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RESEARCH ARTICLE

A COMPARATIVE EVALUATION OF RECONSTRUCTION OF INTERDENTAL PAPILLA WITH CONNECTIVE TISSUE GRAFT AND LABIAL GINGIVAL FLAP TECHNIQUE USING MICROSURGICAL LOUPES: A CLINICAL STUDY

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ABSTRACT

Background: In the modern era, missing interdental papilla is a cause of major concern to most of the patients. Compromised esthetics frequently results from deficient interdental papilla and the reconstruction of the lost interdental papilla remains a challenge for the periodontist. **Materials & Methods:**In the present study, two techniques: Modified Beagle's Technique and the Azzi's technique have been employed for reconstructing& obliteration of black triangles.**Results:**A total of 30 sites were surgically treatedusing these techniques. The mean Plaque index, gingival index,mean mesial and distal probing depths & clinical attachment levels along with the contour of interdental tissues had non-significant differences when compared at baseline, 3 months & 6 months.**Conclusion**:Contour of interdental tissues improved from baseline to 6 months. The surgical techniques used were fairly successful and the improvement wascomparable between the two techniques.

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INTRODUCTION

The treatment modalities associated with mucogingival surgeries have been refined with advanced surgical techniques like microsurgery. Microsurgery incorporates the use of magnification loupes to enhance the normal vision of the operator through magnification and the use of microsurgical instruments enables the operator to work with more precision (Deepa, 2014). Plaque associated loss of periodontal support contributes to the loss of interdental papilla, thus forming black triangles (Jaiswal et al., 2010). The reconstruction of missing interdental papillaposes the greatest challenge as its outcome is least predictable. A number of non-surgical and surgical procedures have been put forward to treat these black triangles such as prosthetic veneers, orthodontic teeth alignment, periodontal surgeries or combination of above. The present study was done to compare reconstruction of lostinterdental papillae in the maxillary anterior teeth using the magnification loupes. Two different surgical techniques i.e., Modified Beagle's technique (Sawai, 2012) involving labial gingival flap (Group 1) and Azzi's technique (Azzi, 1999) involving sub-epithelial connective tissue graft (Group 2) were used.

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MATERIALS AND METHODS

A randomized controlled clinical study was planned after the approval from the DAV © Dental Ethical Committee. A total of 7 patients with 30 surgical sites (15 sites per group) were selected from the Department of Periodontology and Oral Implantology, who reported with the chief complaint of esthetic concern of the lost interdental papilla in the maxillary anterior region. The patients enrolled in the study were informed and asked to sign a written consent after discussing the queries regarding the procedure. This study included patients with age 18-65 years who were systemically healthy with interdental papilla lossin accordance with the Jemt's Classification 1997). Patients with any known systemic diseases/conditions like diabetes or uncontrolled hypertension or bleeding disorders or any other active infection or compromised healing potential or the pregnant females or lactating mothers were excluded from the study. The selected patients were randomly allocated into group 1 and 2.

Surgical procedure for group 1 (modified beagle's technique): After obtaining local anaesthesia of concerned sites, two vertical and one horizontal incision were given so as to raise a partial thickness flap from the attached gingiva apical to the open embrasure on the labial side (Fig. 2).

Fig. 1. Pre-operative view

Fig. 2 Elevation of partial-thickness flap

Fig. 3. Sutures given

Fig. 4 (3 months post-op.)

Fig.5 6 months post-op

Fig. 6 (intrasulcular incision)

Fig. 7 graft harvested from palate

Fig.8 (sutures given)

Fig. 9. post op. 3 month

Fig.10. post-op. 6 months

The flap was then folded upon itself and suspended to completely fill the space between the two teeth. 5-0 sutures were used to suture the free end of the flap with the adjacent normal gingiva (Fig.3).

Surgical procedure for group 2 (azzi's technique): After the administration of local anaesthesia, an intrasulcular incision was made on the buccal and interproximal aspects of the teeth. After that, a split-thickness semilunar incision beginning at the mucogingival junction was made which extended upto the vestibule, followed by a final incision which released the gingiva-papillary complex for coronal positioning without tension (Fig.6). The interdental papilla was undermined carefully to maintain its integrity.

