

The relevance of maintaining the dental arch length for good aesthetic results

Mauricio Egüez Zabala¹

Rachel Furquim Marson²

Bruno D'Aurea Furquim³

Laurindo Zanco Furquim^{4,5}

1) Curso de Especialização em Ortodontia, Dental Press/Unicesumar (Maringá/PR, Brazil).

2) Master in Integrated Clinic and Specialist in Prosthesis, Universidade Estadual de Maringá (Maringá/PR, Brazil).

3) Doctor in Oral Rehabilitation and Master in Orthodontics, Universidade de São Paulo, Faculdade de Odontologia de Bauru (Bauru/SP, Brazil).

4) Doctor in Oral Pathology, Universidade de São Paulo, Faculdade de Odontologia de Bauru (Bauru/SP, Brazil).

5) Universidade Estadual de Maringá, Departamento de Odontologia, Disciplina de Ortodontia (Maringá/PR, Brazil).

Introduction: The management of tooth agenesis may be accomplished through space opening or closure. Long term stability and biological compatibility of final outcomes are the main advantages of the aesthetic closure of such spaces. **Objective:** this paper aimed at presenting a clinical case report in which dental arch length was

maintained after space closure. The approach allowed for an adequate facial profile in a young female patient presenting nine tooth agenesis, treated with a simple and reproducible mechanics, coupled with ceramic veneers restorative treatment. **Conclusion:** space closure in multiple agenesis cases establishes normality throughout

an important character building phase of young individuals lives. With an adequate technique, space closure does not jeopardize the position of upper or lower incisors, leading to a normal incisal guidance as well as to the maintenance of the dental arch length. **Keywords:** Anodontia. Aesthetics. Tooth movement techniques.

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Contact address: Mauricio Egüez Zabala - E-mail: maurieguez@hotmail.com

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» Patients displayed in this article previously approved the use of their facial and intraoral photographs.

INTRODUCTION

Patients with congenitally missing permanent teeth seek treatment to solve esthetic issues. Permanent maxillary lateral incisors agenesis is the second most common agenesis in the overall population, it is second only to third molars agenesis. Patients with such genetic defect might present other associated signs, as simplification of tooth morphology, microdontia, delayed tooth development, ectopic eruption of permanent maxillary first molars, ectopia of canines, transposition, distoangulation of mandibular second premolars, shorter roots, predominance of triangular teeth, decreased cingulum, decreased mesiodistal diameter, occlusal surface with less grooves and shorter cusps.¹⁻¹⁴

As a rule, patients with agenesis present with widespread and significant decreased tooth size, which is not even, since anterior teeth (incisors and canines) are smaller than posterior teeth (premolars and molars).^{22,23}

Treatment given to patients with the aforementioned genetic disorder requires a multidisciplinary team comprising Orthodontics, Periodontology, Restorative Cosmetic Dentistry, and Prosthodontics experts. A few cases also require Implantodontics experts. Implantodontics is not recommended to young patients due to mild and ongoing eruption of adjacent teeth during craniofacial growth. Greater care should be taken for young patients, since passive eruption of adjacent teeth is more noticeable at the site, thus interfering in gingival level. Over the years, implant gingival margin will be higher than normal.⁵⁻¹⁸

For this reason, many research studies and treatment strategies were developed to treat patients with dental agenesis, so as to allow for satisfactory long-lasting outcomes.³³⁻³⁸ One

study assessed space closure in patients with maxillary lateral incisors agenesis in which case the presence or absence of canines had no relation with either occlusal function or TMD signs and symptoms. Additionally, the protocols subjected to analysis did not reveal any difference between prevalence of gingival dehiscence in the buccal surface of premolars reshaped as canines.¹⁹

Space closure is a permanent treatment that ensures marginal gingiva and interdental spaces natural contours. Those factors pose a major challenge to rehabilitation treatment with dental implants. Another great advantage is that, throughout one's life, there is no need for replacement of implants or prostheses in esthetic zones.³³⁻³⁸ Thus, the present study aims at highlighting the relevance of space closure in esthetic zones while maintaining arch perimeter and facial profile, thereby providing the patient with satisfactory esthetic results.

