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Orthodontic Management Of Congenitally Missing Maxillary Lateral Incisors: A Multidisciplinary Treatment Approach

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ABSTRACT:
Missing maxillary lateral incisors present unique orthodontic and prosthetic challenges as well as aesthetic issues. Alveolar bone is not developed here due to congenital absence of lateral incisors. The amount & quality of cortical bone between the canine and central incisors determines the implant prosthesis for missing lateral incisor prosthesis in order to ensure optimal stability. For this reason, the most popular implant type for congenitally absent lateral incisor prosthesis is presently basal or bi-cortical dental implants. In order to successfully rehab these cases nowadays, dental implants that closely resemble natural dentition in terms of emergence profile, prosthetic contour, and color must be installed.
For people who have congenitally missing teeth, such as maxillary lateral incisors, there are a number of treatment alternatives. Treatment techniques for fixed prosthodontics and orthodontics are deemed suitable.
However, since substantial tooth movements are not required, implant-based prostheses are the gold standard for rehabilitation of congenitally absent maxillary incisors.
This is a 25 year old female patients case report, who reported to the department with chief complain of spacing in upper anterior region. this report involves orthodontic and prosthodontic approach in which pre-treatment,mid-treatment &post-treatment records of the patients are presented.

Keywords: *Anodontia/Therapy, Dental Implants,Orthodontics/Corrective*

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I. INTRODUCTION:

The needs and expectations for aesthetic dentistry in the modern day are rising. Patients need to be knowledgeable about all of their dental demands, not just those related to a certain expertise, in order to offer them with an esthetic anterior tooth shape and accurate agenesis.

Patients must be given access to a comprehensive treatment plan that optimizes function, aesthetics, and oral health in order to integrate and coordinate care. In many cases of ordinary dental malocclusions, orthodontic treatment may be insufficient on its own. The patient's lip line, crowding, buccal corridor, smile line, black triangles, and facial profile must all be assessed. A one-sided approach to complex issues frequently yields subpar outcome. In the general population, maxillary lateral incisors have the largest genetic variability, while canines have the least genetic influence on anterior tooth size.

Numerous twin studies [13–15] show that the mesio-distal dimensions of teeth are influenced by genetic variables, and populations with chromosomal aberrations—like those affected by Down syndrome—show a generalized decrease in the quantity and size of teeth.[16] The observation that tooth agenesis is more common among the parents and siblings of people who are missing teeth than in the general population lends credence to the theory that tooth agenesis is a genetic disorder.[17, 18]

An integrated, interdisciplinary strategy is necessary for the treatment of lost lateral incisors [1]. The decision between space closure with canine substitution and space opening with tooth replacement typically depends on a number of factors that need to be taken into account prior to treatment planning.

Occlusal relationship (i.e., overjet and overbite, molar relationship), facial typology and profile, arch length, and tooth size differences are frequently taken into consideration when making a decision. Canine morphology, or the size, shape, and color of the tooth [2] may also influence certain treatment approaches. Lastly, the treatment planning may be impacted by patient expectations and compliance.

When a patient has unilateral tooth agenesis, space opening is frequently advised in order to maintain s mile symmetry and enhance patient appearance.

Conversely, with regard to the previously mentioned problems, space closure and space opening could both be carried out in the event of bilateral agenesis [3-6].

For low-angle subjects, space opening is recommended; for high-angle subjects, space closure is suggested in order to maintain arch anchoring and prevent clockwise rotation of the lower jaw. To better treat retruded profiles and improve labial sagittal relationship, space opening and tooth substitution should be used. In people with bimaxillary dental protrusion, this treatment approach should be avoided as it may exacerbate the profile.

The molar relationship needs to be taken into account. Molar class I or class III tendency should be better treated with space opening to preserve ideal occlusal anterior and posterior relationship (i.e., canine and molar relationship) and establish a solid angle class I.

Space closure should be chosen for entire or partial molar class II cases in order to improve orthodontic biomechanics and shorten treatment times.

Next, a stable canine class I and molar class II are obtained.

In contrast to situations involving large canines, where it is recommended to create space, little canines can be easily converted into lateral incisors with the use of composite materials or porcelain veneers.The ideal t eeth for an incisor replacement are those that are closer to the midline.

