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ORTHODONTIC TREATMENT MANAGEMENT FOR CONGENITALLY MISSING MAXILLARY LATERAL INCISORS

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Congenitally missing of maxillary lateral incisor is one of the most common agenesis anomalies. The purpose of this review was to present the orthodontic treatment of choice for a malocclusion with missing maxillary lateral incisors. Treatment plans consist of three categories: canine substitution, single-tooth implant and tooth supported restorations. Among which the least invasive option to achieve satisfying function and aesthetics is canine substitution.

Factors such as the profile of the patient, the space analysis of dentition, and the color and shape of canine should be taken into consideration for treatment choice. (*Taiwanese Journal of Orthodontics*. 30(4): 196-199, 2018)

Keywords: congenital missing tooth; maxillary lateral incisor agenesis (MLIA); canine substitution.

INTRODUCTION

Maxillary lateral incisor agenesis (MLIA) is a common dental anomaly and has been reported to affect a wide group of populations. It has been reported that the prevalence rate was higher in Asians and those rate was more prevalent in females.¹⁻³ The prevalence rates of congenital missing upper and lower lateral incisors were 2.7% and 4.8% respectively.⁴ MLIA may also be caused by multiple reasons, including infection, trauma, medication and a group of related syndromes (cleft lip and cleft palate, ectodermal dysplasia and Down syndrome).⁵

Also, the mutation of MSX and PAX9 gene can also lead to dental agenesis.⁶

The treatment options consist of three categories: canine substitution, single-tooth implant and tooth supported restorations. Among which the least invasive option to achieve satisfying function and aesthetics is canine substitution. However, for a balanced dentition, optimal aesthetics outcomes and function, the color and size of canine should be taken into consideration in treatment plans. Different approaches, such as prosthetic restoration and periodontal implant surgery which require proper interaction of dental specialties, would also lead to predictable results.

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ORTHODONTIC TREATMENT PLANS

Three treatment options for MLIA were reported as followed: canine substitution, single-tooth implant and tooth supported restoration.

Treatment option 1: Canine substitution

The indications for canine substitution include:

1. Angle Class II malocclusion with no crowding in the mandibular arch
2. Angle Class I malocclusion with sufficient crowding to necessitate mandibular extraction
3. Patients with balanced, straight or mild convex profile
4. Similar size and shape of canines and premolar⁷

Space closure together with canine recontouring is an important treatment option for unilateral MLIA patient. Proper interaction of dental specialties for the esthetic zone enables a harmonious smile in the end.

According to Zachrisson et al, there are six steps to properly achieve optimal space closure.⁸

Step 1: Space closure

Sometimes extraction of lower two premolar is necessary, depending on the severity of crowding, dental protrusion, profile and growth pattern. Maximum anterior anchorage usually is a problem when closing the space. Some clinicians use brackets of different slot sizes in aid of mesialization of posterior teeth, 0.018-inch on the central incisors and canines and 0.022- inch on the premolars and molars. However, it still needs patient's cooperation to wear intermaxillary elastics. Nowadays, with the help of miniscrews (temporary anchorage device, TADs), all posterior teeth can be moved simultaneously forward without compliance problems.

Moreover, we should notice that mandibular arch form should not be expanded and should be coordinate with the maxillary arch form.

Step 2: Orthodontic finishing in the maxillary anterior region

In relation to the different sizes and shapes between lateral incisors and canines, the width of canines can be reduced in order to transfer into those of lateral incisors. The space between canine and first premolar should not

be closed because it can be utilized as recontouring first premolar or increasing the width by rotating premolars.

The extrusion of canines and intrusion of first premolars contributed to gingival margin aesthetics. The resting incisor exposure determined the amount of extrusion and intrusion. For young patients, incisor exposure at rest is about 4-5 mm and the gingival display is about 2-3 mm. The gingival margin of canines should be 1-2 mm lower than those of central incisors. The process of extrusion required occlusal adjustment to achieve better occlusion. The intrusion of first premolars can lead to pseudopocket. Additionally, the extrusion can result in irregular bone peak. Fortunately, both of the defects will be improved by alveolar bone remodeling if the patient keep good quality of their oral hygiene.

The torque control is another key issue. Because the roots of canines are larger than those of lateral incisors, the thickness of alveolar bone and periodontal condition are associated with the gingival biotype. If the gingiva shows thin biotype, palatal root torque will be reinforced by high torque braces or third-order bend. The intrusion of root can bring about buccal crown tipping which is associated with excessive overjet of canine and affect the aesthetics of anterior teeth. Therefore, careful correction of the crown torque of mesially relocated canines to mirror the optimal lateral incisor crown torque, along with providing optimal torque and rotation for the mesially moved premolars is important. The torque control and angulation can be reevaluated by CBCT at the final stage.

