



Esthetics and Patient Level Evaluation of Fixed Orthodontic Treatment Conducted before and After Surgical Frenectomy Procedure for Midline Diastema Cases: An Original Research Study

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KEYWORDS

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ABSTRACT:

Background & Aim: This study was aimed to evaluate the esthetic and patient related factors in fixed orthodontic treatment conducted before and after surgical frenectomy for midline diastema cases.

Materials and Methods: Total 40 patients including both male and female selected by systematic sampling. Written and signed informed consent was obtained from all patients. Group 1 has 20 patients wherein frenectomy was attempted after the space closure. Group 2 has 20 patients wherein frenectomy was attempted before the space closure. The overall esthetic (smile) and patient factors (satisfaction, comfort, social acceptance) was noted in terms of Satisfactory, Non-satisfactory and Questionable statuses after 2 months, 4 months timings. Results thus obtained was compiled and sent for basic statistical analysis. P value less than 0.05 was considered as significant ($p < 0.05$).

Statistical Analysis and Results: All statistical evaluation was completed using statistical software SPSS. Maximum 15 patients were noticed in the age range of 14-15 years. P value was highly significant here (0.01). In Group 1 after 2 months, maximum 17 patients were found to be satisfied with over all factors. 2 patients were not satisfied and 1 patient was Questionable. P value was highly significant for all 17 satisfied patients. In Group 1 after 4 months, 16 patients were found to be satisfied with over all factors. ANOVA Assessments done Between 2 Groups, Within 2 Groups and Cumulative revealed highly significant difference and p value (0.001).

Conclusion: Within the limitations of the study it has been concluded that surgical frenectomy conducted after Orthodontics space closure is a feasible option and provide maximum esthetics and patient satisfaction. Surgical frenectomy conducted before space closure could not present optimal results.



Introduction

Persistent presence of diastema between teeth is often considered as esthetic problem. Also, not all cases of these diastemas can be managed by similar approaches. Literature is overwhelmed with studied conducted over the years on the etiology, pathogenesis, diagnosis and management of maxillary midline diastema.¹⁻² However lots of controversies still exist among the present guidelines of clinical management of maxillary midline diastema. Midline diastema is a space between the maxillary central incisors. Mostly it is seen as normal growth characteristics and during primary and mixed dentition periods. Usually it is self correcting by the eruption of respective canines.³⁻⁵ Severe or cases those failed to self correct, require surgical and or orthodontic interventions. In most of the uncorrected cases, frenum was present when the permanent incisors erupts hence forcing them to spread apart and create midline diastema. These necessitate surgical removal or frenectomy. Clinicians and researchers have experimented and tried different timings of frenectomy procedures like before, during and after the active orthodontic treatment.⁶⁻⁷ Still there is lot many guidelines and interrelated factors those must be considered for ideal frenectomy timing in a particular patient. Many of the pioneer workers still believe that frenectomy performed before orthodontic treatment always leave a hard tissue scar which hinder afterwards space closure process.^{8,9} Hence, this study was conducted to evaluate the esthetics and patient related factors in fixed orthodontic treatment conducted before and after surgical frenectomy procedure for midline diastema cases.

Materials and Methods

This clinical study was proposed, structured and conducted on total 40 patients. The study was solely executed in the Department of Orthodontics and Dentofacial Orthopedics of the institute. The basic ideology was to explore the effects of timing of surgical frenectomy as related to overall Orthodontics treatment outcome. Both male and female patients were included in the study for intended assessments. Systematic sampling was used for the selection of bias free samples. Different exclusion criteria included: maxillary midline diastema less than 3 mm, uncooperative patients, patients with severe ongoing