Missing maxillary lateral incisors present unique orthodontic and prosthetic challenges as well as aesthetic issues. In young orthodontic patients, dental implants are frequently utilized to replace lateral incisors that are congenitally absent (DE AVILA, et al. 2012).To achieve an outcome that is both aesthetically pleasing and meets the patient's functional expectations, an interdisciplinary approach should be followed throughout the diagnosis, prognosis, and treatment plan (ZARONE, F. et al. 2006). The opposing lateral incisor determines the width of the space for the implant and crown in a patient who has a congenital absence of the maxillary lateral incisor. On the other hand crowding, profile, crown form and color, smiling lip level, and occlusion all affect how much room there is for the implant and crown in cases when both lateral incisors are congenitally absent.Prior to the start of the implant surgical stage, the orthodontic phase needs to meet a number of clinical requirements (SPEAR, et al., 1997).

A secure posterior intercuspation with an optimal overjet and overbite must be ensured by the occlusion.

In order to support stable crestal bone levels and optimal dental papilla growth, the anterior edentulous area must provide enough distance between an implant an d the neighboring tooth

(ESPOSITO, et al.1993).After weighing the treatment plan andbiomechanics,it is important to carefully assess whether to keep the spaces from missing lateral incisors or close them orthodontically (SABRI, 1999, B AIDAS; HASHIM 2005).

Furthermore,according to Lombadi(1973),theGolden Proportion factors enable the determination of the optimal width ratio between the maxillary lateral incisor and its neighboring cent ral incisor.

Furthermore, by adding ceramic laminates to the results of orthodontic and implant treatments, minimal ly invasive aesthetic procedures can further improve anterior maxillary aesthetics.

The purpose of this paper was to report a case of maxillary lateral incisor bilateral agenesis in a you ng patient, where multidisciplinary treatment allowed for a suitable resolution with excellent reestablishment of function and aesthetics. Missing lateral incisors are not uncommon in the population, and multidisciplinary pl anning is fundamental to treatment success.

II. CASE REPORT:

A 25-year-old female patient complains of spacing in the upper anterior region.

EXTRAORAL EXAMINATION:

Extraoral examination reveals a mesomorphic facial form, orthognathic facial profile with competent lips and acute nasolabial angle (Fig. 1).

INTRAORAL EXAMINATION:

Angle's class I molar relation on both sides and class II canine relation on both side with overbite of 2 mm and overjet of 2 mm. Bilateral rotated first maxillary premolar present. Spacing in the maxillary anterior region due to the absence of upper lateral incisors, (Fig. 2).

Fig. 1: Pretreatment extraoral views

Fig. 2: Pretreatment intraoral views

Fig.3: OrthopantamographDIAGNOSIS

A case of skeletal class I, average growth pattern with Angles class I molar relation on both sides and end on canine relation on both side, overbite of 2 mm and overjet of 2 mm, spacing in the maxillary anterior region, congenitally missing upper lateral incisors.

RADIOGRAPHIC EXAMINATION:

Panoramic radiograph examination shows congenitally missing maxillary lateral incisors bilaterally (Fig. 3). Cephalometric findings reveal orthognathic maxilla and mandible with mild proclined upper and lower incisors.

TREATMENT OBJECTIVES:

To open up the spaces for the missing lateral incisorTo achieve class I canine relation.
To replace the missing lateral incisors with implant prosthesis
To maintain the class, I molar relation on both sides.

Fig.4: Lateral cephalogram & Analysis

SKELETAL ANALYSIS I

PARAMETERS	NORM	PT.VALUE	INFERENCE
VERTICAL			
FMA	24.2±3°	20	Horizontal growth pattern
SN Go Gn	32°	24	
Y –Axis	53 to 66°	59	
Jarabaks ratio(%)	62 to 65%	70	
LAFH	60.1±4.6mm	61	
Saddle angle	123± 5°	128	
Articular angle	143±6°	145	
Gonial angle (U)	128±7°	120	
(L)	52 to 55°	56	
	70 to 75°	68	

PARAMETERS	PT. VALUE	INFERENCE
Naso-labial angle	90°	nasolabial angle with in normal value
L lip to E-line(mm)	-2	
L .lip to S-line(mm)	1	
U .lip to E-line(mm)	-2	

SKELETAL ANALYSIS I

PARAMETERS	NORM	PT.VALUE	INFERENCE
MAXILLA			
SNA	81.1± 3.8°	81	Maxillary orthogenetic
N Pr. To A(mm)	-2.3± 3	0	
Eff. M. Length(mm)	86 ± 2.3	84	
MANDIBLE			
SNB	79.3±3.9°	78	Mandibular orthogenetic
N Pr. To Pog (mm)	-6.7±5.1	-6	
Eff. Mn Length (mm)	113.4±4.7	110	
MX-MN			
Wits AO/BO (mm)	0 to -1	1	Class I skeletal base
ANB	3.8±2.2°	3	
Angle of convexity	8.5 to 10°	4	
Mx – Mn diff (mm)	21.1 ±2.7	26	