The entire gingiva-papillary unit was then shifted incisally. A recipient bed was prepared for the placement of the graft. CTGharvested from the palate (Fig.7) was contoured to properly fit under the coronally advanced flap in the interdental area. This graft prevents flap collapse and papilla retraction. The surgical site was sutured such that thecoronally advanced flap remained in the incisal position and the connective tissue graft fills the void between the coronally positioned papilla and the interdental bone using 5-0 sutures (Fig.8). In both the groups, periodontal dressing was applied on the surgical site. Appropriate antibiotics and analgesics were prescribed. The dressing and the sutures were removed after 1 week and the Plaque and gingival index were recorded. Subsequently, the patients were evaluated at 3 and 6 months for all parameters postoperatively.

OBSERVATIONS AND RESULTS

The present study included atotal of 30 sites with grade '0', grade '1' and grade '2' of the Jemt's classification. The parameters were assessed preoperatively and postoperatively. The data collected was then subjected to statistical analysis. There was a non-significant difference in the mean Plaque index (Silness, 1964) & gingival index (Loe, 1963) of both the groups when compared at baseline, 3 months & 6 months. When the mean mesial (Table 1, Graph 1) & distal (Table 2, Graph 2) probing depths were compared at baseline, 3 months and 6 months for both the groups, the results were non-significant. There was no significant difference in the mean mesial (Table 3, Graph 3) &distal (Table 4, Graph 4) Clinical attachment level at baseline, 3 months and 6 months between groups 1 and 2. No Statistically significant difference was seen in the mean contour of interdental tissues between Group I and 2 (Table 5, Graph 5).

DISCUSSION

In health, gingiva completely fills the interdental space created by the two approximating teeth. Once the periodontal inflammation sets in, the contour and size of gingiva changes and eventually after the treatment, it leads to the creation of black triangles. Various surgical and non-surgical procedures have been evaluated in the past. The present study evaluates comparison of two surgical techniques. Shapiro in 1982 (Shapiro, 1982) stated that repeated scaling, root planning and curettage of the papillary tissue every 15 days for 3 months induce the reconstruction of missing papilla due to ANUG. Surgical techniques lay stress on either the grafting methods or the displaced flaps that maintain the blood supply of the newly created papillary tissue. Han & Takei (Han, 1996) were the first to propose papilla reconstruction by connective tissue graft and found successful outcome. Beagle (Beagle, 1992) described a pedicle graft procedure utilizing soft tissues palatal to the interdental area to rebuild the papilla. The present study was a parallel arm design with almost identical papilla loss in the maxillary anteriors. Systemic health has been suggested as a generalized risk factor for the presence of black triangles (Chang, 2007) & smoking contributes to periodontal destruction through gingival vasoconstriction (Chambrone, 2009). Therefore, smokers and patients with medical problems were excluded in the study. Patients with the age 18-65 years were includedto maintain the values at baseline since papillary tissue height decreases by 0.012 mm/ year of age (Van der Velden, 1984). The procedures were performed only on healthy periodontal tissues since it allows a precise incision, handling and closure of the mucosal flaps (Yeung, 2008) and prevents wound infection. The classification used for the interdental papilla loss in the maxillary anteriors was the Jemt's Classification, 1997, since this classification clinically evaluates regeneration of papillae adjacent to the other teeth also. The same was followed by Nemcovsky (Nemcovsky, 2001) and Sawai and Kohad (2012). Evidences byTibbets and Shanelec (Shanelec, 1994), Deepa*et al.* (2007) and Belcher *et al.* (2001) have found minimal tissue trauma caused by microsurgical instruments and suturing technique with primary wound closure resulted in reduced cell necrosis and therefore healing faster than with a macrosurgical approach. Hence, the use of microsurgical instruments together with magnifying aids became a standard way of performing periodontal plastic surgery. The minimum scarring using microsurgical closure of the recipient site was also demonstrated by Cairo *et al.* (?)

Table 1. Average 'mpce' of the social groups in India and in its fourteen major states (in Rupees)