Step 3: Gingivoplasty

Sometimes localized gingivectomies are required to level the gingival margins. A gingivectomy should be performed after treatment and repeated sessions of oral hygiene instruction. When there is gingiva swelling or abraded teeth, it may be difficult to determine the cemento-enamel junction (CEJ) and to predict the amount of intrusion and extrusion for each tooth. If there is altered active eruption in growing patients, whose alveolar bone level is coronally to the CEJ, a gingivectomy is not enough. In such cases open flap surgery is needed during the orthodontic treatment to remodel the levels

of the alveolar bone and the gingival margins. However, it is very important to motivate and educate patients to have proper oral hygiene during and after the orthodontic treatment in order to maintain normal healthy tissues.

Step 4: Esthetic restorations

To achieve functional and esthetic anterior teeth, canine will be extruded for a “high low high” gingival contours. This may result in dark triangles and require gingivoplasty and proper restorations for improvement. As for intruded the first premolar, a wide restoration is needed to build up to mimic the canine morphology. As regard to functional aspects, group function is indicated, followed by space closure.

A balanced and attractive exposure of the upper front teeth is a component for esthetic smile. Transversally, Lombardi proposed that the visible width of maxillary lateral incisor should be 62% of that of maxillary central incisor; and the visible width of canine is 62% of that of lateral incisor.⁹ This proportion is called golden proportion and is about 1.618 to 1. Vertically, for the patients with MLIA their teeth are always shorter than normal people. To achieve the optimal width to length proportion, it is important to increase the length of central incisors. Ideally when smiling, the lip line is optimal when upper lip reaches gingival margin and the incisal edges coincide the curvature of lower lip (smile arc).

Step 5: Vital bleaching

Usually, the color of canines is darker than central incisors. Vital bleaching may be required to transform any yellowish or dark canines into an optimal lateral incisor shade. Nocturnal use of 10% hydrogen peroxide gel in an Essix retainer is a preferred way. On the other hand, the prosthetic treatment should be carried out after bleaching treatment (at least 2 weeks).

Step 6: Occlusal finishing, final Restorations, and long-term stability

The rehabilitation should aim to these points as below:

1. Do not over expand lower arch and maintain the initial arch form
2. Fixed retainer appliance is indicated in lower anterior teeth

3. To achieve lip competence after treatment
4. Treatment without CO-CR discrepancy
5. Group function is better than pure cuspid protected occlusion

Upper anterior teeth are potential to relapse after orthodontic treatment. For the purpose of maintaining the space closed, it is suggested to use fixed retention appliance. Bonded retainer is without need for patient compliance and rarely interfered with lateral movement.

When composite recontouring is not satisfactory, veneers would be indicated. After removing upper fixed retainer for 8-12 months, a temporary prosthodontics can be installed in this period. When a stable occlusal condition is confirmed, it is proper to insert the final ceramic restoration, followed by a fixed retainer again.¹⁰

Treatment option 2: Tooth-supported restorations

There are three kinds of restorations: (1) resin-bonded fixed partial denture, (2) cantilever fixed partial denture, (3) conventional full-coverage fixed partial denture.¹¹

The orthodontic treatment can establish adequate space for tooth supported restorations. The ways to determine the appropriate space include golden proportion, contralateral lateral incisor and Bolton analysis. The success rate depends on several factors, such as position, mobility, thickness, and translucency of the abutment teeth as well as the overall occlusion. And we should choose appropriate prosthesis according to the patient's occlusion and oral condition.

Treatment option 3: Implant supported restorations

The orthodontic treatment should not only focus on create adequate space but also need to survey the implant site development. Most of these patients started the treatment at around 7-10 years of age. It is crucial to evaluate the unerupting canine through periodical X-ray films. If the crown of erupting canine is near the apex of primary canine, extraction of primary lateral incisors may be necessary to guide the eruption of canine. The alveolar ridge over eruption site may be deficient without lateral incisor. The movement of canines can increase the width

of osseous ridge. Whatever the situation is, the implant can only be placed after the facial growth is completed. Therefore, the best way is to delay the implant placement and wait until the cessation of the growth.¹²⁻¹³

It is suggested to keep the space (around 1.5 mm~2 mm) between the head of the implant and the adjacent teeth to develop interdental papilla. The implant dimension should be considered by the space left in lateral incisor. On the other hand, the angulation of the root in adjacent tooth is another issue. For instance, a patient with Class III tendency requires proclination of the maxillary incisors. This will result in less converge on the roots apex. Under such condition, alternative treatment will be needed.¹⁴

CONCLUSION

Congenitally missing maxillary lateral incisor is one of the most common agensis anomalies. Treatment plan can be divided into three categories: canine substitution, single-tooth implant and tooth supported restorations. Among which the least invasive option to achieve satisfying function and aesthetics is canine substitution.

This article review demonstrates that orthodontic treatment with canine substitution is a practical approach to treat lateral incisor agensis. Meanwhile, canine recontouring after closing the lateral incisor space of upper dentition is needed to achieve a satisfactory normal occlusion.

In summary, factors such as the profile of the patient, the space analysis of dentition, and the color and shape of canine should be taken into consideration for orthodontic treatment in cases with congenitally missing maxillary lateral incisor.

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