CASE REPORT

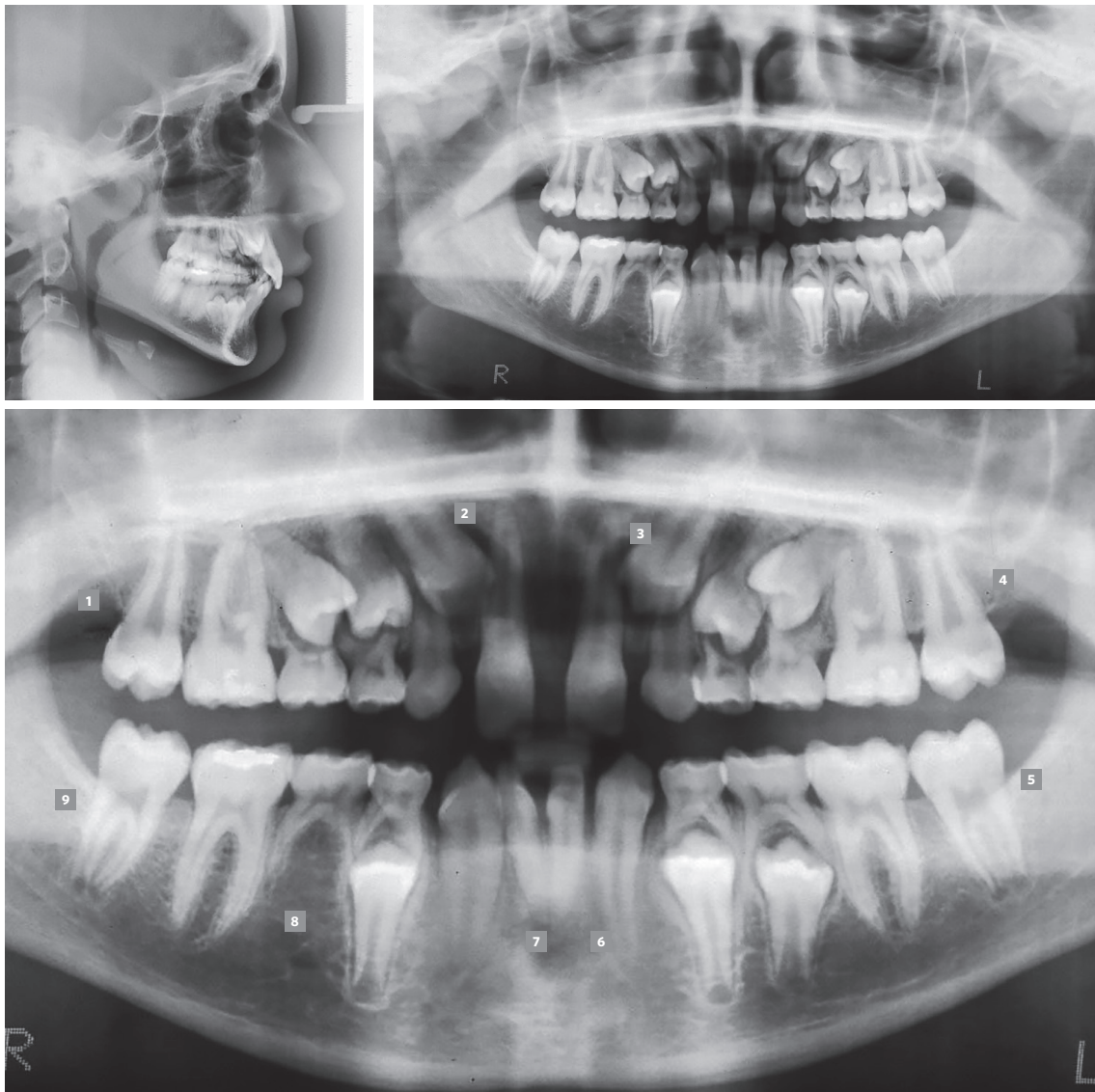
DIAGNOSIS

Female 12-year and 6-month old Pattern I patient presented with balanced, symmetrical face, mixed dentition, 1/4 Class II, and upper midline slightly deviated to the right. She had agenesis of maxillary and mandibular lateral incisors (#12, #22, #32, #42), mandibular second premolar on the right side (#45), and agenesis of third molars (#18, #28, #38, #48), thus totaling nine agenesis.

