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Treatment of Maxillary Lateral Incisors Agenesis with Space Opening: A Case Report

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Abstract

Maxillary lateral incisors agenesis (MLIA) is a common dental anomaly often managed through space opening to accommodate prosthetic replacement. This approach integrates orthodontic and prosthodontic techniques to restore function and aesthetics. This article explores advancements in space opening treatment, with an emphasis on prosthetic rehabilitation using implant and bridge, and highlights the role of digital dentistry in improving outcomes. Recent evidence-based studies provide insights into the clinical decision-making process and long-term success rates.

Keywords: Orthodontics, Agenesis, Maxillary Lateral Incisors, Space Opening, Implant, Bridge.

INTRODUCTION

The hypodontia of one or more permanent teeth is one of the most common developmental anomalies in humans. A tooth is defined as congenitally absent when it has not erupted into the oral cavity, has not been extracted or accidentally lost, and is not visible on radiographic examination [1].

Maxillary lateral incisors agenesis is one of the most common congenital dental anomalies affects up to 2–5% of the population and presents unique challenges due to its impact on smile aesthetics, occlusal harmony, and functional balance [2].

This condition is characterized by the absence of one or both maxillary lateral incisors, which play a critical role in defining smile aesthetics and maintaining proper occlusal harmony. The agenesis not only disrupts dental and facial symmetry but also affects functional balance, including chewing and speech [3].

Management of maxillary lateral incisor agenesis presents unique challenges, requiring a multidisciplinary approach to achieve optimal functional and aesthetic outcomes. Treatment options typically involve either orthodontic space closure or prosthetic space opening, with the latter often including the use of dental implants, resin-bonded bridges, or removable partial dentures [4].

Each case demands a tailored treatment plan based on the patient's age, facial structure, occlusion, relationship of anterior teeth, facial profile, size, shape and shade of canines, as well as smile line height, periodontal and skeletal conditions and aesthetic expectations [5].

This case report presents a nonsurgical orthodontic treatment of an adolescent female patient who presented with a maxillary lateral incisors agenesis malocclusion which was treated with space opening using orthodontic springs and power chains, then the prosthetic rehabilitation was achieved with a resin-

bonded bridge to replace the 22 and an implant to replace the 12.

