

Closure of Midline Diastema by Multidisciplinary Approach- A Case Report

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Abstract:- Midline diastema is one of the common aesthetic concern in late mixed dentition and permanent dentition. Many contemporary treatment modalities are varying from general restorative procedures like composite build-up, prosthodontic consideration to minor surgical procedure (frenectomy) and orthodontics are available. A high frenum attachment is often the cause of persistent diastemas. A Case Report of a 21-year-old female with a high frenulum attachment which has resulted in spacing of the maxillary central incisors is presented. This case report elaborates the removal of the abnormal labial frenum attachment through surgery and subsequent closure of maxillary diastema following orthodontic treatment use of porcelain laminate veneers (PLV)

Keywords:- Frenectomy, Fixed Orthodontic Mechanotherapy, Porcelain Laminate Veneers.

I. INTRODUCTION

The most common aesthetic complaint of patients is maxillary anterior spacing or Diastema.¹ Midline spacing/diastema is called for more than 0.5mm distance in-between the proximal surfaces of two central incisors.² Higher prevalence of midline diastema with maxilla than mandible has been reported in literature. The etiology of midline diastema is multifactorial. Thick labial frenulum being the major etiology, other factors are mesiodens, microdontia, lateral incisor agenesis, lateral incisors of peg-shape, cysts in the midline region, habits such as tongue thrusting, sucking of digits and/or lips, genetics, developmental dental anomalies, dental-skeletal discrepancies, maxillary incisor proclination, and imperfect aggregation of the interdental septa which can lead to diastema.^{3,4} Diastema closure by esthetic treatment presents a challenge in clinical practice. The treatment plan is determined by the length to width ratio of the central incisors for aesthetic rehabilitation in complex midline diastema closure cases. The best suitable technique and material for a patient are also based on time, psychological physical, and economic limitations. Different treatment options for midline diastema include removal of etiology and simple removable appliances incorporating activated labial bow, split labial bow or finger springs. Gleghorn reported a direct composite restoration technique to correct unaesthetic diastema.⁵ Nakamura et al., reported a ceramic restoration of anterior teeth without proximal reduction.⁶ Munshi and Munshi reported extraction of mesiodens or frenectomy immediately followed by utilizing simple fixed

orthodontic therapy for space closure.⁷ One of the commonly practiced treatment options includes porcelain laminate veneers (PLV) which are thin shells of ceramics, which can be bonded using bonding agents and dual cure resins/cements to the facial surface of anterior teeth. Creating excellent esthetic and considering the minimal amount of tooth preparation involved, this procedure is highly conservative. When these are bonded to enamel they take up the strength of enamel and become as strong as the natural tooth structure.⁸ This article reports a case of midline diastema managed conservatively by labial frenectomy, fixed orthodontic mechanotherapy and porcelain veneers, achieving the desired esthetic results.

II. CASE REPORT

A 21 yr female patient reported to Department of Orthodontics and Dentofacial Orthopedics, Rural Dental College, Pravara Institute of Medical Sciences with chief complaint of spacing in upper front teeth region. Patient's medical history revealed absence of any systemic disease. Intra-oral examination revealed presence of midline spacing between maxillary central incisors of 5mm with evident high thick frenum attachment extending upto the interdental papilla of the maxillary central incisors. (Figure 1)

Intra-oral periapical radiograph was recorded to find the cause of diastema and to rule out any presence of unerupted mesiodens. A simple diagnostic was performed for assessment of labial frenum which suggested the presence of highly placed labial frenum attachment.

Other intra-oral and extra-oral examination revealed Angle's Class I molar and canine relation with 1mm space distal to canine in mandibular arch bilaterally with Skeletal Class III bases (ANB= -2) with optimum overjet and overbite. (Figure 2-4) Model analysis concluded less tooth material in maxillary arch along with Bolton's discrepancy with excess in mandibular teeth by 3mm.



Fig 1



Fig 2



Fig 3

Routine fixed orthodontic mechanotherapy would have required Interproximal reduction (IPR) with lower anterior teeth for space closure in upper arch. This would have resulted in increased concavity of the facial profile as the patient had skeletal Class III bases. So, a combination treatment modality was considered with surgical excision of high labial frenum followed by fixed orthodontic mechanotherapy including only the upper anteriors to create uniform space between upper central incisors and lateral incisors and then closure of the space by Porcelain

Laminate Veneer (PLV) to correct the Bolton's discrepancy.



Fig 4

After obtaining the written consent of the patient, frenectomy was carried out under local anesthesia with incision using No.11 Bard Parker blade. The wedge of the tissue was picked up with tissue forcep and excised with tissue shears at the area close enough to origin of frenum to provide a cosmetic effect. Sutures were placed for adequate healing. Suture removal was carried out after one week of surgery. (Figure 5).



Fig 5:- Healing after Frenectomy before Starting of Mechanotherapy

After one week of suture removal, orthodontic brackets with MBT prescription of 0.022 slots were bonded on maxillary anteriors; i.e. centrals incisors, lateral incisor and canine bilaterally. Along with that, lingual button was bonded on the labial surface of both central incisors, gingival to the MBT bracket. Canine and lateral incisor in either side were consolidated by stainless steel ligature wire with figure of eight pattern to form one unit. A 0.017x0.025 stainless steel wire was engaged in these bracket slots along with open coil spring placed between central and lateral incisor bilaterally. An elastomeric chain was incorporated on the lingual button placed on the labial surface of central incisors. (Figure 6).



