

## Rehabilitation Of Maxillary Lateral Incisor Agenesis By Fixed Prosthodontics

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**Abstract:** Congenitally missing lateral incisors create an esthetic problem with specific orthodontic and prosthetic considerations. Selecting the appropriate treatment option depends on many factors, such as the malocclusion, the anterior relationship, specific space requirements, bone volume, root proximity, the condition of the adjacent teeth, and esthetic prediction mainly when the canine must be reshaped. The aim of this paper is to address specific criteria for treatment options when replacing the agenesic lateral with either a single tooth implant or with tooth supported restorations, and to highlight the importance of interdisciplinary treatment planning to achieve optimal esthetics and long-term predictability. There are several treatment options for this anomaly: orthodontic space closure or orthodontic space opening followed by tooth supported restoration, or single tooth implant. The space opening has been performed in two cases in order to replace the missing lateral by an implant supported crown. This treatment option could be managed in the first case and declined in the second one where the bone volume was insufficient, and bone graft was rejected. Clinical conditions were in favour of a mini invasive treatment option where the resin bonded bridge was performed. When, the canine is mesially positioned and needs to be reshaped, associated with several edentulous spaces and deep occlusion, full coverage fixed restorations is a suitable option. A variety of prosthetic approaches is available from the least conservative to the non-invasive one.

**Keywords:** Agenesis, implant supported prosthesis, fixed partial denture.

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### I. Introduction

The lateral incisor is the most common congenitally missing permanent tooth in the maxillary anterior region with the prevalence of 1 to 3%. This has been associated with their anatomical position in the fusion area of facial process. [1] However, when maxillary lateral incisors are missing, individuals are confronted with functional problems and poor smile esthetics at a young age. [1, 2] The management of maxillary lateral incisor agenesis has gained of multiple dental specialties (orthodontics, periodontics, oral surgery, prosthodontics...). [1] Several determinants such as the patient's skeletal pattern, facial profile, smile line, absence or not of multiple teeth, and canine color and shape should always be assessed since they are basic elements of the treatment. [1] In general, the treatment alternatives may include space maintenance or creation for later rehabilitation with prostheses, dental implants, or orthodontic space closure with camouflaging the maxillary canine to mimic the appearance of a lateral incisor. [3, 4] The main disadvantage of orthodontic space closure is the tendency to recreate interdental spaces (space reopening) among the anterior teeth of young patient after the end of treatment. However, the prominence of the canine root eminence is another esthetic concern of the space closure approach in patients with high smile lines. [1] However, acceptable candidates for orthodontic space opening are patients who present: a concave facial profile, multiple missed teeth, a low smile line, hardly modified canine (shape and color), in class I malocclusion with no mandibular crowding and dento-alveolar protrusions, in class III malocclusion, and in class II division 2 and brachicephalic frontal view. The rationale of the space opening approach intends to provide the appropriate space for the replacement of missing maxillary lateral incisors and eventually maintain or establish the normal buccal angle class I occlusion. [1] When space opening is indicated, both orthodontist and prosthodontist play a key role in determining and establishing space requirements. [5] Based on many parameters that can be considered in the choice of the treatment options such as: the height and width of the ridge, occlusal context, interdental spacing, treatment time, and the patient's openness to treatment alternatives. [6] The restorative approaches can be divided into two categories (single tooth implant, and tooth supported restorations) where dental implants are the most commonly used to replace congenitally missing maxillary lateral incisors once skeletal maturity has been reached. [7] When dental implants are contra-indicated, there are two available options: resin bonded bridge which is a minimally invasive option for replacing congenitally missing lateral incisor, and full coverage fixed partial denture. [5]

This article will discuss the variety of treatment managements in case of space opening and the different prosthetic solutions.

### **Case 1**

A 23-years-old woman was transferred to the fixed prosthodontic department in dental clinic of Monastir for the replacement of agenesic maxillary right lateral incisor. The patient's medical history was non-contributing, and the dental history had included orthodontic treatment. The patient had multiple diastemas with the agenesis of the right maxillary lateral incisor confirmed in the panoramic radiograph, a peg shaped left lateral incisor, with class III malocclusion and an anterior cross bite (fig.1). The patient wore an artificial tooth attached to a Hawley plaque. The treatment plan consisted on the replacement of the congenitally missing maxillary lateral incisor with a single tooth implant and the restoration of the peg-shaped right lateral incisor with a ceramo-ceramic crown. After 6months of a standard implant placement, the left lateral incisor was prepared (fig.2). Then, a mixed impression was taken transferring detailed informations concerning the abutment as well as the 3D position of the implant. Titanium angled abutment was chosen because of the buccal position of the implant, then prepared into the model cast and checked in the oral cavity. After that, the ceramo-ceramic crowns were manufactured by CAD-CAM, checked in the oral cavity, and finally sealed (fig.3).

