

## Case Report

### Congenitally missing lateral incisors: Case management with a multidisciplinary approach

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#### ABSTRACT:

Congenital absence of maxillary lateral incisors is a frequent clinical challenge which must be solved by a multidisciplinary approach in order to obtain an esthetic and functional restorative treatment. Fixed prosthodontic and removable prostheses, resin bonded retainers, orthodontic movement of maxillary canine to the lateral incisor site and single tooth implants represent the available treatment modalities to replace congenitally missing teeth. This case report demonstrates the team approach in prosthetic and surgical considerations and techniques for managing the lack of lateral incisors. The aims of this case report of replacement of bilaterally congenitally missing maxillary lateral incisors with dental implants.

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#### INTRODUCTION

Congenitally missing teeth are as a result of poorly developed tooth germs resulting in non-differentiation of dental tissues, [1], it is considered one of the most common anomalies of dental development, [2]. The prevalence of agenesis of permanent teeth varies among countries and races [1]. According to many studies, the prevalence of teeth agenesis varies between 6,7 and 9% , the most frequent agenesis concerns the maxillary lateral incisors and the second mandibular premolars [2-4,6]. The Maxillary Lateral Incisor Agenesis (MLIA), either unilateral or bilateral, has recorded prevalence rates varying between 1.9% and 4,9%. [3,4,5]

There are multiple options when treatment planning these patients. One option is to close the lateral incisor space by moving the canine until it is adjacent to the central incisor and then reshaping it to look like the lateral incisor through a process called canine substitution. [6] The other option is to place the canine at its natural position within the dental arch, filling the void left by the missing lateral incisor with either

a single-tooth implant or a tooth-supported restoration. [5]

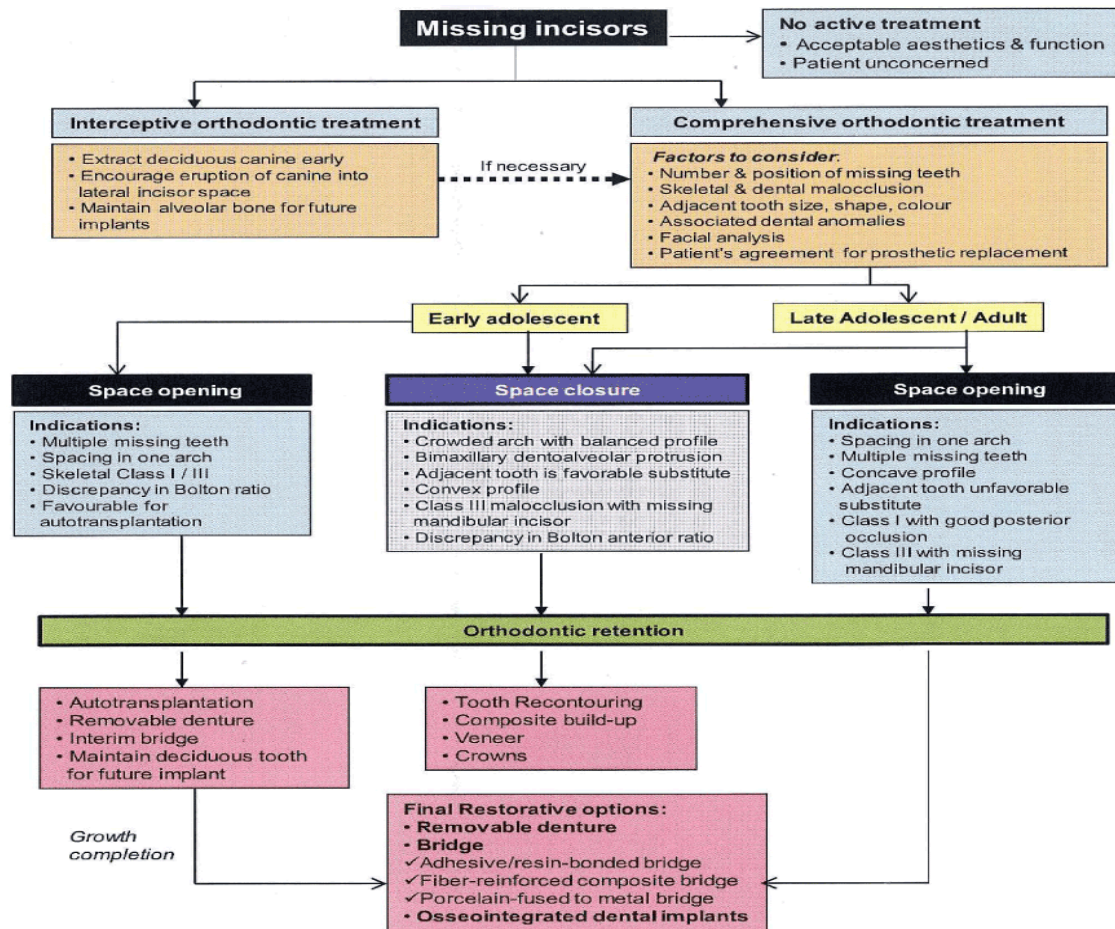
A thorough diagnostic protocol should be used in determining which option is best for each patient. [7] Many articles have been written suggesting that there are certain dental and facial criteria that should be analyzed before deciding which option to choose. [8] They include malocclusion, amount of crowding, profile, canine shape and color, and level of the lip. Another criteria to consider, that isn't mentioned often in the literature is the position in the dental arch where the canine erupts. (TABLE.1) [7,8]

