©Operative Dentistry, 2022, **47-4,** 367-374

Clinical Technique/Case Report

A Multidisciplinary Approach to Maxillary Lateral Incisor Agenesis (MLIA): A Case Report

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Clinical Relevance

To determine the ideal time for insertion of an implant, the state of skeletal growth and emotional state of a young patient must be taken into consideration. However, with the procedure we described, we can achieve a satisfactory conservative solution with a good esthetic outcome and long-term stability.

SUMMARY

Maxillary lateral incisor agenesis (MLIA) is a condition that significantly compromises smile esthetics and is a particular concern in younger patients. The treatment options include orthodontics for space opening with rehabilitation or space closure with canine camouflage. Currently, there is some controversy regarding the most appropriate treatment. In this case report, we propose a multidisciplinary approach through the combination of orthodontic treatment, frenectomy, and a restorative finishing stage with composite resin and dental implants. More specifically, this treatment was planned to orthodontically close the anterior space by opening the premolar area for subsequent placement of implants and enameloplasty with a composite resin.

The replacement of a missing lateral incisor by an implant is a predictable treatment approach, but it might best be deferred until dental maturity and then accurately placed in a well-developed site through a multidisciplinary approach. Precluding the closure of the anterior spaces and the opening of the posterior zone for implant placement, allows for a more stable and appealing esthetic and functional rehabilitation for young patients, in whom esthetic appearance and self-esteem play a primary role.

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http://doi.org/10.2341/21-069-S

INTRODUCTION

The agenesis of one or both maxillary lateral incisors is a frequent clinical condition, affecting approximately 2% of the population.[1,2]Patients with maxillary lateral incisor agenesis (MLIA) are commonly challenged with functional and esthetic problems at a young age, which may affect their confidence and social relationships.[3-5] Restoring an unbalanced dentition is a challenging process, demanding a multidisciplinary approach that should focus on minimally invasive options to satisfy the expected functional and esthetic objectives.[6-9]

Orthodontically, there are two primary treatment options to be considered: 1) space closure with canine camouflage; or 2) space opening with a tooth-supported, resin-bonded fixed dental prosthesis (RBFDP) or dental implant.[10] In cases where the occlusion and anatomy/dimension of the canine in the lateral incisor position are acceptable for camouflage, orthodontic space closure with canine mesialization provides a satisfactory long-term result both functionally and esthetically.[11]A replacement by implant is also a possible solution. The main advantages of this approach are the possibility of obtaining an ideal occlusion, the maintenance of the canine in its natural position, and the clear benefit of avoiding any damage to the adjacent teeth.[12,13] The patient's age is an inexact predictor of dental maturity because young patients develop at different rates.[14] Nonetheless, the placement of implants in the anterior area presents some visible disadvantages, such as bone resorption, infra-occlusion of the implant, gingival retraction, recession of the interdental papillae, gingival changes (including blue staining of the gingiva), and exposure of the abutments.[12,15-18]

In order to avoid such disadvantages, it is possible to open the spaces in posterior sextants, namely in the premolar area. The closure of the anterior space associated with the re-anatomization of the canine into lateral incisor and the first premolar into canine, with the subsequent placement of implants corresponding to a third premolar, is an achievable solution with outcomes that can be as good or superior to those obtained with implants in the anterior sextants.[19]

The objective of this clinical case report is to illustrate the rehabilitation of a patient affected by bilateral MLIA who received an orthodontic treatment comprising anterior space closure and space opening between the premolars. Dental bleaching and rehabilitation of the canines with a direct restorative procedure and dental implants in the premolar area were also performed.

CLINICAL CASE REPORT

A 14-year-old female patient presented with bilateral MLIA associated with bone loss between central incisors and canines. The patient had many concerns about the esthetics of her appearance and was psychologically affected by her smile disharmony (Figure 1). The patient's medical history did not reveal any systemic diseases, and an intraoral examination showed healthy dentition and no symptoms or signs of periodontal disease.

Figure 1. *Smile close-up view before orthodontic treatment.*

In terms of esthetics, the clinical examination of the patient revealed a low smile (considering the patient's young age), competent lips, and a straight profile. Regarding dentition, the examination showed right and left molar Class I and bilateral canine Class II, normal overjet and overbite, first upper premolars in scissor bite relation (Figure 2 A-D); a large maxillary interincisive

Figure 2. *Preoperative imaging before orthodontic treatment—maxillary lateral incisor agenesis (MLIA).*

true diastema associated with interradicular bone loss and significant atrophy, and a large frenum strongly inserted in the lip and palate (Figure 2E). In addition, the examination revealed a severe hypodivergent biotype, a maxillary dental midline shifted 2 mm to the right in relation to the facial midline, and a slightly negative lower dentomaxillary discrepancy (DDM). The panoramic radiograph showed a congenital absence of maxillary right and left lateral incisors (Figure 3).