systemic disease, pregnancy, psychic problems, patients with poor periodontal support, cysts related with tooth. Primary inclusion criteria were maxillary midline diastema equal or more than 3 mm. Other inclusion criteria were acceptable patient compliance, non allergic to any orthodontic component, acceptable follow ups and non smokers. All 40 patients were studied into 2 major groups. Group 1 has 20 patients wherein frenectomy procedure was attempted after the space closure (after the fixed Orthodontics treatment). Group 2 has 20 patients wherein frenectomy procedure was attempted before the space closure (before the fixed Orthodontics treatment). All selected patients were treated with 0.022" MBT pre-adjusted edgewise appliance using consistent contemporary biomechanic principles. The sequence of the wire placed was 0.016" NiTi, followed by 0.019" x 0.025" NiTi and finally 0.019" x 0.025" Stainless steel archwire. Space closure is done with the help of springs or elastics. Comprehensive history was recorded including demographic details and other related findings (Figure 1). Written and signed informed consent was obtained from all patients. Local anesthesia administration was done in all cases to control intra-operative pain (infiltration by using 2% Lignocaine with 1:200000 adrenaline. Initially the frenum was engaged with a hemostat. This hemostat was inserted into the depth of the vestibule. Following this, an incision with no 15 blade was placed on the upper and lower surface of hemostat until the hemostat was free. This separates a triangular portion of labial frenum with underlying rhomboid area showing deep connective tissue fibers (Figure 2). After this all additional muscle fibers were resected and wound margins were sutured by 3-0 black silk sutures using simple interrupted techniques (Figure 3). Patient called after ten days for surgical follow up. The overall esthetic (smile) and patient factors (satisfaction, comfort, social acceptance) was noted in terms of Satisfactory, Non-satisfactory and Questionable statuses. It was noted after 2 months and 4 months timings. This study had been undertaken because such clinical studies are supposed to be extremely vital in obtaining complete data about personal perceptions. Clinical studies are also competent of estimating the responses of patients at personal levels. Results thus obtained was compiled and sent for basic statistical



analysis. P value less than 0.05 was considered as significant ($p < 0.05$).



Figure 1: Pre-treatment Intraoral Views

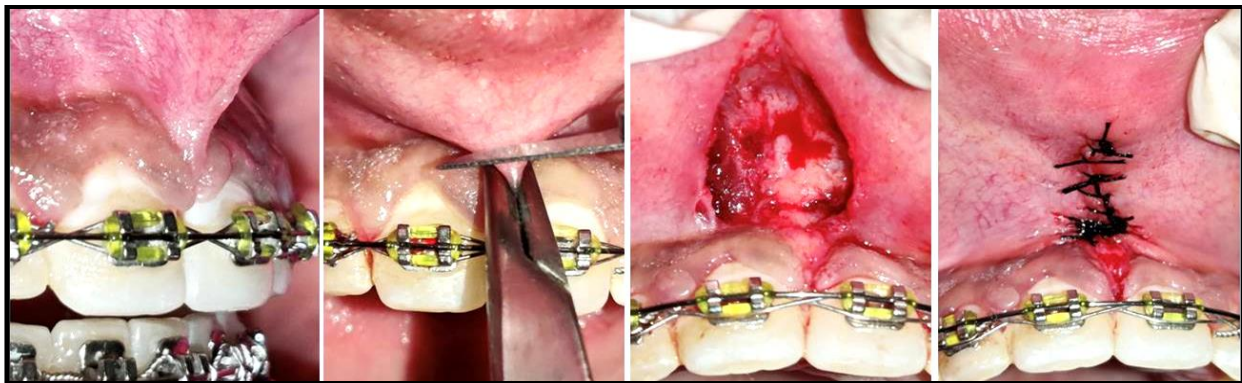


Figure 2: Surgical Procedure Step by Step (Frenectomy) Intraoral Views

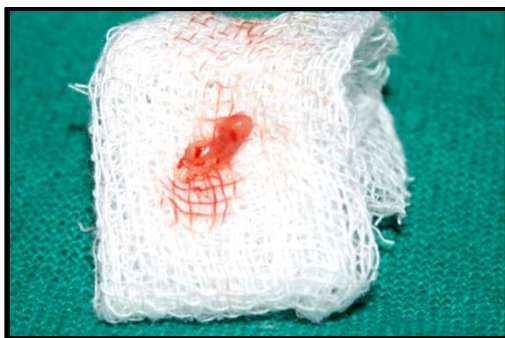


Figure 3: Resected Portion During Frenectomy

Statistical Analysis and Results

All the viable findings were compiled and sent for statistical evaluation using statistical software Statistical Package for the Social Sciences version 22 (IBM Inc., Armonk, New York, USA). The resultant data was subjected to appropriate statistical tests to calculate p values and other statistical inferences. Responses and results were analyzed. The patients were separated into four age groups. Table 1 and graph 1 confirmed about