States	Rural (A)					Urban (B)				
	Others	OBC	SC	ST	Total	Others	OBC	SC	ST	Total
Andhra Pradesh	993.83	792.24	706.67	741.8	868.37	1491.63	1188.16	1254.98	1128.05	1340.48
Assam	1144.55	660.03	721.04	594.09	805.22	1380.44	1100.61	885.21	1126.02	1216.32
Bihar	749.56	627.06	518.32	400.52	610.24	1436.68	859.29	643.79	312.99	1037.6
Gujarat	880.2	750.72	740.14	528.27	817.7	1587.11	987.46	1016.38	901.6	1305.36
Karnataka	882.26	790.92	512.79	628.9	810.5	1641.93	1410.83	1020.82	968.09	1451.21
Kerala	1086.07	940.08	664.13	695.41	991.58	1415.32	949.71	781.32	789.99	1139.93
Madhya Pradesh	654.62	532.95	468.34	279.48	605.97	1265.47	813.69	713.46	657.84	1024.22
Maharashtra	708.53	716.07	610.93	454.02	806.73	1179.95	1033.83	873.31	1023.99	1137.52
Orissa	655.62	499.72	385.49	335.85	595.66	1623.27	1056.11	723.63	585.34	971.45
Punjab	1200.68	1002.16	794.54	866.17	1020.79	1409.76	1114.69	1086.55	1128.99	1284.14
Rajasthan	762.56	703.53	556.81	552.32	711.71	1515.45	914.73	748.26	966.08	1169.8
Tamil Nadu	975.79	833.69	653.8	490.16	814.6	1577.72	1155.42	899.84	573.56	1164.7
Uttar Pradesh	895.04	715.71	486.64	442.96	662.23	1498.33	966.9	843.89	1149.47	938.1
West Bengal	895.57	804.75	586.7	464.38	753.36	1470.61	1174.34	837.2	1200.9	1314.18
All India	869.99	774.88	581.18	450.16	771.85	1475.81	1096.21	925.44	1014.75	1235.94

Table 2. Average years of schooling of the social groups in India and its fourteen major states

States	Rural (A)					Urban (B)				
	Others	OBC	SC	ST	Total	Others	OBC	SC	ST	Total
Andhra Pradesh	5.68	3.93	3.89	3.02	4.84	8.12	6.52	6.57	6.75	7.41
Assam	7.9	6.27	5.87	5.32	6.23	9.09	9.44	8.45	7.73	9.31
Bihar	5.87	3.33	2.47	1.32	3.87	8.79	6.65	4.57	8.12	7.75
Gujarat	5.72	4.59	4.8	3.37	5.08	9.66	6.65	6.95	6.74	8.36
Karnataka	6.05	5.27	3.8	4.22	5.15	9.66	7.91	6.49	6.37	8.28
Kerala	8.71	7.97	6.6	6.06	8.22	10.28	8.93	8.52	8.51	9.45
Madhya Pradesh	5.51	3.98	3.43	2.59	4.23	9.43	6.46	5.22	4.91	8.47
Maharashtra	5.92	5.71	5.24	4.56	5.85	8.76	8.45	6.89	6.29	8.4
Orissa	5.88	5.01	3.98	3.11	5.14	9.83	7.99	5.2	6.24	8.69
Punjab	5.78	5.48	4.42	4.14	5.17	10.08	7.83	7.52	6.86	8.9
Rajasthan	4.83	4.03	3.25	2.94	4.11	8.85	6.02	4.96	5.25	7.81
Tamil Nadu	6.43	6.02	5.05	4.62	4.98	9.6	7.91	6.49	5.31	8.68
Uttar Pradesh	5.96	4.07	3.47	2.73	4.69	8.82	6.62	5.11	8.7	8.22
West Bengal	6.38	5.59	4.01	2.49	4.9	9.73	8.04	6.45	6.77	9
All India	6.06	4.61	3.66	3.6	5.05	9.25	7.49	6.37	6.83	8.72

Table 4. Multidimensional inequality among the social groups in rural areas

States	Rural		Urban	
	I_C^{AKS} $r_j(\forall j) = 0.5$ (2)	I_C^{GGI} $r_j(\forall j) = 0.5$ (3)	I_C^{AKS} $r_j(\forall j) = 0.5$ (4)	I_C^{GGI} $r_j(\forall j) = 0.5$ (5)
Andhra Pradesh	0.062 (6)	0.072(8)	0.063 (10)	0.08 (11)
Assam	0.075(5)	0.064 (9)	0.101(5)	0.068(14)
Bihar	0.133 (1)	0.179(1)	0.151 (2)	0.191(2)
Gujarat	0.037(12)	0.056(10)	0.053 (11)	0.074(12)
Karnataka	0.053 (9)	0.08(6)	0.067(9)	0.084 (9)
Kerala	0.041(11)	0.041(12)	0.041(14)	0.069(13)
Madhya Pradesh	0.091 (4)	0.137(3)	0.162 (1)	0.197(1)
Maharashtra	0.043(10)	0.04 (13)	0.069 (8)	0.082(10)
Orissa	0.119 (2)	0.145(2)	0.136(4)	0.149 (4)
Punjab	0.032(13)	0.037(14)	0.072 (7)	0.095 (7)
Rajasthan	0.059 (7)	0.105(4)	0.09(6)	0.128 (5)
Tamil Nadu	0.022(14)	0.055 (11)	0.051 (12)	0.11 (6)
Uttar Pradesh	0.097(3)	0.102(5)	0.149 (3)	0.152(3)
West Bengal	0.056(8)	0.079(7)	0.044(13)	0.087(8)
All India	0.092	0.091	0.112	0.163