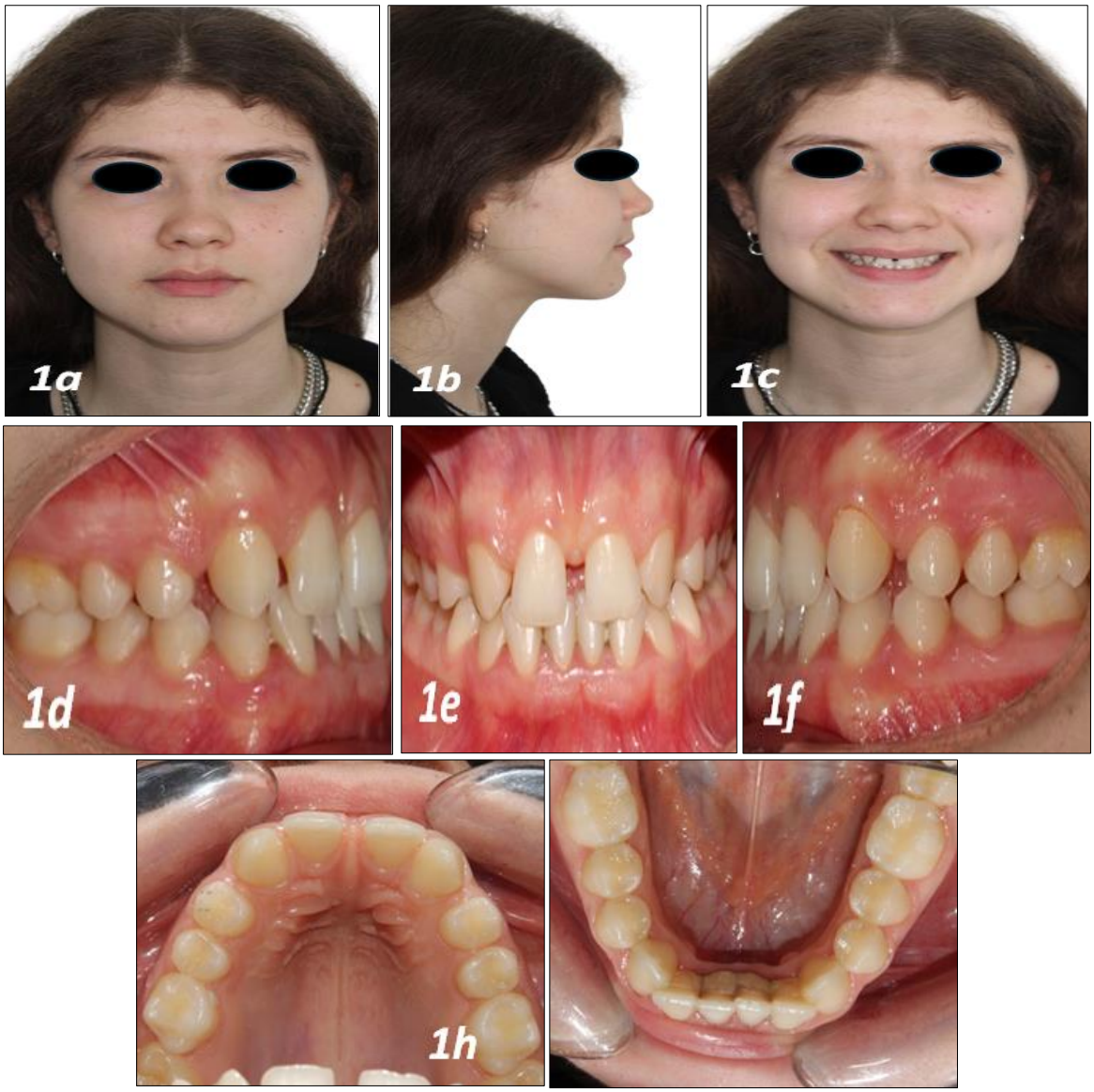

Figure 1 (a-h): Pre-treatment photographs: facial and intra-oral photographs

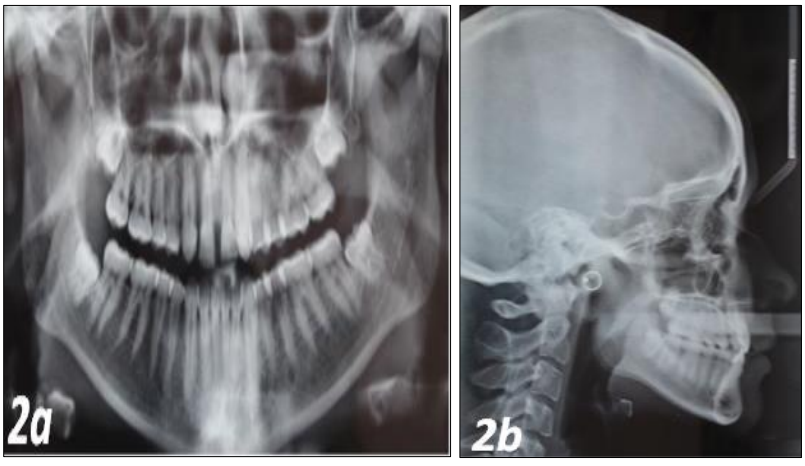

Figure 2 (a-b): Pre-treatment radiographs

PRESENTATION OF THE CASE

Clinical Examination and Diagnosis

A female patient aged 17 years consulted with the Dento-Facial Orthopedics Department at the dental medicine clinic of Monastir, Faculty of Dental Medicine, University of Monastir. Her demand was esthetic. She had a chief complaint about her maxillary inter-incisal diastema. No systemic or medical abnormalities were described.