First, orthodontic treatment was performed with self-ligated brackets to close the maxillary interincisive diastema and bilaterally close the lateral incisor space with mesialization of the canines. A frenectomy, including the lip and palatal side, was performed (Figure 4). At the end of orthodontic treatment, enameloplasty was performed with dental composite. This treatment allowed for space opening in a more posterior location (between the premolars) for subsequent rehabilitation with implants.

During the orthodontic correction, bite ramps on posterior teeth were necessary for relieving the occlusion, moving the teeth, and correcting dental intercuspation (Figure 5A). Great cooperation was needed from the patient, who was required to use intermaxillary elastics (Figure 5B) throughout the correction. Buttons on lingual surfaces of the first lower premolars with crossed elastics were necessary to correct the scissor bite relation. Coil springs were used between the premolars bilaterally, and they were activated during the correction to enhance mesialization (Figure 5).

During the steel arch wire process (0.19" x 0.25''), some steps were done in three dimensions, with extrusion of the maxillary canines and intrusion of the maxillary first permanent premolars contemplated to improve the gingival architecture and canines' facial-lingual root position (Figure 5B).

The treatment goals of the orthodontic correction were successfully achieved, with anterior space closure and opening of enough space for future placement of implants. At that time, the patient was 17 years old, still too young to place implants between the premolars.

Figure 3. *Initial panoramic radiograph, MLIA.*

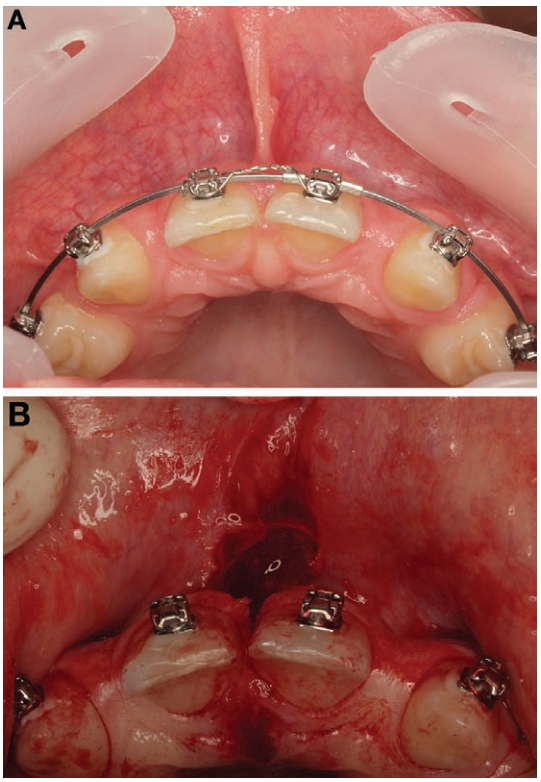

Figure 4. *Preoperative photograph showing high frenal attachment during orthodontic treatment (A) and frenum excised (B).*

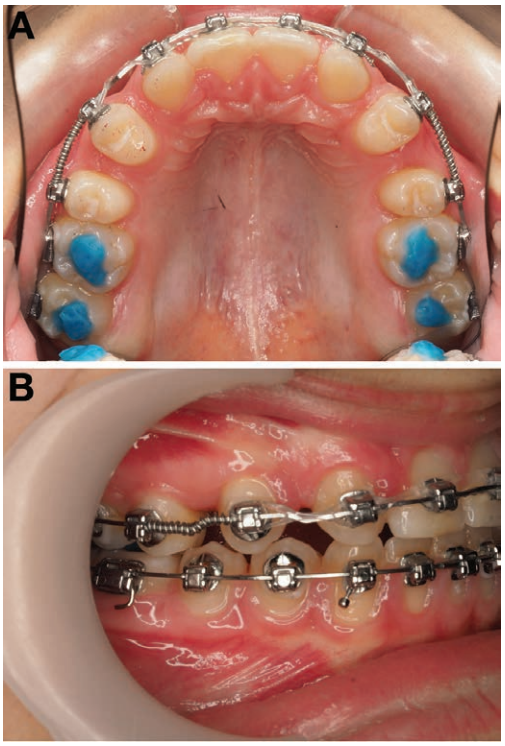

Figure 5. *Orthodontic treatment: (A) Self-ligated brackets with elastic chain and coil spring to close the anterior maxillary spaces; (B) One year later, with wire steps to compensate gingival margins.*

Despite this, the patient was very satisfied with the result and psychologically more confident, as the anterior spaces were closed even though the canines had not yet been remodeled.

