective tissue graft.

Beagle (1992)\(^\text{10}\) presented a technique using the principles of Abram’s roll technique and Evian papilla preservation technique to reconstruct interdental papilla. But this technique has certain disadvantages. There is a risk of damage to the incisive nerves and vessels and incorporation of fat in the undersurface of flap thereby, preventing its vascularization. Also, obtaining a uniform thickness of flap from the palate and retention of periodontal dressing is difficult. Thus in present study, a variant of beagle’s technique was to
reconstruct the lost or blunted interdental papilla for esthetic purpose and to maintain oral hygiene. Ten sites were treated for closure of unaesthetic open gingival embrasure and their results were evaluated at 1 week, 1 month and 3 months postoperatively. Here, Jemt’s grade ‘1’ and grade ‘2’ are only included in study because as per iconic study by Tarnow et al. determined that the distance from the base of the contact area to the crest of bone could be correlated with the presence or absence of the interproximal papilla. The 5-mm rule given by Tarnow et al. states that when the distance from the contact point to the interproximal osseous crest is 5 mm or less, there is complete fill of the gingival embrasures with an interdental papilla. For every 1 mm above 5 mm, the chance of complete fill is progressively reduced by 50%. Thus grade ‘0’ is excluded from the study which has more chances of recurrence.

Present study shows, at baseline there is significantly increase in plaque and gingival index score (p<0.001), main reason for this is because of food lodgment, but these scores significantly decrease at 3 month follow up (p<0.001)[Table 1 and 2]. This change can be attributed due to motivation of the patients to maintain oral hygiene and patient’s complain of food lodgement is sorted. Similar results have been observed in the study by Nayak. The mean average increase in contour of the interdental papilla is 3.54 at 1 week postoperatively which decreases to 2.83 at 1 month this may due to slight amount of gingival shrinkage. While at 3 months, papilla underwent reorganization so as to obliterate the open embrasure due to continuous stimulation with proper brushing.

When the sulcus depth was evaluated at 1 and 3 months postoperatively, it was observed that in the cases where reconstruction of interdental papilla occurred, there was a creation of pseudo-pocket of about 2-3 mm [Table 3]. Though, there was an increase in sulcus depth, the oral hygiene could be properly maintained with toothbrush and dental floss to prevent recurrence of the problem.

Similar results have been observed by various clinicians like Beagle and Azzi et al. in the study by Nayak. 18.18% of sites showed decrease in sulcular depth at the end of 3 months due to gingival atrophy thereby increasing the embrasure spaces. However, in 22.73% of the cases showed a creation of a pseudo-pocket of about 3-4 mm the end of the study where the surgical procedure partially covered the unaesthetic defect. Thus, in the present study, the Plaque index, gingival index scores significantly reduced at the end of 3 months and interdental papillae completely obliterated the open embrasure in 66.66% cases and 75 % cases in grade “1’ and grade ‘2’ respectively.

CONCLUSION
Thus, at the end of the study, it was presumed that this surgical procedure assessed for reconstruction of interdental papilla was very effective. However, if bone grafting techniques or connective tissue grafting techniques are used in conjunction with this surgical technique, there will be better outcomes to help in reestablishing gingival esthetics, thereby satisfying the patient’s esthetic demands.

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