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Orthodontic treatment of patient with bimaxillary dentoalveolar protrusion and agenesis of maxillary left lateral incisor

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Abstract

Treatment planning for dental agenesis of lateral incisor is open space for prosthetic replacement or orthodontic closure of space by canine mesialization. This case report explains orthodontic management of an adolescent boy had clinical features of Edward Angle's class I malocclusion with moderate bimaxillary dentoalveolar protrusion and unilateral congenital absence of maxillary left lateral incisor. Treatment completed in 18 months which included Straight wire fixed appliances, extraction of right peg lateral, retained deciduous left lateral in maxilla and right and left first premolars in mandibular arch. The end results showed maxillary canines were successfully substituted in the place of lateral incisor space.

Keywords: Canine; hypodontia; tooth agenesis

Introduction

Congenital agenesis of few teeth, many teeth and all teeth are called hypodontia, oligodontia and anodontia respectively.[1] Distal most teeth are most commonly missing as noticed in hypodontia.[1,2] Maxillary and mandibular third molars are the most commonly congenital missing tooth followed by maxillary lateral incisors, mandibular second premolar, mandibular incisors and maxillary second premolars.[3] The congenital tooth agenesis is more frequent in permanent than in deciduous dentition.[4] Hereditary plays a more significant role for missing teeth.[5] Disturbances present during the epithelial- mesenchymal interaction and bud to cap stages of tooth structure formation results in missing teeth.[1,2]

The frequency of congenital agenesis of maxillary lateral incisors varies significantly among different populations. Most reports in the literature show a variance between 1% and 3% for absent lateral incisors and 2% and 5% for peg shaped teeth.[6] Congenital absence of maxillary lateral incisors on both quadrant is much more common than single quadrant and females predilection is reported in many literature.[7] Radiographs confirmed agenesis of maxillary permanent lateral incisor if it is failed to erupt by the age of nine years or delay in period of 6 months of the contralateral tooth.[8]

The management of maxillary lateral incisor agenesis often needs interdisciplinary or multidisciplinary approach and can be broadly divided into space opening or space distribution for prosthetic replacement and space closure by canine substitution.[9] Multiple factors should be considered in the management of such patients, they are skeletal base relation, type of malocclusion, total number of missing teeth, teeth size, shape, colour and the gingival level of the maxillary canine.[10,11] Usually Bimaxillary dentoalveolar protrusion is treated with extraction of all first premolars and retracted distally with orthodontic fixed appliance, but in this case routine extraction plan couldn't be

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applied due to congenital absence of maxillary left lateral and peg shaped right lateral. This is the first case report successfully managed maxillary left lateral incisor tooth agenesis, microdontia of right lateral and bimaxillary dentoalveolar protrusion with extraction of maxillary lateral incisor and two first premolars in mandibular arch.

Case report

A 16 year old male patient came to the outpatient dental clinic of Adhiparasakthi dental college and hospital. His chief complaints were protrusion and spacing in between upper front teeth. He had a symmetrical face, straight profile, potentially competent lips and an acute nasolabial angle. Overjet and overbite were 4mm. Deep curve of spee of 3mm was noted in the lower arch. Angle's class I molar relationships were noticed on right and left sides with average clinical mandibular plane angle. Retained deciduous tooth 62 was present and permanent maxillary left lateral incisor was clinically absent. Maxillary right peg shaped lateral incisor was noticed. Spacing was present in the maxillary anterior segment and distal to mandibular left canine. Maxillary dental midline 2mm shifted to left side and gingival recession was noted in mandibular right central incisors. Mandibular premolar 35 and 44 were rotated. His oral hygiene was good (Fig: 1). The Orthopanoramic radiograph confirmed the absence of maxillary left lateral incisor, mandibular right and left third molar. Generalized mild horizontal bone loss was also noticed. The cephalometric parameters showed class I skeletal pattern, normodivergent facial pattern, proclined upper and lower incisors and protrusive lips (Fig:2 and Table 1).