### **II. Case 2**

A 14-years-old girl with congenitally missing lateral incisor was referred to the clinic of dental medicine for diastemas closure. Her medical history was unremarkable. A clinical examination revealed multiple anterior diastemas with unilateral missing maxillary lateral incisor and bilateral class I molar and canine relationships with canine guidance. Radiographic analysis confirmed the agenesis. A comprehensive treatment plan included diastemas closure and space opening for the replacement of the missed lateral with single tooth implant. When the patient attended 20-years-old, implant placement was not allowed for insufficient bucco-lingual bone ridge. For that, a bone grafting was indicated, and rejected after 6months which declined implant placing (fig.4). As the occlusal bite in the anterior teeth was shallow, the indication of resin bonded bridge was retained. Abutments were prepared with the respect of necessary requirements. A complete arch impression was made with a silicone impression material. A zirconia based framework was fabricated by CAD-CAM. At the initial trial, complete seating of prosthesis marginal adaptation, form of the pontic, and tissue contact were assessed. Subsequently, the framework was veneered and bonded after sandblasting the internal surface (fig.5).

### **III. Case 3**

A 22-years-old woman presented to the department of fixed prosthodontics for the replacement of missing teeth. The intraoral examination revealed the absence of maxillary right lateral, maxillary and mandibular second premolars with the persistence of deciduous maxillary second molar. The maxillary right canine was positioned in the lateral incisor placement (fig.6). Panoramic radiograph confirmed the teeth agenesis. Persistent deciduous tooth showed root resorption and needed to be extracted. Implant supported crowns and resin bonded fixed partial denture were excluded because of the financial ability of the patient, the depth of the occlusion and the existence of several missing teeth. So, conventional full-coverage fixed partial denture was indicated. For that, provisional bridges were made indirectly in the laboratory. The teeth were prepared, deciduous tooth were extracted, then provisional bridges were cemented. After the healing of the mucosa, master impression was taken and sent to the laboratory. The framework was checked intraorally, then veneered, to be finally glazed and cemented (fig.7).

### **IV. Discussion**

However orthodontic space closure procedure has been reported as encouraging for periodontal health preservation compared with prosthetic replacements, the presence of undesirable buccal corridors may be a drawback for smile esthetics, as well as the inherent size, shape, and shade of canines if orthodontically moved.[1, 4]In the opposite, the choice of orthodontic space opening facilitates the maintenance of the canines of their natural position within the dental arch having the ideal intercuspation through first premolars, and provision of canine-protected occlusion.[1] However, a prosthetic restoration should replace the missing lateral.

Currently, it would be inappropriate to remove enamel and dentin to place crowns on adjacent teeth in patients with dental agenesis, mainly if these individuals have no restorations or wear of their existing teeth. The implant procedure would be the most suitable solution if placed after completion of facial growth.

But, this restorative treatment is often challenging because the 3D morphology of the alveolar ridge might be less than ideal.[8] In addition, if orthodontic treatment doesn't establish parallel or divergent roots this may contraindicate the placement of an implant in the site, where earlier studies have documented that proximity between implant and adjacent roots promotes a reduction in alveolar bone crest height over time. Meanwhile, Rabelo et al reported, in a retrospective study, that in 6.6% off all cases, implant installation was not possible. [9]When implant placement and/or guided bone regeneration techniques are not feasible, RBFDP represents the most conservative alternative among the tooth-supported restorations, seeing that the least

sacrifice of sound tooth structure is required for their preparation.[1, 6] However, a detailed assessment of both static and dynamic occlusal relationships is crucial to optimize success.[10] This needs a shallow anterior overbite, absence of parafunction, non-mobile abutments,[1] and the pontic must not be involved in guidance during mandibular extrusive movements. When it comes to RBFDP, compared to implant crowns, Sonoyama et al[11] proved that there is no difference in quality of life, however Chris et al[12] reported that RBFDP has less survival rate than full coverage fixed partial denture which is considered as a treatment of choice when contraindicating single tooth implant and RBFDP. Moreover, if replacing of an existing fixed partial denture is required or in case of several edentulous areas, mainly when occlusion is deep, and when the adjacent teeth require restoration for structural or esthetic reasons, full coverage fixed partial denture is the most suitable treatment alternative, however, it is the least conservative.[5] Its benefit is the degree of control it exerts over the occlusion and occlusal forces.

## V. Figures



**Figure 1.** Intraoral view showing an anterior cross bite with the absence of right lateral incisor, the existence of multiple diastemas, and a peg-shaped left lateral incisor.



**Figure 2.** After orthodontic treatment, dental implant was placed and peg-shaped lateral incisor was prepared.



**Figure 3.** Patient's smile after restorative treatment.



**Figure 4.** Intraoral view after space opening and rejection of bone grafting



**Figure 5.** Lateral view of seated zirconia based resin bonded bridge.



**Figure 6.** Intraoral view of missing lateral incisor showing compromised esthetics by the mesial position of the canine, and persistent deciduous tooth.



**Figure 7.** Full coverage bridge replacing missing teeth, showing the reshaped canine restoration.

## **VI. Conclusion**

Many restorative options exist for the replacement of congenitally missing lateral incisors, including the single tooth implant, the resin-bonded fixed partial denture, and the conventional full-coverage fixed partial denture. Each of these restorations can be used with success if used in the correct situation. The treatment choice depends on many factors, orthodontic space opening offers the maintenance of canines in their natural position where the implant procedure avoids preparation of adjacent teeth. If contra-indicated, the choice of the most conservative treatment option would be suitable when possible. This needs a careful assessment of the clinical situation.

## **Acknowledgements**

We thank Mr Fethi Troudi for his valuable efforts that helped to manage a successful treatment.

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