Missing lateral incisors as well as peg shaped lateral incisors present the clinician with unique and very challenging aesthetic demands [2,3,4]. It is helpful to determine from an early stage which final Missing lateral incisors as well as peg shaped lateral incisors present the clinician with unique and very challenging aesthetic demands . It is helpful to determine from an early stage which final. [9,10,11]

Treatment planning for these patients can be challenging. There are many concerns one needs to be aware of when planning these cases because the

congenital absence of one or both of these teeth introduces an imbalance in maxillary and mandibular dental arch lengths in the permanent dentition. The most predictable way to achieve the optimal esthetic and functional result is to use an interdisciplinary team consisting of a general dentist, orthodontist, periodontist, oral surgeon, and prosthodontist. Together, they should elaborate and create the patient's treatment plan and communicate throughout the course of treatment to make sure that all aspects of treatment are considered and the overall treatment objectives are achieved.[6,8,9,10]

There are multiple options that exist for treating these patients. The space sometimes closes spontaneously. If not, the space can be closed orthodontically through a process called canine substitution. This is done by moving the maxillary canine into the position normally occupied by the maxillary lateral incisor and then reshaping it to look more like the lateral incisor. The other option is to place the canine at its normal position within the arch, creating space for either a single-tooth implant or a tooth-supported restoration.[11,12,13]



**TABLE 1: Algorithm of “Orthodontic management of developmentally missing incis**

The orthodontist plays a key role in determining and establishing space requirements for patients with congenitally missing maxillary lateral incisors. However, the implant based treatment option in such patients requires an interactive and interdisciplinary management approach [1,3,5]. This interdisciplinary approach may involve preprosthetic orthodontic treatment following consultations with an oral surgeon or periodontics and restorative dentist to ensure orthodontic alignment will facilitate the surgical, implant and restorative treatment. Too often, surgeons attempting to place standard-diameter implants have forced the restorative team to manage these small dimensions with a lack of adequate prosthetics because of the size and diameter of the

fixture head. Recently, manufacturers in the implant industry have offered a 3-mm diameter implant design to address these challenges [3,4,5,6]. Most of the implants available in the 3-mm size have been one-piece or unibody implants, which often necessitate conventional tooth-preparation techniques by the restorative team as well as standard cord-impression techniques for indexing the restorative margins. With some systems, there is no need for preparation due to a cervical marginal collar that can be captured utilizing a snap-in impression transfer [6,8,10,11,13].