She also presented with simplification of tooth morphology in teeth #11, #21, #31 and #41, in addition to deep bite, ANB = 2°, interincisal angle = 131°, satisfactory nasolabial angle (95°) and IMPA = 100° (Figs 1 to 10).°,



Figure 1 to 7: Initial intra- and extraoral photographs.



76

Figure 8 to 10: Initial cephalogram and panoramic radiograph.

TREATMENT PLAN

Two treatment options were presented to the patient. The first one was orthodontic treatment carried out by closure of spaces resulting from agenesis. Treatment would be performed through mesialization of teeth while maintaining arch perimeter and facial profile. Right deciduous mandib-

ular second molar (#85) would remain to preserve alveolar bone. Should the need to have it replaced by an implant arise, the bone would be in perfect favorable conditions to receive the implant. This treatment option would require a multidisciplinary team majorly comprising Esthetic Restorative Dentistry experts addressing anterior teeth.

The second orthodontic treatment option would maintain agenesis-related spaces with provisional crowns until the patient had reached skeletal maturity for implant placement. This treatment options would also require a multidisciplinary team majorly comprising Implantodontics and esthetic rehabilitation experts.

Patient and her legal guardians chose the first option, since they would not have to wait for growth completion and adult age to have agenesis-related spaces definitely esthetically restored.

TREATMENT PROGRESS

First, a bite lifting splint was placed to aid deep bite correction, thus allowing for extrusion of posterior teeth – at this point, the patient was nine years old. Recommendation was for extraction of deciduous maxillary canines (#53, #63) and deciduous maxillary first molars (#54, #64), which would favor eruption of permanent maxillary canines (#13, #23) and permanent first premolars (#14, #24) (Fig 11).

When the patient was 10 years old, brackets Capelozza prescription I were bonded to permanent maxillary central incisors (#11, #21) in counter-angle position, so as to move roots in a mesial angle. Should brackets have been bonded on the long axis of clinical crowns, roots would move in a distal angle, which would interfere in the eruption of permanent maxillary canines (#13, #23). Subsequently, the following was carried out: permanent maxillary central incisors conjoined with metal ligatures, thus closing diastema; bonding of permanent maxillary first molars tubes (#16, #26). The first wire used was 0.016-in stainless-steel, with larger omega loop to prevent loss of upper arch perimeter control. The omega loop controls the tendency maxillary incisors have to tip palatally, which is a

crucial factor for incisors positioning at smiling (Figs 12 and 13).

Thereafter, brackets were bonded to permanent maxillary canines (#13, #23) by the reverse technique to achieve positive crown torque (+5), followed by bonding on maxillary first premolars (#14, #24). NiTi 0.014-in wire was used (Figs 14 and 15). The patient was referred to reshaping of mandibular incisors with composite resin (Fig 16). Stainless-steel 0.018-in wire with larger omega loop was used, in addition to a spring placed on the mesial surface of maxillary first molars (#16, #26) to control arch perimeter during mesialization of maxillary premolars (#14, #15, #24, #25). Maxillary canines were reshaped as maxillary lateral incisors and had lateral incisors brackets bonded.

Reshaping the canine as lateral incisor before orthodontic treatment completion allows the bracket to be bonded more cervically; as a result, extrusion will correct the gingival margin (gingival apex). Lateral incisor bracket is of high profile. This is a characteristic that allows canine/lateral incisor to be positioned inside the bone (in-set). Furthermore, previous reshaping will eliminate the rounded contour of canine which is now a lateral incisor, thus providing it with straight morphology and allowing lateral incisor bracket bonding. This bracket has buccal crown torque and palatal root torque, both of which are providential for the region of anodontia where cortical, buccal and palatal surfaces are near due to tooth absence. Canine mesialization to this region of anodontia with little bone, no in-set and no palatal root torque, might increase the likelihood of dehiscences and/or fenestrations (Figs 17 and 18).