Source: 66th Round of employment and Unemployment Survey (NSSO; 2009-10). Note: We take $\alpha_j = 100$ for monthly per capita consumption expenditure and $\alpha_j = 1$ for years of schooling.

Burkhardt and Hurzeler (2000). To avoid the effect of plaque biofilm on the outcome of the procedures, the plaque &Gingival Index were maintained at score <1throughout the study. This could be due to motivation of patient to maintain oral hygiene. After 1 week, patient was asked to use a soft tooth brush for next 2 weeks. Then regular tooth brushing habits were resumed and chlorhexidine rinses were discontinued as said by Deepalakshmi *et al* in 2007. The re-evaluation period of 3 & 6 months were in accordance with Kaushik *et al.* (2014) & Sawai & Kohad. (2012). The surgical procedure performed in Group 1 was modification of Beagle's Technique since the original technique had a risk of damage to incisive nerves and vessels and incorporation of fat in the undersurface of flap, thereby reducing its vascularization (Beagle, 1992). Group 2 followed the Azzi's Technique of subepithelial connective tissue graft in which the connective tissue supported the coronally positioned papilla. The rationale behind comparing these two techniques was to evaluate the incorporation/non-corporation of graft on the outcome. Non-eugenol periodontal dressing (coe-pak) was used to provide the patient comfort and to prevent the impingement of foreign material into the grafted site and prevent flap displacement. The patients were also advised to rinse with 0.2% Chlorhexidine mouthwash twice daily until suture removal

because of its anti-plaque action. No suture removal was required in Group 1 as we had used 5-0 Vicrylbioresorbable sutures, as done by Carnio, (2004) Post-operative sutures were removed after 10 days from the palatal donor site for the group 2 as done by Sanz & Simion, (2014). There was no significant difference in the mean change in Mesial & Distal Probing Depth from baseline to 3 months, from baseline to 6 months and from 3 to 6 months between groups 1 and 2. Our findings coincided with the study done by Azzi *et al.,* in 1998. When the Mesial and Distal CAL for group 1 & 2 was evaluated, there was a significant decrease from baseline to 3 months and baseline to 6 months follow-up. However, this change was non-significant when the values were compared at 3 months and 6 months follow-up.

Saletta (Saletta, 2001) *et al* found no correlation between papillae height and mean root coverage. As there was no significant reduction in the probing depth as explained earlier, the CAL gain could be attributed alone to the amount of recession coverage achieved through papilla reconstruction. These results were in consistent to the study done by Byun *et al.* (2009) and Azzi *et al.* in 1999. The increase in mean contour of interdental tissues was seen in study done by Chaulkar*et al.* (2017), who had also used modification of the original Beagle's technique and had observed a statistically significant increase in contour at 24 weeks post-operatively. However, in the present study, the contour of interdental tissue in group 1 and group 2 showed statistically non-significant differences when compared from baseline to 3 months (p= 0.72), baseline to 6 months (p= 0.92) and 3 months to 6 months (p= 0.80). Therefore, the intergroup comparisons revealed that there was no statistical difference between both the groups, hence neither of the technique was superior over the other. This was in accordance to the study done by Shruthi *et al.* (2016) Pinto *et al.* (2010) and Carranza and Zogbi (Carranza, 2011). The areas with narrow loss of interdental papilla showed a complete reconstruction of papilla when compared to areas with wide loss. The failure to reconstruct the papilla in Group 2 with wide areas could be due to the donor tissue obtained from palate. If the tissue was obtained from the tuberosity area, the donor tissue would be thick and fibrous hence improving its outcome (Nordland, 2008).

Summary and conclusion

Both the procedures used in the study resulted in statistically significant improvement, though modified Beagle's technique was slightly better than the Azzi's technique. This study gives an insight into the surgical procedures using grafts or just relocating the mucogingival complex. Since some patients want to avoid second surgical site, Modified Beagle's technique could be plausible alternative with equally good results.

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