PARAMETERS	NORM	PT. VALUE	INFERANCE
MAX. INCISORS			
U. Incisors to NA (deg/ mm)	22/4°	20/2	Incisor position mild linguoversion
U . Incisor to A vert. (mm)	3.3±1	-5mm	
U. Incisor to A pog (mmm	-1 to 5	+7mm	
U. Incisor to FH	107		
U . Incisor to SN	102°	97	
MAN. INCISORS			
L incisors to NB (deg/mm)	25°/4	27/4	Incisor position mild labioversion
L incisor to Mn. Plane	90	93	
L incisors to Occ.plane	14.5	20	
L incisors to A-pog (mm)	1.6 sd 2.3	7	
MX-–MN			With in normal limit
Inteincisal Angle	135°	133°	
Overjet (mm)	2mm	1mm	
VERTICAL PLANE			
Overbite (mm)	2mm	2mm	

TREATMENT PLAN:

Treatment plan is divided in to two phases:

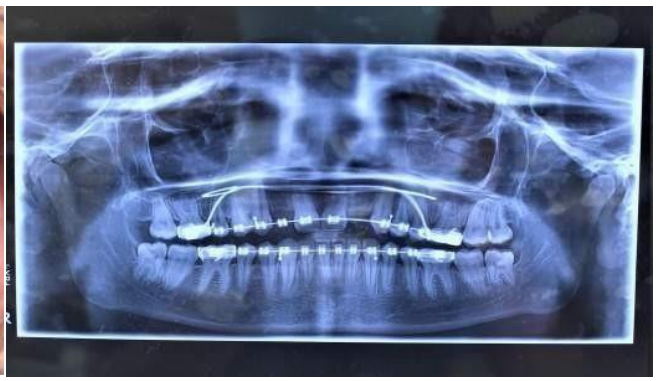
A. Orthodontic phase
B. Prosthodontic phase.

ORTHODONTIC PHASE:

Aim of the orthodontic phase is to open the space by distalizing the canines. The option of space closure by mesializing canine was not preferred due to class I molar relation well interdigitated posterior occlusion, and also for recontouring of canine to lateral incisor the morphology of canine with sharp cusp, need for intentional root canal treatment of a sound naturalteeth.

Treatment Progression Orthodontic treatment started with 0.022" MBT preadjusted edgewise appliance. The sequence of archwires started initial with 0.016" NiTi arch wire followed by 0.018"SS, 16× 22"SS, 17 × 25"SS and 19 × 25"SS arch wires. In 19 ×25"SS arch wire canine was retracted on both sides by beneath method of retraction. Sufficient space wasgained for replacement of lateral incisors by distalizing the canine to class I relation and also closing the mid-line space (Figs 4). Treatment period lasted for 12 months.

After retraction radiographs were taken to assess thebone level and root parallelism for the implant placement. After final finishing and detailing of the occlusion the fixed appliance was debonded and upper Hawley's retention appliance were given.

PROSTHODONTIC PHASE:

The prosthodontic phase includes the following:

Implant Selection and Template Fabrication:

Template was fabricated for guiding implant placement during surgical procedures. Based on bone density, height and width implant was selected**.**

SURGICAL STAGE:

First stage surgery:

In the first surgical stage, utilizing a surgical templateprepared from a wax-up of the proposed implant-supported restoration, a 3.5 to 11 mm Biconuncoated implant fixture was placed under local anesthesia.

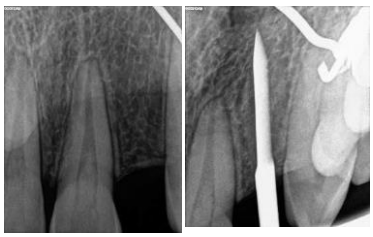


Fig.7 Pilot drilling & final drilling with physiological handpiece

Second surgical phase:

The second surgical phase involved placement of the abutment and fabrication of a temporary crown. Under local anesthesia, a Bicon 4.0 to 6.5 mm angled abutment was installed and a temporary crown was placed.