Deciduous mandibular second molar (#85) was reshaped, thus acquiring the size of a premolar mesiodistally. The tooth was not included

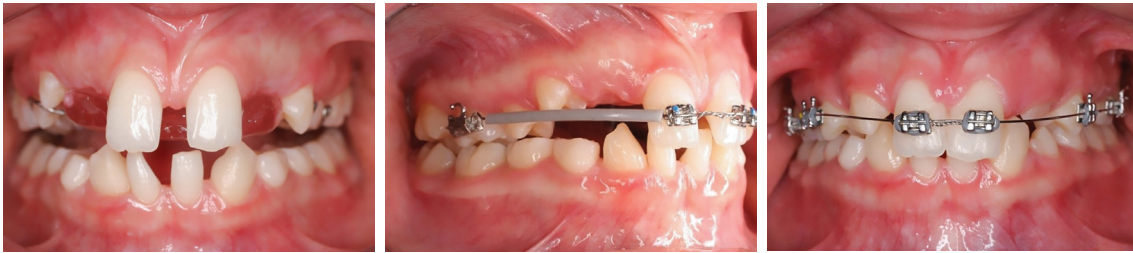


Figure 11: Simplification of tooth morphology in permanent maxillary and mandibular central incisors (mechanics with bite lifting splint).

Figure 12 and 13: Bracket bonding in counter-angle position.



Figure 14 to 16: Permanent maxillary canine bracket bonding by the reverse technique and reshaping of permanent mandibular incisors.

78

in mechanics, so as to avoid stimulus to root resorption. The goal was to keep it for as long as possible and, as a result, preserve bone at site. Should the need for deciduous mandibular second molar replacement by implant and crown arise, the alveolar bone will be in favorable conditions²⁰ (Fig 19).

Maxillary first premolars were intruded (#14, #24), thereby improving gingival margin (gingival apex), and further reshaped with composite resin as maxillary canines. Subsequently, brackets Capelozza prescription I were bonded to maxil-

lary canines (#14, #15, #24, #25) (Fig 20).

Mechanics with functional appliance and 0.019 x 0.025-in stainless-steel wire after curve of Spee correction enhances incisal guidance, achieves Class I canine relationship and Class II molar relationship, thus correcting patient's sagittal relationship. Thereafter the following was carried out: orthodontic buttons were bonded to maxillary premolars (#15, #25) for retraction (Figs 21 to 23); and larger omega loops were manufactured to increase arch perimeter or prevent its reduction (Figs 24 and 25).

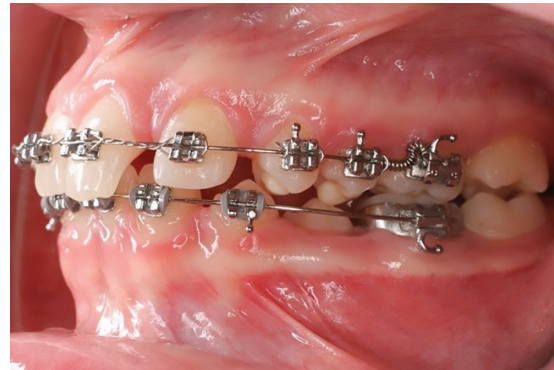


Figure 17 and 18: Maxillary canines reshaped as lateral incisors, and right deciduous mandibular second molar (#85) not included in the mechanics.



Figure 19: Reshaped deciduous mandibular second molar.



Figure 20: Intruded maxillary first premolars reshaped as canines.

Convertible maxillary first molars tubes (#16, #26) allowed a larger omega loop to be used on second molars mesial surface. Those tubes have their “lids” removed and are converted into brackets. Omega loops on second molars “push” first molars, thus inducing mesialization. This is a contributing factor in maintenance of arch pe-

rimeter (Figs 26 and 27). After agenesis-related maxillary and mandibular spaces closure, the case was completed with Class II elastics followed by orthodontic appliance debonding (Figs 28 to 32). Final intraoral photographs taken after orthodontic appliance debonding are shown in Figures 33 to 35.