The extraoral examination showed from the frontal view a symmetrical face with a parallelism at the horizontal lines of the face and a straight medial sagittal plane, an increase in the lower third of the face. She also presented a barely marked nasolabial fold and an adequate lip vermilion, a labial occlusion with normal volume as well as a narrow smile (Figure 1a and 1c).

The profile analysis showed a slightly convex profile, a normal anterior facial height and divergence. She also presented a well-positioned upper and lower lips and a labio-mental fold in allonged S shape. The chin-neckline and the nasolabial angle were normal (Figure 1b).

The intraoral examination showed unsatisfactory oral hygiene, a healthy periodontal status, with no bleeding on probing but with normal periodontal tissues. The upper dental arch was U shaped with the absence of the 12 and 22 and an interincisal and post-canine diastema. The lower dental arch was U shaped, exhibited a mild crowding in the anterior area with linguoverted canines and a normal lingual frenulum (Figure 1g and 1h).

Moreover, the occlusal examination revealed an Angle class I molar relationship on both sides associated with an Angle class II canine on both sides. The upper incisors were normoclined and the lower incisors were retroclined. maxillary midline was deviated 4 mm towards the left of the midsagittal plane. The overjet was irregular from 0,5 to 1 mm and the overbite was from 4 to 5 mm, with an anterior deep bite. No midline shift was noted (Figure 1d, 1e and 1f).

Furthermore, no symptoms or signs of any temporo-mandibular joint (TMJ) disorder were observed, maximal opening and lateral and anterior movements were within normal limits.

The functional examination revealed a mixed ventilation with a nose breathing predominance, a functional swallowing and a normal phonation.

The analysis of plaster models showed a total dento-maxillary disharmony (DMD) of -29 mm according to Tweed's analysis and -3,5 mm according to Steiner's analysis (Table 1 and 2).

Table 1: Tweed's analysis

Tweed's analysis		
	+	-
Ant.Crow		1,5
IR		8
Mid.Crow		○
C.Spee		2,5
Post.Crow		17
Post.Growth		○
Total DMD		29

Table 2: Steiner's analysis

Steiner's analysis		
	+	-
Crowding		1,5
IR		0
C.Spee		2
DMD		3,5

The panoramic radiograph showed the absence of the 12 and 22 with the presence of maxillary wisdom teeth germs. The mandibular third molars were under development. There were no supernumerary teeth. The crown-root ratios were normal with good alveolar bone levels, no bone pathology and no root resorption. In addition, the mandibular condyles, nasal floor and maxillary sinuses appeared normal (Figure 2a).

The lateral cephalometric radiograph revealed a class I skeletal malocclusion (ANB = 3°) (AoBo = 4mm) with a maxillary and mandibular protrusion (SNA = 91,5°; SNB = 88,5°) in relation to the anterior skull base. Additionally, a normodivergent vertical skeletal pattern was noted (GoGn/SN = 28° and FMA = 22°). Furthermore, the maxillary incisors presented a normal axial inclination (I/F = 111°) and the mandibular incisors were retruded in relation to their alveolar base (IMPA = 80°) (Figure 2b and Table 3).

Table 3: Patient's cephalometric values

Angles	Patient's initial values	Average values
SNA	91,5°	82° ± 2°
SNB	88,5°	80° ± 2°
ANB	3°	0-4°
AoBo	4 mm	[-2 mm – 2 mm]
FMIA	57°	68°
IMPA	80°	87°
FMA	22°	[22° - 28°]
GoGn/SN	28°	32° ± 5°
I/i	110°	135°
I/F	111°	107° ± 5°

Treatment Goals:

The treatment goals for this patient were as follows: (1) to obtain a functional swallowing. (2) To establish normal Class I canine and molar relationships. (3) To normalize the overjet and overbite. (4) To open space for prosthetic replacement of maxillary lateral incisors. (5) To harmonize the shape of the arches. (6) To Improve facial esthetics and smile of the patient.