Fig 6



Fig 9

Advantage of open coil spring was that it gave a “Push force” from the lateral incisor to central incisor on either side whereas the elastomeric chain provided a reciprocal anchorage by delivering a “Pull force” between the two central incisors, thus resulting in bodily movement of central incisors.



Fig 10



Fig 7

After 6 weeks of mechanotherapy, desired space was achieved; i.e. 2mm between Central incisors and 1.5mm between the central and lateral incisors on both sides (Figure 7-10). The brackets were debonded followed by removal of remaining composite on tooth surface. (Figure 11 & 12).



Fig 11



Fig 8



Fig 12

Minimal tooth preparation of 0.5mm was carried out with diamond bur for definite chamfer finish line extending from the marginal gingival tip towards the incisal edge on both distal and mesial proximal surface as well as on labial surface of central and lateral incisors. The incisal edges were trimmed by 1 mm, on the lingual aspect with relation to 21,22 & 11,12. Two-step polyvinyl impression technique was used for final impression and the cast were sent to the lab. (Figure 13 & 14)

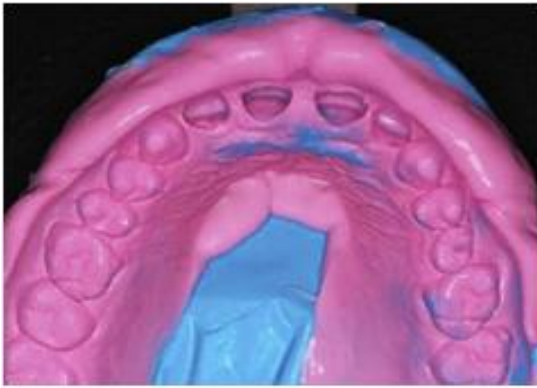


Fig 13



Fig 14

Provisional restorations were done by clear acrylic resin. After the fabrication of the PLV, during the placement of PLVs, etching was carried out by hydrofluoric acid 9.5% for 20 seconds and silanization with a silane coupling agent of the veneers was done before luting. Slurry of pumice was used to clean the tooth surface and use of retraction cord for gingival displacement. 37% phosphoric acid was used for acid etching and the etchant was rinsed off thoroughly after duration 15 seconds of duration. Bonding agent was applied in thin layer on all the prepared teeth surfaces and inner surface of veneers and light cured for 25-30 seconds. On the inner surface of porcelain veneers, dual cure composite luting agent of appropriate shade was selected and placed. Veneers coated with luting cement were placed on the teeth surfaces to check proper seating and margin of it, followed by applying pressure and polymerizing initially for 5 seconds for removal of excess luting agent and later each tooth was cured for 60 seconds. Refinement of the margins was done by extra-fine diamond points. Final Cementation of Veneers is shown in Figure 15-17.



Fig 15



Fig 16



Fig 17



Fig 18

Flexible spiral retainer (FSW) is placed on the lingual aspect of maxillary anteriors over the cingulum area extending from canine on the one side to the opposite side as a permanent fixed retainer (Figure18).

III. DISCUSSION

Midline diastema could be transient or created by many causative factors which have been described above. Because of multiple origins, causative factors and etiologies, the diagnosis of a diastema must be based on a thorough clinical examination. Different treatment modalities include removable orthodontic appliances, full arch, single arch or sectional fixed orthodontic appliances, excision of the frenum, restoration techniques, extraction of mesiodens, habit breaking appliances, etc. In the present case, frenectomy was done because the etiology was traced to high frenal attachment. In general, abnormal frenal attachment may require removal either before orthodontic treatment or at the end of active treatment. For the ease of surgical access, excision prior to orthodontic treatment is advantageous. If the surgery is performed before the orthodontic procedure, the scar tissue might impede the closure of diastema, but the noted advantages of excision after orthodontic tooth movement is the scar tissue formation, which helps to maintain closure of diastema.⁹

Conservative and prosthodontic solutions along with orthodontic treatment are available ways to correct diastema based on tooth-size discrepancy. The restorative techniques have been mentioned for the closure of diastema which includes; indirect composite veneers, direct composite veneers, porcelain laminate veneers, all ceramic crowns, metal ceramic crowns and composite crowns. Micro-filled and hybrid resins can be used for smaller diastema closure if the diastema is not more than 1-1.5mm in dimension. Composite resin gets easily worn off and stained even though it is easy to use, requires less appointments and economic, making it inferior in quality when compared to dental porcelain. Porcelain laminate veneers (PLVs) have become the alternative to composite restorations ceramic crowns and the traditional porcelain-fused-to-metal.¹⁰ Smiles can be transformed conservatively and quickly with excellent response with tissues, and resembling to the natural tooth. Natural fluorescence is exhibited by veneers which is same like the natural tooth structure.¹¹ The estimated survival probability of porcelain laminate veneers over a period of 10 years is 91%.^{12,13} The case report justified the choice of diastema closure using porcelain laminate veneers, along with limited orthodontic mechanotherapy. A retainer was bonded to prevent relapse. Detailed diagnosis, planning and correct selection procedure and use of dental materials resulted in to a smile which is harmonious and satisfying both professionals & patient.

➤ Conflict of Interest:

The authors of this paper enclose that there is no conflict of interests associated with the publication of this paper.

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