This article aims to present a case report of replacement of bilaterally congenitally missing maxillary lateral incisors with dental implants.

## CASE REPORT

The initial clinical exam revealed diastema, congenitally missing maxillary lateral incisors with the canines located in the lateral incisor positions, and the primary maxillary canines still located in their original positions. These aspects created not only esthetic deficiencies but also malocclusion. (TABLE.1) Therefore, a multidisciplinary treatment was suggested to restore both esthetics and function [1,2,14,15,16].

### Phase 1: Planning

All dental professionals involved in the treatment (orthodontist, periodontist, master ceramist, and operative dentist) evaluated the clinical case individually to decide which noninvasive procedures were indicated. Next, the four professionals discussed the prognosis and limitations of the case. The master ceramist performed a diagnostic wax-up to provide a model of the multidisciplinary treatment. After patient approval, the conservative treatment was then split into three restorative phase orthodontic, surgical, and restorative. (TABLE.1) [1,2,14,15,16]. (Fig. 4)

### Phase 2: Orthodontics ; (Fig.1a,1b,1c,2,3a,3b,4)

Dental implants have become a common method for restoring missing teeth. However, especially upper lateral incisor implants are esthetically challenging. The orthodontic improvement of the procedure and the final attendance result of these patients can be accomplished best by positioning the remaining natural dentition in the anatomically correct location. This treatment should be closely coordinated with the implant placement and the restorative team. In cases of extensive dento-alveolar and skeletal malformations, occlusion and facial proportions additionally must be improved by orthognatic surgery and sometimes even by esthetic plastic surgery [1,2,15,16,17]. (TABLE.1)

The orthodontic treatment used the following parameters for evaluation: sagittal relationship between the dental arches; posterior occlusion; location, shape, and size of the canines; amount of remaining interdental space; and profile and facial skeletal pattern of the patient [14-18]. (Fig.1a,1b,1c,2)

After orthodontic treatment was finalized, the orthodontic brackets were removed and a removable appliance was used to replace the missing maxillary lateral incisors [1,2,14,16,17,18]. (3a,3b,4)

Phase 3: Surgical; (Fig.4,5,6,7,8a,8b)

A more recent option for treating congenitally missing lateral incisors, and one that currently is recommended often, is the single-tooth implant. Over the past several years, the predictability and long-term success rates of implants have made them an obvious restorative choice, especially when teeth adjacent to the space are healthy, of normal size and shape, and unrestored. Furthermore, placement of an implant may provide a functional stimulus to help preserve

bone and prevent resorption. However, when choosing the single-tooth implant as a restorative option, several factors must be taken into account such as growth considerations, space requirements, and site development [2,3,15].

Because an implant acts essentially like an ankylosed tooth, any vertical alveolar growth and eruption of teeth would cause a discrepancy between the gingival margin of the natural tooth and the implant. Therefore, implant placement should occur only after growth has been completed, and it has been suggested that neither chronological age nor hand-wrist radiographs are reliable enough to make that determination. Instead it would be best to compare superimposed cephalometric radiographs taken at 1-year intervals until no growth changes are detected [16,17]. Also, the amount of space between the roots is critical to successful implant placement, and orthodontic intervention usually is necessary to achieve not only the amount of interradicular space needed, but also the proper root angulation. Because orthodontic treatment usually occurs at an early age, several years of maintenance therapy may be required until the appropriate age for implant placement. It is also important to maintain proper spacing for ideal tooth proportions of the final restoration. In addition to the tooth width requirements for mesiodistal spacing, the alveolar width in a buccolingual direction must be adequate for implant placement. Often an additional surgical appointment is necessary to graft or augment the alveolar ridge before an implant can be placed. It has been suggested in the literature that by allowing or guiding the eruption of the canines into the lateral position and orthodontically moving them to their natural position, the necessary amount of buccolingual alveolar thickness for implant placement can be achieved naturally, without the need to perform any ridge augmentation [17,18]. ; (Fig.4)