Treatment Alternatives:

Two treatment plans were proposed:

1) The first option was an orthodontic treatment using Roth technique .022''x.028'' without premolars extraction and space opening for the upper lateral incisors.
2) The second option was an orthodontic treatment using Roth technique .022''x.028'' and space closure.

Treatment Progress:

After obtaining the patient's consent, a transpalatal arsh was sealed, preadjusted 0.022" x 0.028"-in brackets were placed to the maxillary teeth. A 0.014"-in nickel-titanium wire was engaged as the initial archwire to start leveling and aligning (Figure 3).

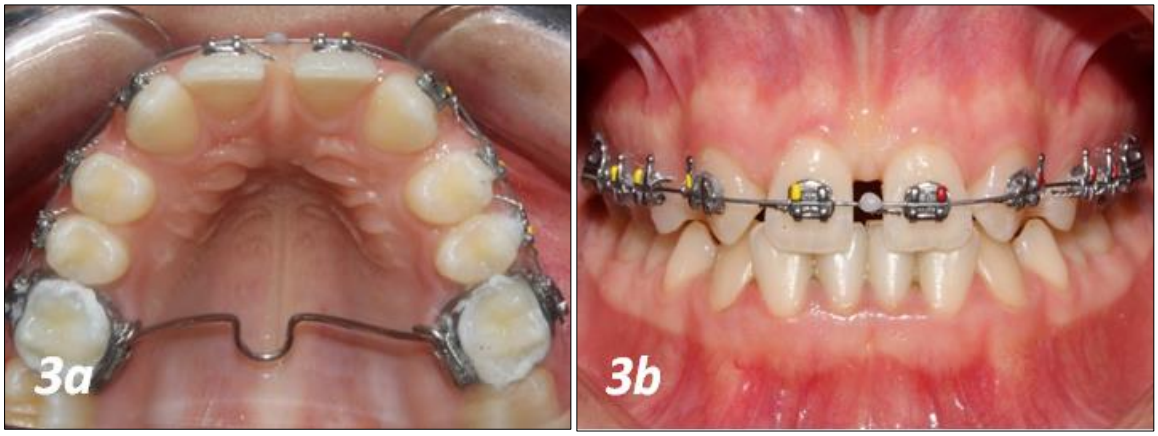

Figure 3 (a-b): Leveling phase with upper 0.014" NiTi archwire

For the maxillary and mandibular arch, the following orthodontic archwires: 0.016" NiTi, 0.018'' NiTi, 0.018"-in SS, 0.017" x 0.025"-in SS and 0.018" x 0.025"-in SS was used successively. Maxillary canines was retracted on 0.017" x 0.025"-in SS arch using orthodontic chain from canines to first upper molars. Two open springs having the same length as the space between the 11 and the 13 and between the 21 and the 23 were used to maintain space (Figure 4).

Figure 4 (a-e): Retraction of maxillary canines on 0.017" x 0.025"-in SS arch

Two open springs were used between the 11 and the 13 and between the 21 and the 23 to open space for a prosthetic replacement (Figure 5).