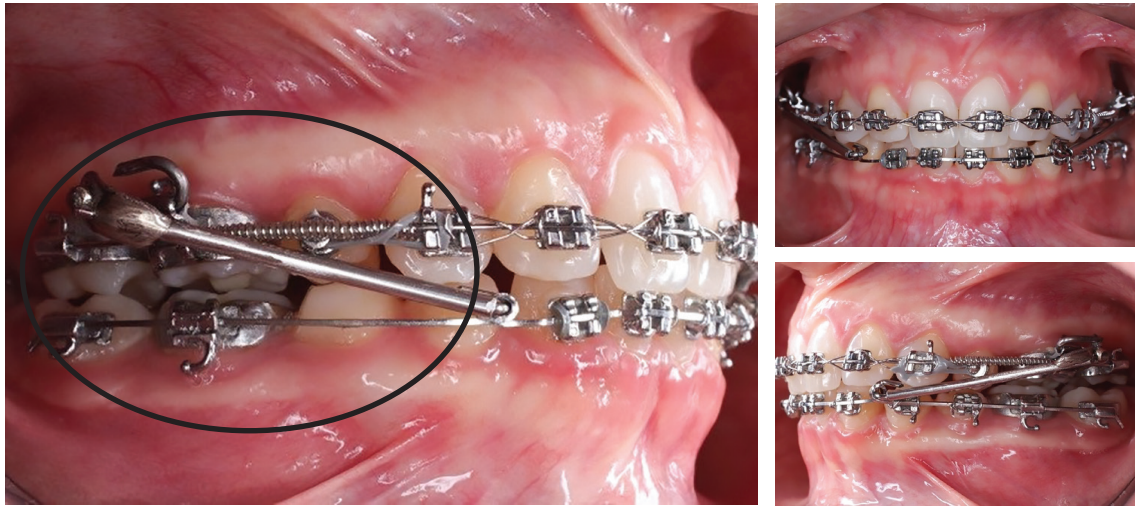


Figure 21 to 23: Mechanics with functional appliance.

80

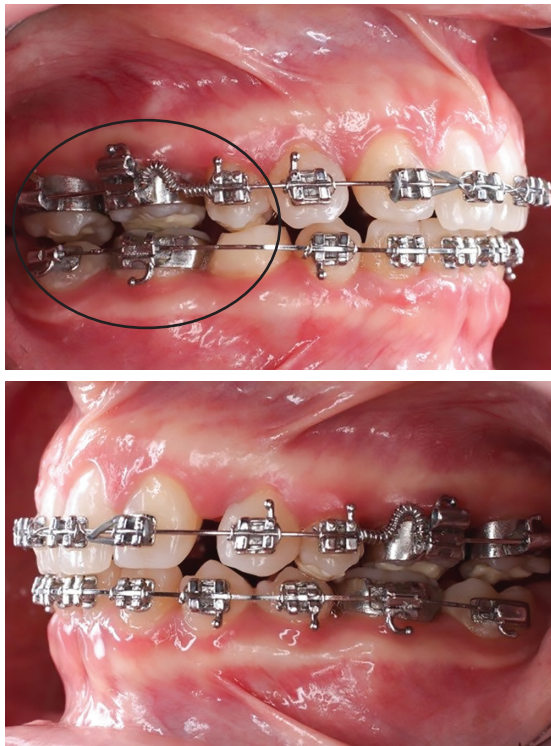


Figure 24 and 25: Upper arch perimeter maintenance.