The Bicon abutment utilizes a locking taper for retention of the abutment to the implant fixture. The locking taper allows any sized abutment to fit onto any sized implant, improving prosthetic versatility. The abutment was prepped to provide ideal alignment and emergence profile of the crown. The tissues allowed to mature for 6 weeks, and the patient returned for the impression appointment.

Fig.8 Intraoral periapical view before implantplacement

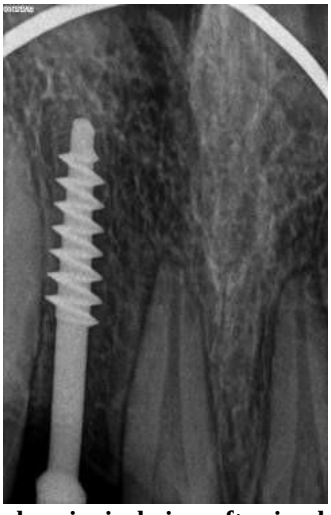
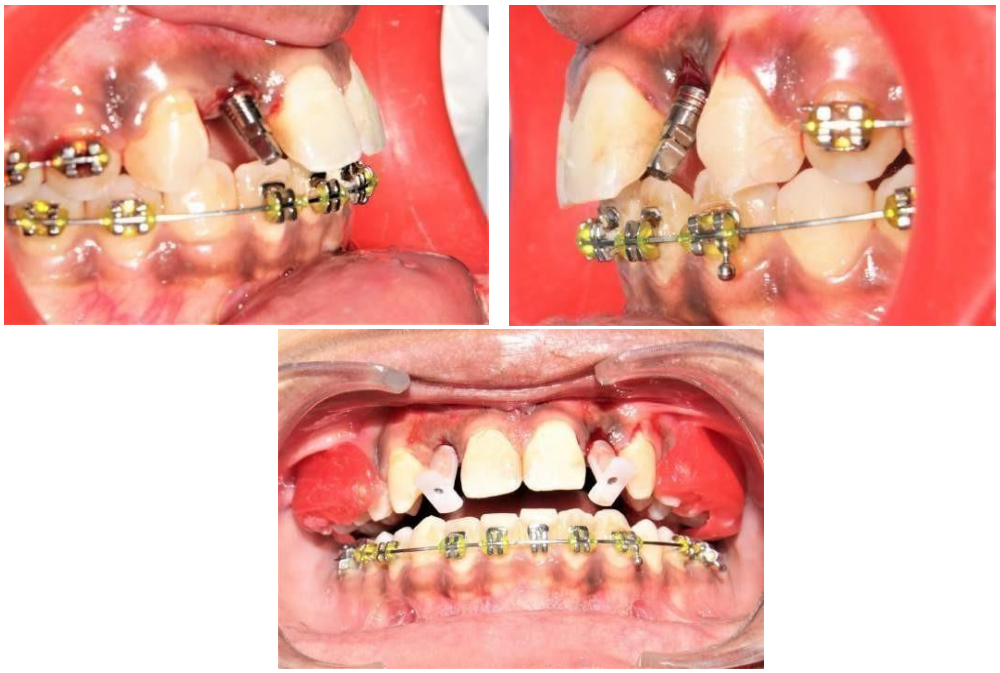


Fig.9 Intraoral periapical view after implantplacement

Fig.10: Implant placement



Impression Making

After the fixture was placed, impression copings were placed and an open tray impression technique wasused to transfer the exact position of implants to the cast (Fig.).

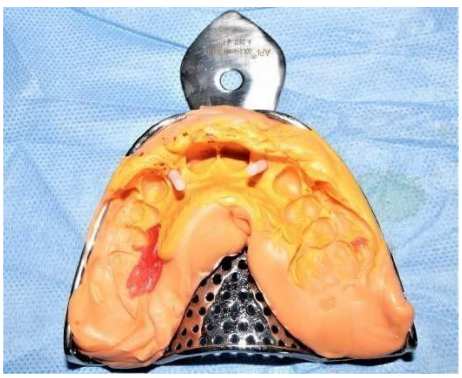


Fig.11 Impression

III. DISCUSSION:

A patient with a missing lateral incisor will have a noticeable asymmetry in their smile and a shift in their dental midline. Dental implants have been used in the aesthetic zone for a long time; multiple controlled clinical trials have demonstrated that the overall implant survival and success rates are comparable to those reported for other jaw segments.Permanent canines often erupt mesially to their natural placements when maxillary lateral incisors are absent from birth.Through orthodontic therapy, the canine can be shifted distally into its normal position once it has erupted.An alveolar ridge with sufficient buccolingual width is formed by shifting the tooth distally, which lays down bone and facilitates implant implantation. Another problem is maintaining alveolar bone for several years until growth ceases since implants are best suited as a restorative option for adults once facial growth is finished. [19,20]