Variables	Pretreatment	Posttreatment
SNA	86°	86°
SNB	84°	84°
ANB	2°	2°
WITS	BO=AO	BO=AO
SN-GOGN	30°	30°
FMA	24°	25°
INTERINCISAL ANGLE	102°	135°
IMPA	102°	84°
U1-NA (ANLGULATION)	39°	23°
L1 - NB (ANGULATION)	36°	20°
U1-NA (LINEAR)	+15mm	+4.5mm
L1 -NB (LINEAR)	+8mm	+8 mm
U1-SN	125°	107°
S-LINE TO UPPER LIP	+4mm	+2mm
S-LINE TO LOWER LIP	+6mm	+3mm

Figure 1: Pre-treatment clinical extraoral and intraoral photographs of the patient
Figure 2: Pre-treatment radiographs (a) Panoramic (b) Lateral Cephalogram
Figure 3: Beginning and end stage of space closure clinical photographs
Figure 4: Posttreatment clinical extraoral and intraoral photographs of the patient
Figure 5: Posttreatment radiographs (a) Panoramic (b) Lateral Cephalogram

Figure 1: Pretreatment clinical extraoral and intraoral photographs of the patient

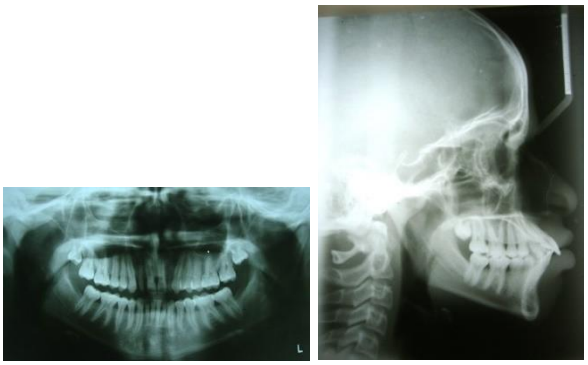

Figure 2: Pretreatment radiographs (a) Panoramic (b) Lateral Cephalogram

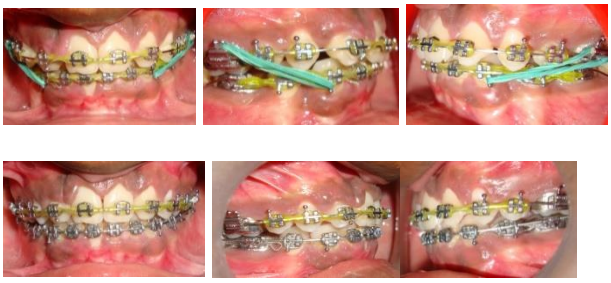

Figure 3: Beginning and end stage of space closure clinical photographs

Figure 4: Post treatment clinical extraoral and intraoral photographs of the patient

Figure 5: Post treatment radiographs (a) Panoramic (b) Lateral Cephalogram

Treatment objective

The treatment objectives were planned to correct bimaxillary dentoalveolar protrusion, lip protrusion, rotated 35, excessive curve of spee and midline shift. Establish ideal overjet and overbite. Maintain molar in class I position and substitute maxillary canine in the lateral space. The periodontal consideration should be taken to prevent further progression of bone loss and gingival recession in 41.

Treatment plan

It was decided to extract four premolar teeth for correction of dentoalveolar protrusion, but presence of maxillary right peg lateral and congenital absence of left lateral incisor changed decision in the extraction plan. Finally, this case was planned for extraction of peg shaped right lateral and retained deciduous left lateral in maxillary and two first premolars in mandibular arch. Maxillary canines were planned to substitute in the place of lateral incisor space.[12,13]

Treatment alternatives

Two alternative treatments were proposed. First option is extraction of peg shaped right lateral and retained deciduous left lateral in maxillary and two lateral incisors in mandibular arch. This plan was avoided due to two reasons; less space available in the mandibular arch for complete retraction of maxillary anterior segment and formation of

black triangle. Second option is extraction of maxillary premolar 14, retained deciduous 62 and two first premolars in mandibular arch. Here, maxillary right lateral need veneer or crown at completion of treatment. Maxillary left canine is substituted in the missing lateral space that may require reshaping and veneer to match with contralateral lateral incisor. This second plan also avoided due to unaesthetic appearance and additional cost.

Treatment progress

After extraction of 12, 62, 34 and 44, a 0.022 slot McLaughlin, Bennett and Trevisi brackets were placed in the upper and lower arch. Maxillary canine bracket was placed inverted to decrease root prominence and 35 was banded for rotation correction.[14] Alignment and leveling was started with 0.016 Nickel Titanium superelastic archwire in both arches. Three months later, 17× 25 nickel titanium wire was engaged. Progressively 19×25 nickel titanium and stainless steel wires were installed. In 19×25 stainless steel space closure was began with sliding mechanics (Fig:3).

En mass retraction of lower anterior segments was done by elastomeric chain engaged from left first molar to right first molar. Some amount of lingual rolling of lower right and left first molars were observed during space closure. To correct lingual rolling slightly expanded lower arch near molar region and also included second molar for better control of first molar position and curve of spee correction. In the maxillary arch elastomeric chain was engaged from right second premolar to left second premolar for ease mesialization of canine and retraction of maxillary incisor teeth. Additionally patient asked to wear class III elastics for maxillary molar protraction and mandibular anterior retraction (Fig:3). Gingival enlargement in maxillary anterior teeth region was noticed at the end of space closure. Motivated patient to improve oral hygiene after oral prophylaxis.