the Age & Gender based statistical explanation of the patients. Maximum 15 patients were noticed in the age range of 14-15 years. P value was highly significant here (0.01). Minimum 5 patients were found in the age of 20 years. Total 23 male and 17 female patients were studied particularly. Table 2 and Graph 2 stated about the essential statistical description with level of significance assessment using “Pearson Chi-Square” test and interpreted as satisfactory or non-satisfactory or Questionable. It was done for Group 1, n=20 patients, noted after 2 months. Maximum 17 patients were found to be satisfied with over all esthetic (smile) and patient factors (satisfaction, comfort, social acceptance). 2 patients were not satisfied and 1 patient was Questionable. P value was highly significant for all 17 satisfied patients. Table 3 and Graph 3 stated about the essential statistical depiction with level of significance assessment using “Pearson Chi-Square” test and interpreted as satisfactory or non-satisfactory or Questionable. It was done for Group 1, n=20 patients, noted after 4 months. Maximum 16 patients were found



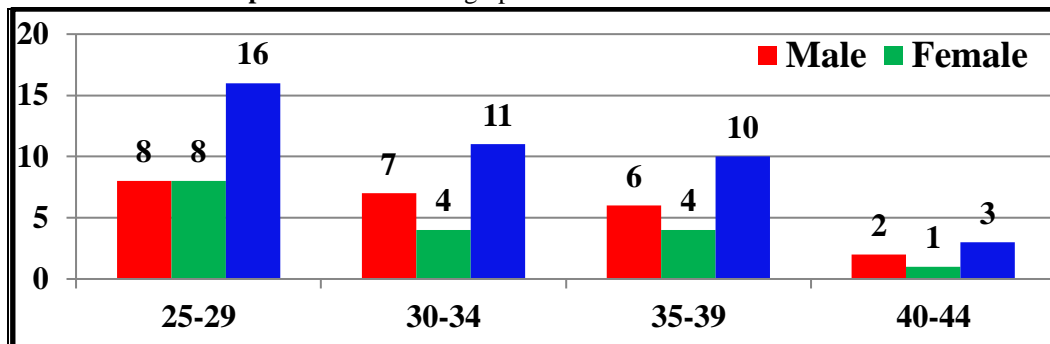
to be satisfied with over all esthetic (smile) and patient factors (satisfaction, comfort, social acceptance). 3 patients were not satisfied and 1 patient was Questionable. P value was highly significant for all 3 non satisfied patients. Table 4 stated about the essential statistical explanation with level of significance assessment using “Pearson Chi-Square” test and interpreted as satisfactory or non-satisfactory or Questionable. It was done for Group 2, n=20 patients, noted after 2 months. Maximum 14 patients were found to be satisfied with over all esthetic (smile) and patient factors (satisfaction, comfort, social acceptance). 4 patients were not satisfied and 2 patients was Questionable. P value was highly significant for all 14

satisfied patients. Table 5 stated about the essential statistical explanation with level of significance assessment using “Pearson Chi-Square” test and interpreted as satisfactory or non-satisfactory or Questionable. It was done for Group 2, n=20 patients, noted after 4 months. Maximum 13 patients were found to be satisfied with over all esthetic (smile) and patient factors (satisfaction, comfort, social acceptance).P value was highly significant for all 13 satisfied patients. Table 6 is about the evaluation amongst all 2 Groups using one-way ANOVA. Assessments done Between 2 Groups, Within 2 Groups and Cumulative revealed highly significant difference and p value (0.001).