Although not completely understood, it has been shown that very little, if any, resorptive change in alveolar bone width is observed when space is opened orthodontically compared with the decrease in alveolar ridge width after extraction of maxillary anterior teeth. However, a disadvantage of orthodontic canine distalization for implant site development is the potential for loss of arch length when the canines are allowed to erupt mesially [1,3,17,18,19,20]. (Fig.5,6,7,8a,8b)

When agenesis of maxillary lateral incisors is diagnosed in a young patient, usually primary maxillary lateral incisors are retained. In such cases, it may be necessary to selectively extract the primary lateral incisors to encourage the permanent canine to erupt mesially, adjacent to the central incisor. [20,21] The canine will influence the thickness of the edentulous alveolar ridge due to its large buccolingual width; otherwise the osseous ridge will not fully develop due to the absence of the lateral incisor [1,2,17,18].

As the canine is moved distally to open space for the lateral incisor implant and crown, the root movement creates an increased and adequate alveolar ridge which allows proper implant placement. However, the time of implant placement should be relative close to the orthodontic treatment. This procedure is called "Implant site development". If inadequate alveolar ridge is present, ridge augmentation may be necessary using bone grafts [19,20]. (Fig.5,6,7,8a,8b)

Phase III: Restorative;(Fig.9,10,11,12,13,14,16a,16b,16c,17)

The restorative phase was initiated 8 weeks after implant placement. After the resin-bonded bridges were removed, an incision was made lingual to the implants and the tissue released to the facial. The implant cover screws were removed, and standard analog abutments were tried in using an Essex retainer to evaluate space. A 1.5-mm to 4-mm straight standard abutment was chosen for each implant. Bis-acryl provisionals were made and cemented with a temporary crown-and-bridge cement. The tissue was approximated around the provisional and sutured. (TABLE.1) (Fig. 9)

After 2 weeks of healing, the provisionals were removed and a closed-tray polyvinyl siloxane impression was taken. Two weeks later, porcelain-fused-to-metal crowns were tried in and cemented with Premier Implant Cement. (Fig.10,11)

Adequate implant space: The amount of space needed for the implant and crown is generally determined by the contralateral lateral incisor. However, if both lateral incisors are missing or the contralateral one is peg-shaped, the amount of space should be determined by one of the methods below:

- The golden proportion or a recurrent esthetic proportion
- The Bolton analysis
- A diagnostic wax-up
- Mean values

The small size of the maxillary lateral from 5,5-8,0 mm requires careful planning for an implant to be placed. Is important that orthodontic movement has distanced not only the crowns, but the roots of the adjacent teeth too. Generally, the adequate coronal space should be no less than 6,3mm whereas the interradicular space no less than 5.7mm. «At least, 1,5 mm between of the implant and adjacent roots is desirable as it is cited that narrower distances between them are more likely to show a reduction in bone height over time. In addition, fixed retention is suggested rather than removable appliances to prevent relapse. crowns, but the roots of the adjacent teeth too [2,9,10,11].

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Generally, implants must not be placed until the patients have completed their facial growth and the majority of their tooth eruption[1,2,6,8,11]. As the face grows and the mandibular rami lengthen, teeth must erupt to remain in occlusion. However, the implant behaves like an ankylosed tooth and will not follow the changes of the alveolar processes due to the eruption of adjacent teeth. This may result in clinical infra occlusion of the implant supported crown and cause a discrepancy in the occlusal plane and between the gingival margins of the implant and the adjacent natural teeth.[5,7,17,18,19] Thus, evaluation of the completion of facial growth by cephalometric radiographs must be done and subsequently, the patient should be informed for the optimal time of implant placement. However, even mature adults can exhibit major vertical steps after anterior restorations with implants to the same extend as adolescents [4,5,7,17]. (Fig.15a,b)