To give the patient more occlusal stability and confidence, a removable acrylic maxillary prosthesis with two premolars was provided until the patient had completed skeletal and dental growth and it was possible to place the implants (Figure 6A). In addition, the patient used maxillary and mandibular removable retention, as well as fixed mandibular retention (Figure 6B). At this point, it could be observed that the patient had gingival inflammation (Figure 7), which was controlled mainly through improved oral hygiene habits, an important condition to establish before the dental restorations. However, associated with this inflammation, there was a hypertrophy of the gums that required a gingivectomy prior to the rehabilitation stage.

When the patient was 19 years old, the implants were placed (Figure 8). Considering the clinical observation of the mandibular excursive movements, enameloplasty was attempted on the palatal faces of the mesialized

Figure 6. *(A) Placement of removable acrylic maxillary prothesis for esthetic improvement as well as space retention; (B) Maxillary and mandibular removable retention was used to stabilize tooth positions.*

Figure 7. *Smile close-up view after orthodontic treatment with gingival inflammation.*

canines and the palatal cusp of the first premolars. Also, the right central incisor, maxillary canines, and first premolars would be additively remodeled to the shape of lateral incisors and canines, respectively, using direct composite resin. At-home dental bleaching was also included prior to the final restorative phase. This treatment consisted of a two-hour daily regimen of 16% carbamide peroxide (Vivastyle 16%, Ivoclar Vivadent AG, Schaan, Liechtenstein). Four weeks after bleaching, monochromatic restorations were placed on the anterior sextant.

After composite shade selection with the hydrated tooth, rubber dam isolation was used to provide an optimally clean and dry working field. In order to predictably obtain a favorable esthetic outcome with the addition of composite resin, a dimensional guide was fabricated by taking an impression of the palatal surfaces extending over the incisal edges of the maxillary anterior teeth, using an addition silicone putty (Aquasil Soft Putty, Dentsply DeTrey, Konstanz, Germany) from mock-up. The enamel surface was etched with 35% phosphoric acid (Vococid, Voco GmbH, Cuxhaven, Germany) for 30 seconds and rinsed for 20 seconds. Then, a universal adhesive bonding agent was applied (Futurabond U, Voco),

Figure 8. *Radiological investigation after orthodontic treatment and implant placement— panoramic radiograph.*

dried, and polymerized for 20 seconds. The material used for the build-up was a hybrid composite (A1/B1 maxillary central incisors and A2/B2 maxillary canines and first premolars; BRILLIANT EverGlow, Coltène-Whaledent, Altstätten, Switzerland). To prevent the formation of an oxygen-inhibition layer, a glycerin gel was placed on the restoration and polymerized. Any excess material at the margins was removed with a #12 surgical scalpel blade (SwannMorton, Sheffield, England). Finishing and polishing were carried out using fine and extra-fine diamond finishing burs, abrasive disks, and finishing strips (Swiss Flex, Coltene, Cuyahoga Falls, OH/USA). Abrasive silicone points were also utilized (Diamanto, Voco) to obtain better color stability over time and greater wear resistance. Finally, occlusal adjustment was performed.

In the eight-month follow-up, the rehabilitation showed good soft tissue adaptation and excellent esthetic maintenance (Figures 9 and 10).

Figure 9. *Intra-oral record after oral rehabilitation with implants and composite buildups (eight- month recall).*

DISCUSSION

The decision to open space in the posterior area was supported by factors such as the patient's young age, the hypodivergent biotype, the presence of interincisor diastemas with bone defects, the anteroinferior crowding, and the Class I molar relationship.

In cases like the present one, in which esthetics was a major concern, it was important to consider not only the position of the teeth but also the gingival architecture. Orthodontic therapy should involve movement of the teeth in three dimensions; this is more specifically the case in the situation of MLIA, where extrusion of the maxillary canine and intrusion of the first permanent premolar will mimic the gingival architecture of a natural smile.[20]In the present case, in spite of the spaces created by the agenesis, the midline diastema was highly associated with a hypertrophic maxillary interincisive frenum.[21] This was surgically removed after the closure of the diastema because it is believed that heavy orthodontic forces deprive the transseptal fibers of sufficient blood supply. In addition, the maintenance of the outcome probably was due to the newly developed tissue, contributing to the good results achieved.[22,23]

Furthermore, orthodontic mesialization allowed bone recovery at the area affected by the agenesis and, with diastema closure, at the interincisive area. This bone recovery minimized the problems associated with subsequent placement of implants at this area, which had had a bone defect. It has been reported that, when compared with natural contralateral teeth, implant-

Figure 10. *Smile close-up view after oral rehabilitation with implants and composite buildups (eight- month recall).*

supported crowns replacing upper lateral incisors have shown increased gingival inflammation, increased probing depths, bleeding on probing, and accumulation of plaque.[12,13] Whenever possible and indicated, treatment using anterior space closure is preferable to anterior implants in regard to periodontal health.[12]