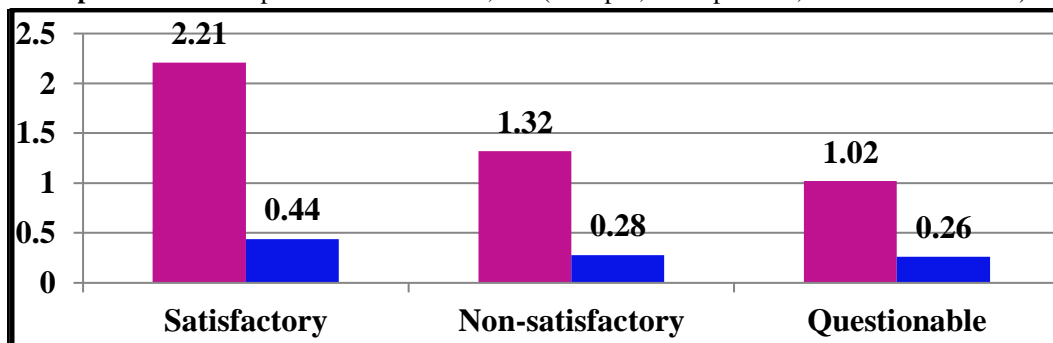
Table 1: Age & Gender based statistical description of contributing patients

Age Group (Yrs)	Male	Female	Total	P value
14-15	7	8	15	0.01*
16-17	8	4	12	0.50
18-19	5	3	8	0.20
20	3	2	5	0.90
Total	23	17	40	*p<0.05 Significant

Graph 1: Patients demographic assortment and related details



Graph 2: Detailed representation of Mean, SD (Group 1, n=20 patients, noted after 2 month)



Graph 3: Detailed representation of Mean, SD (Group 1, n=20 patients, noted after 4 month)

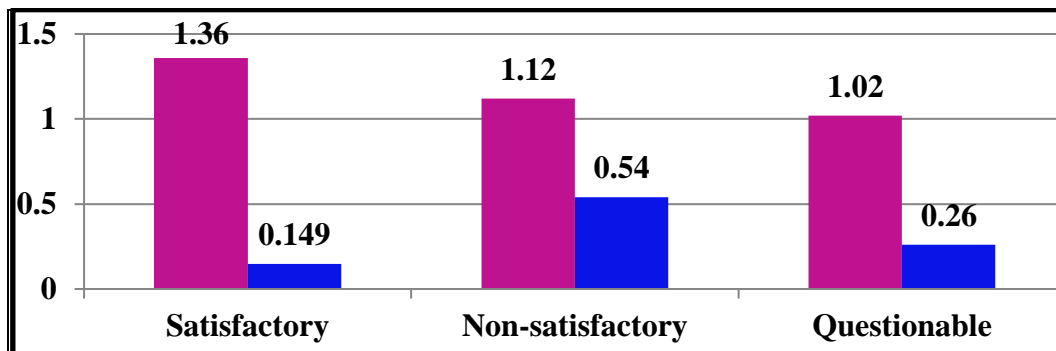


Table 2: Essential statistical description with level of significance assessment using “Pearson Chi-Square” test and interpreted as satisfactory or non-satisfactory or Questionable (Group 1, n=20 patients, noted after 2 months)

Status	n	Stat. Mean	Std. Dev.	Std. Error	95% CI	Pearson Chi-Square	df	p value
After 6 Months								
Satisfactory	17	2.21	0.440	0.476	1.36	1.449	1.0	0.01*
Non-satisfactory	2	1.32	0.280	0.540	1.62	1.124	2.0	0.06
Questionable	1	1.02	0.260	0.650	1.82	1.984	2.0	0.08
*p<0.05 significant								

Table 3: Essential statistical description with level of significance assessment using “Pearson Chi-Square” test and interpreted as satisfactory or non-satisfactory or Questionable (Group 1, n=20 patients, noted after 4 months)

Status	n	Stat. Mean	Std. Dev.	Std. Error	95% CI	Pearson Chi-Square	df	p value
After 12 Months								
Satisfactory	16	1.36	0.149	0.140	1.86	1.860	1.0	0.17
Non-satisfactory	3	1.12	0.540	0.114	1.12	1.621	2.0	0.02*
Questionable	1	1.02	0.260	0.650	1.82	1.984	2.0	0.08
*p<0.05 significant								