Six weeks after surgery the patient returned for the restorative phase of treatment. The healing abutment on the implant was then modified to create a better emergence profile(1,2,%). This was achieved with air abrasion of the healing abutment, application of metal primer, bonding agent and flowable composite.[17,18,32] The desired effect was achieved in that the soft tissue moved in a bucco-apical direction creating a more labial emergence profile. A harmonious gingival contour with the adjacent teeth was established. It was suggested from the outset that a crown lengthening procedure on the peg shaped lateral would create a longer crown length and a more symmetrical gingival contour in relation to the contralateral incisor [4,7,8,11]. The patient decided to keep treatment simple and avoid further surgery and cost .[1,2] Fig. 11,12,13 )

Finally, the minimally veneered monolithic high-translucent zirconia crowns were inserted with 20 Ncm torque following the manufacturer recommendations .The screw access opening was protected with polyfluoroethylene tape and then covered with an opaque composite resin mimicking the shade of zirconia. (Fig.11,12)An occlusal splint was used at the end of the treatment to control the active and passive eruption of the adjacent teeth. The patient was scheduled for 3 and 6-months follow-up. The soft tissues around the implantsupported crowns, as well as the gingiva around the teeth that received feldspathic veneers were stable, with no evidences of inflammation after 6 months. The patient was very satisfied with the esthetics and function of the restorations.[1,2,14-21,28-30] (Fig. 16a,16b,16c,17)



**FIG.1a; Pre-operative view.**



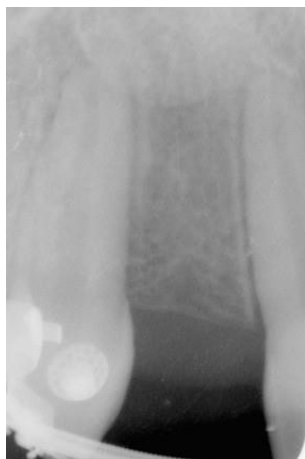
**FIG.1b; View of right preoperative site**



**FIG.1c; View of left preoperative site**



**FIG.2 Pre-operative radiograph**



**FIG.3a** Preoperative radiograph of the congenitally missing right lateral incisor.



**fig.3b** Preoperative radiograph of the congenitally missing left lateral incisor.



**FIG.4** View of maxillary preoperative sites.



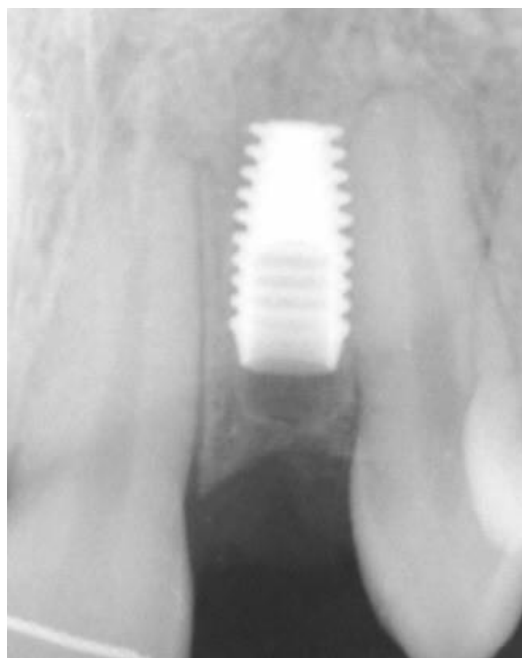
**FIG.5** Initial incision



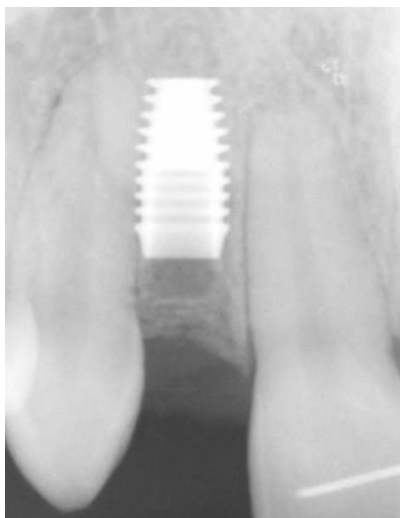
**FIG.6**Parallel pins seated in pilot osteotomies