The orthodontist has to make sure that there is enough room between the crowns and roots when arranging for the implantation of a single tooth. Before considering implant implantation, the amount and quality of alveolar bone must be evaluated.[21]

A standard implant requires a minimum of 10 mm of incisor-gingival bone and 6.0 mm of facial lingual bone.[22]When there is insufficient alveolar bone to place implants, ridge augmentation may be necessary in addition to orthodontic realignment of nearby teeth.[21] Sufficient distance between neighboring roots is also necessary for the implant. [23, 24]

The typical width of a dental implant fixture is 3.75 mm, and the fixture and neighboring roots need to be separated by 1 to 2 mm.[25]

It is generally advised to leave 6 to 8 mm of bone between the canine and central roots.Creating adequate space between the roots must be specifically addressed since the central and Canine roots may be brought into closer proximity when the teeth are initially aligned orthodontically.[22] To create adequate space for the implant further orthodontic treatment may be necessary to move the roots further apart. Space for the coronal restoration must also be assessed. The average implant platform, which is 4.0 mm wide, requires a space of 1.0 mm medially and distally between the platform and the adjacent tooth to facilitate proper healing and the development of a papilla post-operatively. [24,25] Thus, a minimum of 6 mm of space for the lateralcrown is required. [23,24] Single tooth implants are a good treatment option for replacing the missing teeth provided that the subject's dental and skeletal development is complete and it has several improvements over resin-bonded prosthesis. Preparation of adjacent teeth is not needed; the tooth replacement will function individually; a conventional oral hygiene technique can be used; preservation and stimulation of existing bone and soft tissues occur, including re-creation of the interproximal papillae; and stability andfunction are improved because of the implant supporting the crown.As discussed above, one goal of orthodontic alignment is to achieve sufficient bone between the roots to place the implant.The roots of the central incisor and canine should be parallel to slightly divergent to avoid complications resulting from root proximity. Usually, the tip of the central incisor is approximately 5° while that of the canine is13°, which means that the roots are slightlydivergent. There are additionalmechanotherapy treatment options that canbe used to orthodontically position the rootsof the adjacent teeth and create adequate space for the implant. These include ideal placement of brackets to achieve the correct root and crown positions; bending the arch wire to accentuate root divergence; or bonding a contralateral bracket on a central incisor (such as placing the maxillary right central incisor bracket on the maxillary left central incisor) to accentuate root divergence in the implant area [27]. The esthetic advantage of a single tooth implant vs a three-unit bridge is that a pontic for a three-unit bridge simply sits on top ofthe soft tissue, whereas a single tooth implant restoration emerges from the soft tissue. Maintenance of oral hygiene is not a major issue when a single tooth dental implant is placed as the patient can easily floss conventionally as with a natural tooth. Advantages of single-tooth implants include improved esthetics, improved hygiene accessibility, osseous preservation, andreduced future maintenance all at a comparable cost. The most importantadvantage of using implants to replace missing lateral incisors is that they leave proximal teeth untouched. Implants have become the restoration of choice for most patients when the treatment option is to open space.

For implant treatment to be successful there must an adequate intercoronal and interradicular space opening and root paralleling of the adjacent teeth, including the apical areas, and the abutment teeth must be completelystabilized.[19]

Placement of a dental implant is the most conservative approach from a biological standpoint as placing a dental implant in bone provides a functional stimulus to help preserve the remaining bone and prevent resorption while preserving the sound structures of the adjacent teeth.

IV. CONCLUSION:

Congenitally missing lateral incisorspresents a challenging treatment dilemmafor the clinician as they are usually associated with other malocclusions and abnormalities. For a successful outcome and patients' satisfaction a coordinated orthodontic, prosthodontic, periodontal and restorative treatment approach, with

careful concern toward patient expectations and requests are critical. For the replacement of congenitally missing upper lateral incisors single tooth implants should represent the treatment of choice. An implant will preserve tooth structure and alveolar boneand provide esthetics and function.

As mentioned above successful restorative treatment involving implants depends on interdisciplinary treatment planning, especially if pre-prosthetic orthodontic tooth alignment is required. The roots of the teeth adjacent to the edentulous implant region must be parallel or slightly divergent to create sufficient bone for implant placement,and there must be sufficient space betweenthe crowns to place an implant and restore.

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