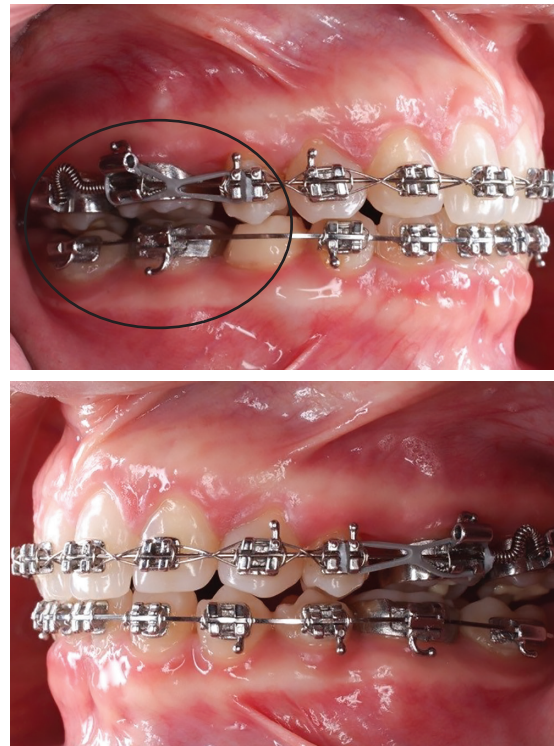


Figure 26 and 27: Convertible maxillary first molar tubes.

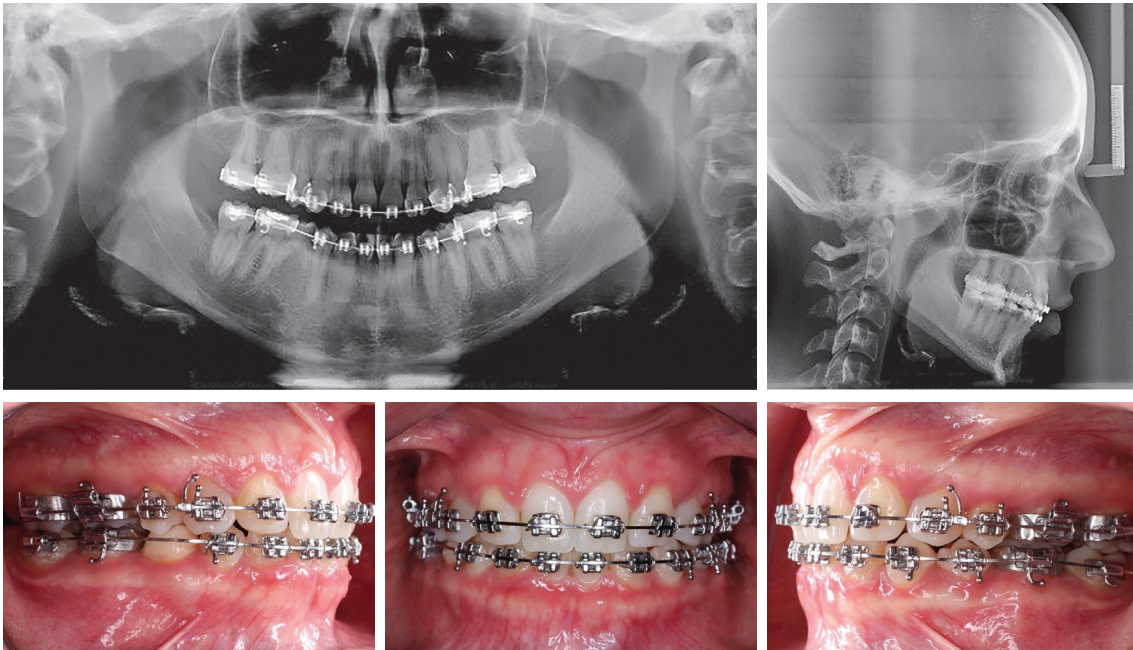


Figure 28 to 32: Photographs at orthodontic treatment completion.



Figure 33 to 35: Final intraoral photographs taken after orthodontic appliance debonding.

FINAL TREATMENT RESULTS

After orthodontic appliance debonding, the patient remained with composite resin for a few years. When she was 23 years old, an esthetic procedure was carried out with six ceramic veneers used to enhance smile esthetics.

Ceramic veneers are minimally invasive and provide better esthetics and strength to maxillary teeth in comparison to light-cured resin.²¹ Six ceramic veneers

were manufactured with e.max by means of CAD-CAM technology. Subsequently, pieces were enhanced by the prosthetic clinician. The ceramic color of choice was MT (medium translucity) BL4 (Ivoclar), and ceramic veneers were cemented with Variolink Esthetic resin cement (Ivoclar) of Neutral color.