At the end of space closure, orthopantogram was advised to assess the root parallelism and bone loss. Orthopantogram showed distally tipped roots of maxillary right and left canine. Mandibular arch showed parallel roots. Maxillary canine brackets were replaced with lateral incisor bracket for root correction and reshaping. The distal angulation of maxillary canine root could not be able to correct, due to presence of decreased alveolar bone width noticed clinically in the lateral incisor region. Discussed with patient and parents about widening of alveolar bone width and bone grafting to improve maxillary canine root angulation, but they denied the surgical procedure. So debonding and debanding were done after fixing lingual retainer from right canine to left canine in the mandible and maxillary arch.

Treatment results

The end results showed maxillary canines were successfully moved into lateral incisor space clinically. Normal overjet and overbite of 2mm were achieved and class I skeletal base was maintained. Mild rotation of 35, improvement in lips strain and protrusion were noted (Fig:4). The Orthopanoramic radiograph showed mesially angulated crown of maxillary canine, premolar and molars. This findings was not acceptable but due to patient unwillingness to do further correction, finished with compromised results. Lateral cephalometric analysis revealed no significant skeletal changes. The protrusive upper and lower incisors were retracted into ideal place and soft tissue profile improvement also noticed (Fig:5 and Table 1)

Discussion

The treatments for maxillary lateral incisors agenesis is space opening followed by prosthetic replacements or space closure with canine mesialization. The orthodontic space closure is indicated for patients presents with Edward Angle's class II malocclusion without lower arch crowding and an Angle's class I malocclusion with severe crowding or proclination needs mandibular teeth extractions. Whereas, space closure are contraindicated in patients presents with moderate convex profile and mandible

retrognathism or deficient chin prominence, excessive gingival canine contours, high smile line and unmatched canine shade.[15]

Maxillary lateral incisors agenesis can be managed by canine substitution. The advantage of canine substitution are preserving alveolar bone level, maintaining gingival position, decreasing the chances of third molar impaction and stable results compared to prosthesis.[16,17] In this case, canine substitution was done because patient presents with class I skeletal base with bimaxillary protrusion. Though maxillary canine was positioned optimally in more aesthetic and functional location, restorative dental correction such as porcelain veneer or crown and intentional bleaching might require in re-creating normal lateral incisor colour and shape.[18] In this case canine shape and color are matching with central incisor, hence canine substitution was done with minimal reshaping of canine.

In this case canine substitutions were not finished excellently due to resistance encountered in root movements of maxillary canines and decreased alveolar bone volume. This problem would have been avoided by proper evaluation of pretreatment maxillary canine root position and alveolar bone volume by using cone beam computed tomography.[19, 20]

Studies supporting space closure of maxillary lateral incisors agenesis by canine substitution are Thordarson et al, Nordquist & Mcneill and Armbuster et al. Thordarson et al stated that canine substitution and recontouring into lateral will give long term esthetic results and healthy periodontal conditions rather than by replacing missing lateral with bridge or implants.[21]

Nordquist and Mcneill concluded that modified group function on the working side was satisfactorily achieved with canine substitution.[22] Robertsson and Mohlin concluded that orthodontic space closure could not affect Temporomandibular function and periodontal health in comparison with the prosthetic appliances.[23] Armbuster et al stated that lay people and orthodontist very well accepted that canine as lateral incisors in the series of photographs used to evaluate attractiveness in their study.[24]

Schneider et al noticed that orthodontists and dentists were pleased equally with implant and canine substitution, but laypersons prefer space closure.[25] Silveira et al found that periodontal scores were bad with tooth supported bridge prostheses than with orthodontic space closure by canine mesialization .[26]

Disadvantage of space closure is reopening of space after treatment, but this could be prevented with long term fixed bonded palatal retainer and proper restorations of incisors and premolars adjacent to mesialized canine, supported by a well-balanced functional occlusion.[27,28] Along with fixed retainer, removable Hawley's plate also advised to use 24 hours a day for 6 months and then at night time wear.[29] A ten year follow up study showed no significant changes in correction noted with this regimen.[21]

Conclusions

The decision to open or to close absent unilateral or bilateral maxillary lateral incisors spaces remains a challenging task for most orthodontist. But meticulous evaluation of the patient problems, expectation, limitations and correct treatment planning will definitely satisfy esthetic, restore function and periodontal health in long term.

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