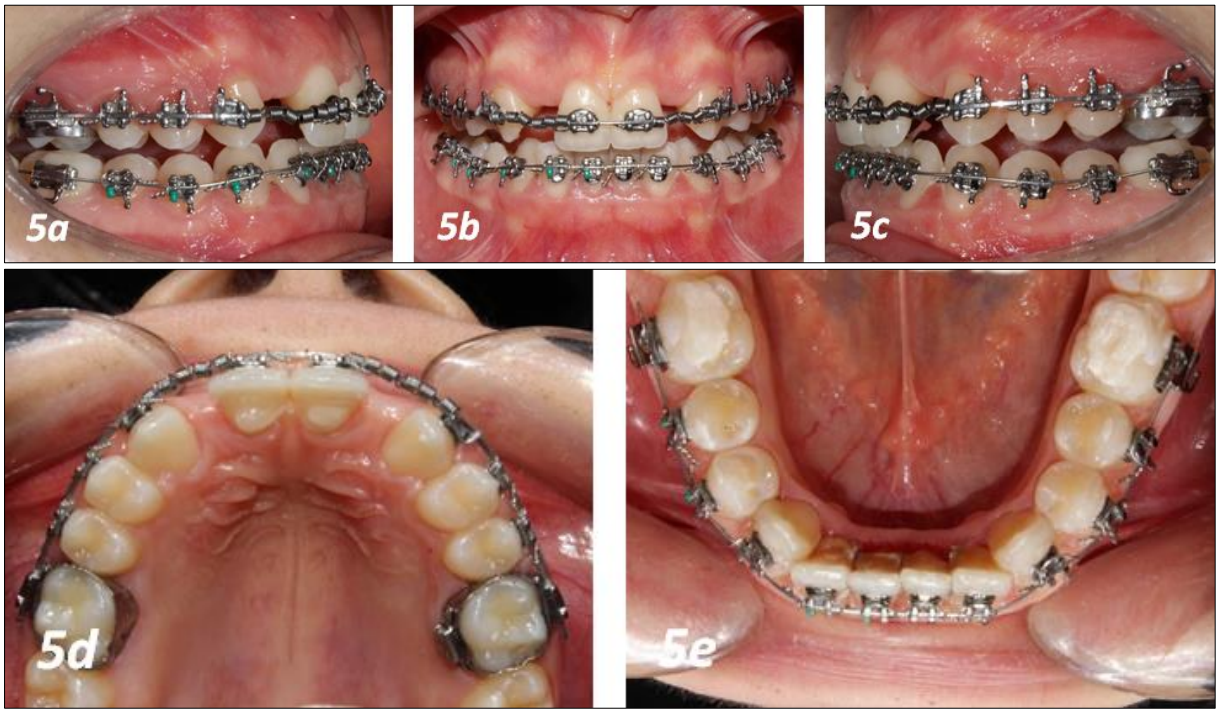

Figure 5 (a-e): Space opening with open springs on 0.018" x 0.025"-in SS arch

After space opening in the maxillary arch, prosthetic teeth replacing the 12 and the 22 were attached to the 0.018" x 0.025"-in SS archwires with artistic bends (Figure 6).

Figure 6 (a-d): Artistic bends on 0.018" x 0.025"-in SS arch and temporary prosthetic teeth replacing upper laterals

After 4 months of finishing and detailing, the appliance was debonded. Retention was performed with a bonded stainless-steel lingual canine-to-canine fixed retainer in mandibular arch. For the maxillary arch, a bonded bridge and an implant were used to replace the 12 and the 22 respectively. Finally, post-treatment records were taken.

TREATMENT RESULTS

All the predefined objectives were fulfilled, the correction of dental problems allowed the occlusal, functional, and esthetic goals to be achieved: a significant improvement in the soft tissue profile indicated by the position of the lips and the chin (Figure 7).

Figure 7: Profile comparison and smile photographs

Her smile esthetics improved (Figure 7 and 8c). Intraorally, an Angle class I bilateral canine and molar relationship was achieved with good, interdigitated occlusion, crowding was corrected, open bite was closed and an adequate overjet and overbite were achieved. Interincisal midline coincidence was obtained (Figure 8d to 8h). Additionally, functional dynamic occlusion was procured with lateral movement guided by the canines and protrusive movement by the incisors.