Older resin was removed during preparation, with little need for tooth wear – ceramic veneers were 0.6 to 1-mm thick (Figs 36 to 46).



82



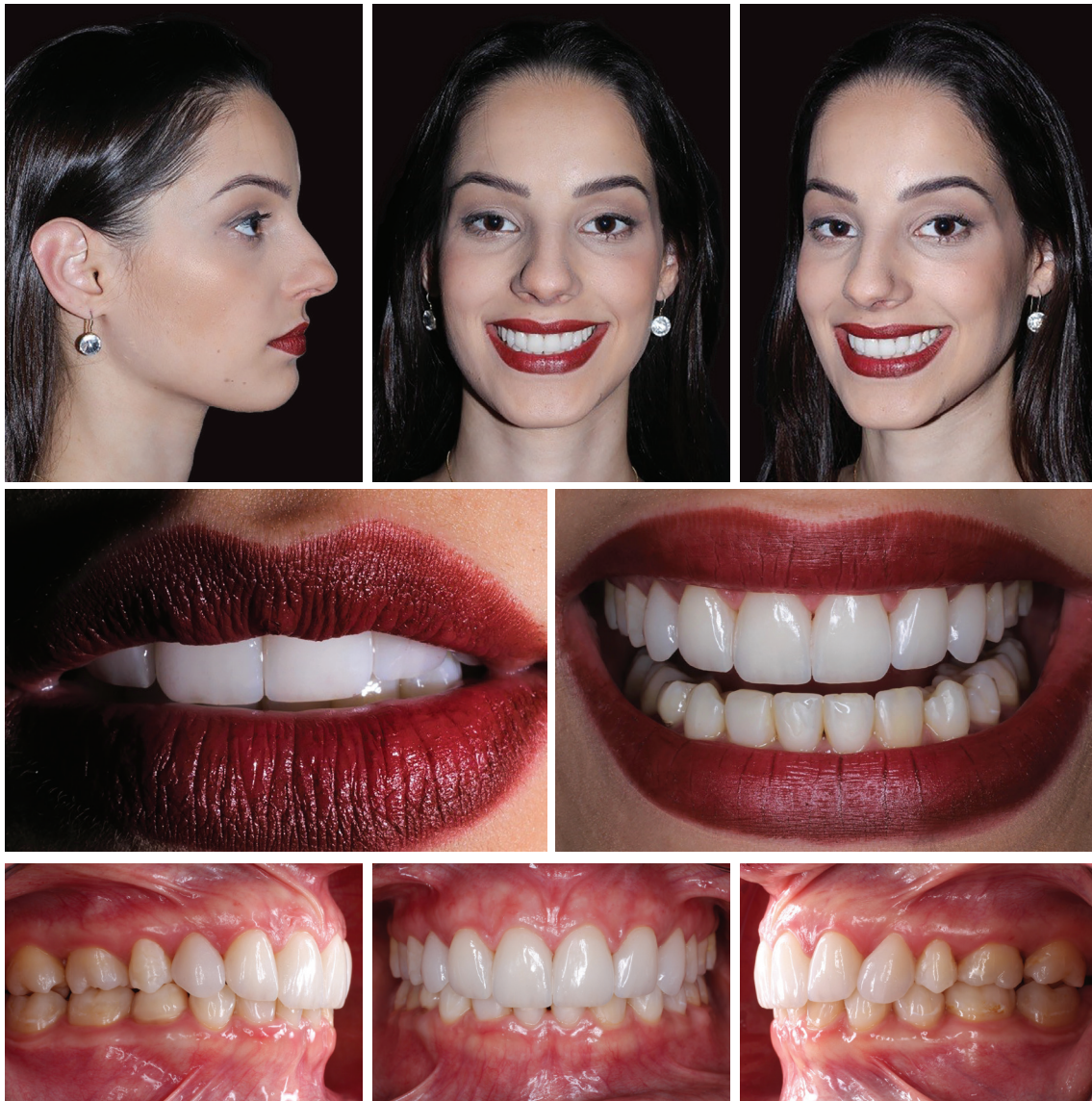


Figure 36 to 46: Color choice and final outcomes after cementing six ceramic veneers (#13 to #23).

