

Closure of Midline Diastema by Multidisciplinary Approach

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Abstract

Midline diastema is a common aesthetic problem in mixed and permanent dentition. Many innovative therapies are varying from restorative procedures such as composite build-up, prosthodontic consideration to surgery (frenectomy) and orthodontics are available. A high frenum attachment is often the cause of persistent diastemas. Presented herewith is a case report of a 21-year-old female with a high frenal attachment that had caused spacing of the maxillary central incisors. This case report demonstrates 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

Introduction

A common aesthetic complaint of patients is maxillary anterior spacing or Diastema.¹ Midline diastema as anterior midline spacing greater than 0.5mm between the proximal

surfaces of adjacent teeth.² Maxilla showing a higher prevalence of midline diastema than mandible has been reported in literature. The midline diastema has a multifactorial etiology. Thick labial frenulum being the major etiology, other factors are microdontia, mesiodens, peg-shaped lateral incisors, lateral incisor agenesis, cysts in the midline region, habits such as finger sucking, tongue thrusting, and/or lip sucking, dental malformations, genetics, maxillary incisor proclination, dental-skeletal discrepancies, and imperfect coalescence of the interdental septum which can cause diastema.^{3,4} Esthetic treatment of diastema closure presents a challenge in clinical practice. The width to length ratio of the central incisors for aesthetic rehabilitation in complex midline diastema closure cases determines the treatment plan. The appropriate technique and material for a patient are also based on time, physical, psychological, and economic limitations. Different treatment modalities for midline diastema include removal of etiology and simple removable appliances incorporating finger springs or split labial bow. 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 subsequently followed by the space closure utilizing simple fixed orthodontic therapy.⁷ One of the preferred treatment options includes thin shells of ceramics known as porcelain laminate veneers (PLV) which can be bonded to the facial surface of anterior teeth using recent bonding agents and dual cure cements. This procedure is highly conservative considering the minimal amount of tooth preparation involved and creates excellent esthetic results in just two sittings. 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 conservatively managed labial frenectomy, fixed orthodontic mechanotherapy and porcelain veneers, achieving the desired esthetic results.

Case Report

A 21 year 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 did not reveal 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)



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 place 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.



Figure 2



Figure 3



Figure 4

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.

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).



Figure 5

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).



Figure 6

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.

Minimal tooth preparation of 0.5mm was carried out with definite chamfer finish line with diamond bur extending from the papilla tip towards the incisal edge on both mesial and distal proximal surface as well as on labial surface of central and lateral incisors. Provisional restorations were done by clear acrylic resin. The internal surfaces of the veneers were etched with 9.5% hydrofluoric acid for 20 seconds and the veneers were silanized with a silane coupling agent before luting. The tooth surface was cleaned using slurry of pumice and gingival displacement obtained using retraction cord. Acid etching was done with 37% phosphoric acid and the etchant was thoroughly rinsed off after a duration of 15 seconds. All the teeth surfaces and inner surface of veneers were coated with bonding agent in thin layer and light polymerized for 25-30 seconds. Dual cure composite luting agent of appropriate shade was selected and placed in the inner surface of porcelain

veneers. Veneers with luting cement were placed on the teeth surfaces, margins were checked for proper seating, pressure was applied and initial polymerization was done for 5 seconds to remove excess luting agent and cured for 60 seconds on each tooth. Extra-fine diamond points were used to refine the margins.

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).

Discussion

Midline diastema could be transient or created by developmental, pathological, or iatrogenic factors such as mesiodens, microdontia, hypodontia, abnormal oral habits, high frenum attachment, etc. Because of the potential for multiple etiologies, the diagnosis of a diastema must be based on a thorough medical/dental history, clinical examination, and radiographic survey. Removal of the etiologic factor usually can be initiated upon diagnosis and after sufficient development of the central incisor. 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. The advantage of excision prior to orthodontic treatment is the ease of surgical access. 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

Diastema based on tooth-size discrepancy is most amenable to restorative and prosthodontic solutions along with orthodontic treatment is a viable option. The restorative closure of diastema can be achieved by using any of the techniques mentioned; direct composite veneers, indirect composite veneers, porcelain laminate veneers, all ceramic crowns, metal ceramic crowns and composite crowns. Smaller diastema can be closed with microfilled and hybrid resins if the diastema is about 1-1.5mm in dimension. Composite resin is easy to use, requires fewer appointments, is economic but offers less wear resistance and surface staining, which makes it inferior 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 painlessly, conservatively and quickly with dramatic, long-lasting results with the successful use of the porcelain laminate veneer. Tissue response is excellent, and the finished surface is very similar to the natural tooth. Veneers exhibit natural fluorescence and absorb, reflect, and transmit light exactly as does the natural tooth structure.

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