**FIG.7;**A 4.5mm x 8.0mm HA coated implant being inserted into the osteotomy



**FIG.8a;**Post operative radiograph



**FIG.8b;Post operative radiograph**



**Fig.9;three months after the implant placement**



**FIG.10;View of green 3.0mm plastic impression posts**



**FIG.11;View of Integrated Abutment Crowns**





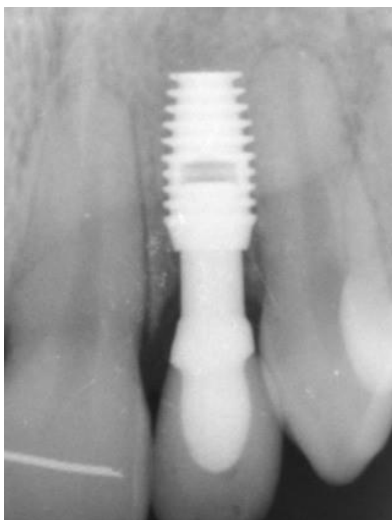
**FIG.12;Integrated Abutment Crown**



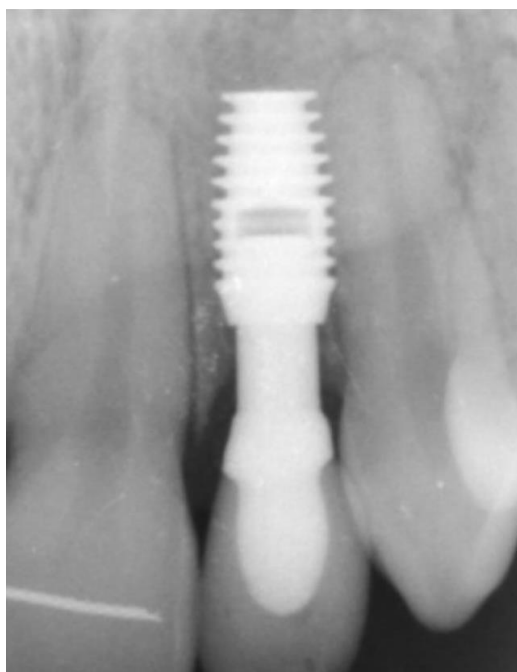
**FIG.13 ;View immediately after the insertion of right maxillary lateral**



**FIG.14;Facial view immediately after the insertion of two Integrated Abutment Crowns**



**FIG.15a;Post operative radiograph after the insertion of the right maxillary lateral**



**FIG.15b;Post operative radiograph after the insertion of the left maxillary lateral**



**FIG.16a;8 weeks after being inserted**



**FIG.16b. '8weeks after being inserted**



**FIG.16c. '8weeks after being inserted**



**FIG.17;Patient's smile two weeks post insertion**

#### **DISCUSSION**

Minimally invasive dentistry aims to preserve healthy oral structures, respecting the original tissues whereas simplifying clinical steps in order to achieve the treatment goals in a predictable way.[1] As clinical conditions are different, there is not a common guide to achieve these objectives for every case. However, a multidisciplinary analysis usually leads to an appropriate case resolution.[16,17,18] Treatment modalities which comply the original characteristics

of soft and hard tissues, like flapless extraction followed by immediate implant placement and immediate provisional restoration are in accordance with the aforementioned statements of minimally invasive dentistry.[1,2,18,19,20,21] (Fig. 4)

Regarding restorative modalities, it is common to have doubts regarding the proper material for each case scenario. When small modifications are needed, composite resin would be more practical.16 On the other hand, when major modifications in shape and

color are needed, an indirect approach through the use of ceramic veneers would be preferred.[22,23] Although these are different modalities, both should rely on healthy tissue preservation.<sup>8</sup> Feldspathic ceramics are indicated for restoring dental tissues with thin veneers because of its optimal esthetic properties, which allow to simulate optical effects such as translucency, shade, and texture.[24,25,26] (**TABLE.1**)