DISCUSSION

The case was finished with satisfactory sagittal relationship, 90° nasolabial angle and well-defined mentolabial sulcus. The maxillary incisor is responsible for providing support to the upper lip, where-

as mandibular incisor and mentolabial sulcus are responsible for facial profile. In cases of retraction mechanics aimed at agenesis-related space closure, arch perimeter and mandibular as well as maxillary incisors (mainly) buccal tipping must be maintained.^{4,21}

In cases of maxillary lateral incisors agenesis for which treatment option is space closure, there is ongoing concern over lateral disocclusion performed by premolars reshaped as canines. Research reveals the presence or absence of canine has nothing to do with occlusal function nor it is a factor that triggers TMD signs and symptoms. Furthermore, no study has found in protocols subjected to analysis any difference regarding the prevalence of gingival dehiscence on premolars buccal surface in reshaping processes. Research also reveals that patients undergoing space closure with reshaping consider having better smile esthetics.²¹⁻²⁴

Esthetic limitations of implant-supported and tooth-borne prostheses result in more unfavorable appraisal by laypeople, patients and clinicians than space closure.²¹ Prosthetic replacement does not prove to be a superior option in comparison to space closure when the outcomes presented by different treatment modalities are taken into account.²³ Patients having implants that replace maxillary lateral incisors present with less filling of interdental papillae found between incisors (central and lateral).²⁴

When transformation involves a larger tooth being reshaped as a smaller one, selective tooth wear is required. To this end, correct planning should be carried out for both composite resin or ceramic veneers reduction and addition, with a view to restoring pleasant smile esthetics to the patient. It is highly recommended that resin or ceramic veneers be used, for instance, to disguise natural canine color, as this tooth is reshaped as lateral incisor. Reshaping of those teeth is carried out not only for esthetic reasons, but also for functional ones. Long-term studies reveal reshaping of those teeth does not produce negative effects on pulp or dentin.^{25,26,27}

Anatomical reshaping of canines, for example, can be performed before composite resin treat-

ment, and enhanced after treatment conclusion with the aid of new restorative material. The aforementioned restorations restore incisal shape and contacts, providing excellent results for reshaped canines. Periodontal procedures are also paramount to restore the golden ratio of teeth: procedures such as gingivectomy and gingivoplasty are important to restore the vertical dimension of clinical crowns and also to correct the architecture of gingival tissue, as the gingiva becomes hyperplastic during space closure and intrusion mechanics.²⁵

Rosa and Zachrisson¹⁶ determined that canine guidance can be established when reshaping is carried out with ceramic veneers due to their greater structural stiffness in comparison to tooth enamel. When reshaping is carried out with composite resin, canine guidance is also established; however, composite resin have lower structural strength in comparison to ceramic veneers and, for this reason, are more likely to fracture.

In cases opting for implant placement, it is important to consider patient's age. One must be aware that the implant will function as an ankylosed tooth, and adjacent teeth will have ongoing and permanent eruption achieved through alveolar bone vertical development. Additionally, periodontal issues will arise as time goes by, for instance, marginal bone loss around adjacent teeth and on implant buccal surface. Implant placement is recommended at sites with proper alveolar bone support, which normally does not occur in esthetic zones, especially when the patient presents with agenesis. This is because bone thickness is limited, thereby producing sequelae over the years.²⁸⁻³³

Therefore, implants should be recommended for very specific cases. However, we must pay closer attention to the potential for active eruption of adjacent teeth, esthetic issues arising in the long term, and the need to wait to solve the es-

thetic issue during a period that is key to patient's character formation.

FINAL CONSIDERATIONS

Treatment carried out by means of agenesis-related space closure and maintenance of

arch perimeter resulted in satisfactory facial profile and esthetics. Thus, it is recommended to treat young patients with tooth agenesis, provided that an effective orthodontic mechanics is used to maintain arch perimeter and it is performed by a competent multidisciplinary team.

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