The mesial migration of the canine helps to develop the alveolar bone at the place of the congenitally absent lateral incisor, as the bone around the canine will form in the position of the lateral incisor.[24-26] This was taken into consideration during the planning of the orthodontic treatment for this case, and the movements were made in the direction of the bone defects in the interest of bone formation/apposition. Furthermore, it is important that the treatment end during adolescence, to positively impact the individual's self-esteem and social acceptance. The decision to close the anterior spaces was also reinforced by this factor and fortunately did not require a provisional prosthesis in the anterior region before the patient reached the required age to place implants.[27] The authors encourage the use of an maxillary acrylic prosthesis and removable retainers for use at night before placing implants because, as in this case, these measures help to retain tooth position (Figure 6) and provide functional information for the subsequent implant treatment plan.[28,29] Although it is a controversial issue, according to Dietschi and Schatz,[30] implant placement in children younger than 16 to 18 years should be avoided, to prevent infraocclusion due to adjacent alveolar bone growth. Bohner[29] stated that implants must be placed when growth is almost complete. For this reason, the implant surgery on the present case was postponed until the patient reached the age of 19.

In this case, the positioning of the premolars in the place previously occupied by the canines may result in heavy occlusal forces. Occlusion protected by the canine is not possible and this situation can lead to abfraction cervical lesions in the premolars,[12] which must also be re-anatomized for better esthetics and to provide a harmonious smile (Figure 9). However, this substitution is functionally acceptable, giving priority to the occlusion, and consequently distributing the occlusal load between as many posterior teeth as possible.[12] Thus, the opening of the posterior space for implant placement in that region provides an ideal axial load.[19] In this case, the decision to close the space in the anterior area and open the posterior area was taken to eliminate any possibility of bone defect inherent to MLIA and thus eliminate negative esthetic effects in the short and long term.

To optimize smile harmony, before assessing the morphology and proportion, it was important to evaluate the tooth color. Due to their size, canines present a more saturated color when compared with incisors.[31] Hence, following enameloplasty, color correction should be considered to make the teeth brighter, using one of the many available bleaching techniques for vital teeth.[32,33] The restorative procedure was completed four weeks after dental bleaching in order to avoid any possible negative effects of bleaching on bond strength and to allow color stabilization.[34]

The choice of restorative treatment should be based on certain factors that must be well defined, such as preservation of tooth vitality, minimal or no reduction of the dental structure, minimal or no invasion of the gingival area, the esthetic expectations of the patient, cost estimate, and duration of the treatment.[35] In this case, the treatment option chosen was supported by the fact that the canines had a shape and color favorable to space closure, ie, they were small canines with a smaller mesiodistal diameter, and by the fact that a slightly pronounced cusp fits better esthetically and functionally in the position of the lateral incisor. In this way, we were able to solve the problem of the lack of bone in the agenesis area and address the esthetic problem by narrowing spaces in the anterior area during the opening of the space.

The choice of direct restorations with a resin composite over an indirect restoration approach was made mainly due to the fact that the treatment was less expensive and did not involve any injury to the dental tissues.[35-37] Furthermore, the reversible nature of the resin composite technique allows for other treatment approaches in the future. An important benefit of this procedure over others is that the repair may be possible intraorally without the risk of modifying esthetics or mechanical performance.[38] The clinical outcome of anterior resin composite restorations is directly related to the use of a very precise technique, and clinical studies have shown good outcomes without major complications.[36] However, the patient should be mindful that restorations require periodic maintenance because the texture and shade of the material will change over time.[39]

This clinical case demonstrates that a multidisciplinary approach—the combination of initial orthodontic treatment with a restorative finishing stage with composite resin and dental implants, can provide satisfactory esthetic and functional long-term results in a young patient with missing bilateral maxillary lateral incisors.

CONCLUSIONS

In cases of agenesis of the upper lateral incisors, it becomes evident after analyzing the treatment

possibilities that multidisciplinary approaches must be prioritized, linking orthodontics with implantology, prosthodontics, direct restorative dentistry, periodontology, and occlusion. It is important to realize that each patient is unique and needs an appropriate, individualized treatment plan.

Although the usual treatment approach would be the opening of space in the agenesis area, the esthetic limitations in this case resulted in an alternative treatment—the closing of the anterior spaces and opening of the posterior spaces. This solution proved to be viable, showing good results and eliminating any disadvantage of placing implants in the anterior area.

Acknowledgments

This work was supported by IINFACTS—Institute of Research and Advanced Training in Health Sciences and Technologies, in the scope of OrthoAlignPI-4RL-IINFACTS-2019. The rehabilitation with implants was done by José António Fernandes Araújo e Silva.

Conflict of Interest

The authors have no financial interest in any of the companies or products mentioned in this article.

(Accepted 19 June 2021)

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