In restorative dentistry, the most important finding that allowed treatments to be minimally invasive was adhesive bonding.<sup>18</sup> Without the need for mechanical retention, less invasive preparation designs can be applied, and a healthy tooth structure can be preserved at its maximum; especially the enamel, which plays a fundamental role in adhesive bonding.[27,28,29] (**Fig.16a,16b,16c**) Finish lines and cementation areas in dentin must be avoided whenever possible to increase the longevity of the treatments.<sup>18</sup> Proper selection of adhesive luting agents is critical to obtain appropriate and long-lasting adhesive results. Light-cured resin cements are indicated as they present greater color stability than dual-cured resin cements.[30,31] Most dual-cured resin luting cements have a tertiary amine in its composition, responsible for color modifications over time that could be noticeable through ceramic veneers.[1,2,17,18] However, dualcured resin cement without tertiary amine was chosen for this case.

From an esthetic point of view (**Fig.17**), patients treated with implants presented similar mean teeth width values, but divergent height values when compared to patients without agenesis [26,32,33]. This is due to the natural limitation of the implant technique, in which the height of the implant will be determined by crestal bone level and the thickness of keratinized tissue of the gingiva around the implants. These aspects may vary depending on several different aspects such as the type of platform or abutment, the relationship between implant and adjacent teeth, the location of the implant/abutment junction, gingival biotype, among others [60]. As a result, implant crown height may not always be reestablished proportionally to the width of the agenesis area [12,14,15]. Although MLIA patients treated with implants present narrower teeth, it has been reported that they finish their treatment with a more proportional smile than patients treated with canine recontouring, closer to the Golden Proportion [26].

A minimally invasive surgical approach is mandatory in the anterior region, using conservative incisions in surgeries. Also low speed drilling sequence, infra-preparation and osteotomes were used in order to avoid overpreparation, overheating and to minimise the destruction of the cancellous bone. (**Fig.4,17**)To achieve implant stability, a proper implant design and minimal and precise manipulation is required.[1,2,27,28]

In cases of missing maxillary lateral incisors, it is beneficial to use an interdisciplinary treatment approach to obtain the most predictable outcome.[7,13,14] Our interdisciplinary team believes that this is indeed the best approach for these patients. In fact, before initiating any treatment procedure, we have been trying to have a consultation with all specialists involved, discussing the benefits and limitations of all treatment possibilities in front of the patient, as well as the ideal timing of the interventions in order to have the most efficient treatment[15,16,29]. The patient presented in this case report said that the interdisciplinary consultation facilitated the understanding of his problems and possible solutions, as well as made him feel more secure about the chances of achieving a satisfactory final result.[30,31]

Thus, the interdisciplinary team opted for replacing the missing lateral incisors with implants using modern prosthetic resources. Custom-made zirconia implant abutments associated to all-ceramic restorations were used to achieve better esthetics. These restorative materials minimize possible darkening of the labial gingiva around the implants through the years.[1-7,21,22] (**Fig.4,17**)

The esthetic relationship between the size of the central and lateral incisors has been called the “golden ratio.” Ideally, the size of the lateral incisor is about two-thirds of the width of the central incisor.[1-7,22,23]Most of the central incisors measure 9 mm, and the width of the lateral incisor space should not be 6 mm. Today, the smallest implant measures 3.2 mm in diameter. If the edentulous space is 6 mm wide, 1.4 mm exists between the implant and the adjacent roots. Earlier studies have documented that proximity between implants and adjacent roots promotes a reduction in alveolar bone crest height over time. Therefore, 1mm between the implant and the root side is desirable. [1-7,23,24,25]

## CONCLUSIONS

This case report describes aesthetic and functional outcomes obtained by the multidisciplinary approach for the restoration of congenitally missing maxillary left and right lateral incisor areas and fabrication of two single crowns. In congenitally missing situations, in absence of any pathologic symptoms or negative radiologic findings, such a kind of treatment suggest a successful and a satisfactory result in short-term evaluation.

## Source of Support

Nil

## Conflict of Interest

Nil

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms

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