Table 4: Essential statistical description with level of significance assessment using “Pearson Chi-Square” test and interpreted as satisfactory or non-satisfactory or Questionable (Group 2, n=20 patients, noted after 2 months)

Status	n	Stat. Mean	Std. Dev.	Std. Error	95% CI	Pearson Chi-Square	df	p value
After 18 Months								
Satisfactory	14	1.32	0.330	0.424	1.12	1.541	2.0	0.01*
Non-satisfactory	4	1.72	0.834	0.654	1.84	1.349	1.0	0.24
Questionable	2	1.28	0.240	0.514	1.42	1.321	2.0	0.12
*p<0.05 significant								



Table 5: Essential statistical description with level of significance assessment using “Pearson Chi-Square” test and interpreted as satisfactory or non-satisfactory or Questionable (Group 2, n=20 patients, noted after 4 months)

Status	n	Stat. Mean	Std. Dev.	Std. Error	95% CI	Pearson Chi-Square	df	p value
After 18 Months								
Satisfactory	13	1.34	0.270	0.724	1.42	1.331	2.0	0.01*
Non-satisfactory	6	1.37	0.194	0.387	1.84	1.829	1.0	0.08
Questionable	1	1.09	0.860	0.850	1.92	1.284	2.0	0.06
*p<0.05 significant								

Table 6: Evaluation amongst all 2 Groups using one-way ANOVA

Variables	Degree of Freedom	Sum of Squares Σ	Mean Sum of Squares $m\Sigma$	F	Level of Sig.(p)
Between 2Groups	4	1.024	1.158	1.7	0.001*
Within 2Groups	14	2.349	0.545	-	-
Cumulative	131.12	11.237	*p<0.05 significant		

Discussion

A successful orthodontic intervention always ensures optimal smile which is eye-catching, healthy and stable. Any abnormal thickening of gingival can negatively affect the position of teeth before and after orthodontic therapy.^{10,11} Therefore surgical frenectomies are suggested to manage these cumbersome situations. Maxillary labial frenectomy is surgical removal of tissue from the labial frenum which connects the upper lip to upper gum line. It is very crucial to finalize the exact timing of frenectomy procedure.^{12,13} Any space or gap present in midline of the dental arch is called as midline diastema. Midline diastema can be defined as a gap more than 0.5 mm between mesial surfaces of adjoining central incisors. Midline diastema is normal in primary and mixed dentitions and is considered as a standard during this phase.¹⁴⁻¹⁶ The midline diastema ultimately vanishes after eruption of permanent maxillary canines, but the most common causative reason of midline diastema is atypical labial frenum attachment. Treatment of midline diastema due to anomalous frenal attachment can be achieved by elimination of basic cause, orthodontic intervention and surgical management.¹⁷⁻¹⁸ Orthodontic intervention involves using fixed appliances like springs or elastics and removable appliances like finger springs and labial bows. Different surgical techniques for frenectomy includes V-shaped incision, Z-plasty incision and lateral pedicle gingival flap.¹⁹⁻²⁰ Usually irregular frenal

attachment can necessitate removal either before orthodontic treatment or at the end of active orthodontic treatment. There are few advantages of frenum removal prior to orthodontic treatment including ease of surgical access. Other researchers support and recommend frenectomy after active orthodontic treatment. There are clear disagreements of outlook over whether to do a frenectomy before or after an orthodontic space closure. So there are mixed school of thoughts about it.²¹⁻²² This study results indubitably showed the clinical outcomes and responses of patients about the frenectomy procedures attempted before and after fixed orthodontic treatment in midline diastema cases.

Conclusion

Within the limitations of the study it has been concluded that surgical frenectomy conducted after orthodontic space closure is a viable option and provide maximum esthetic and patient satisfaction. Surgical frenectomy conducted before space closure could not offer optimal outcomes. Nevertheless, the overall success and relapse possibilities depend on numerous interrelated factors and patient responses. Findings of this study must be considered as indicative for assuming prognosis for similar clinical circumstances. However, few large scale studies should be conducted in these perspectives.



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