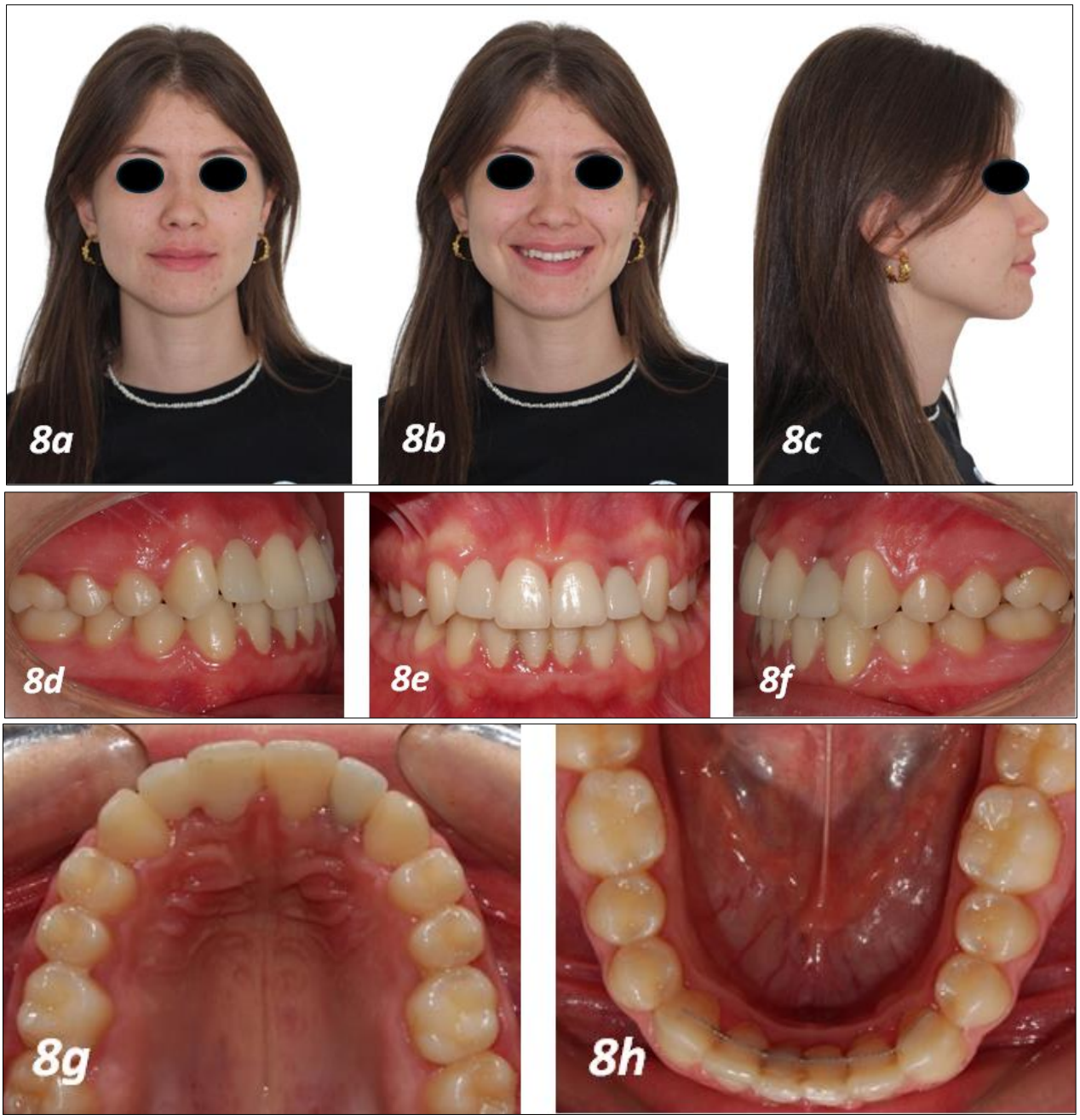

Figure 8 (a-h): Post-treatment photographs: facial and intra-oral photographs

Post treatment cephalometric evaluation and superimposition confirmed a positive change in the profile. Moreover, final cephalometric analysis showed a class I relationship with no change in value of the ANB angle (3°). The facial divergence has decreased with a change in values of the FMA angle from 22° to 20°. The maxillary incisors were protruded and buccally tipped, and the mandibular incisors were also protruded and had their axial inclination increased (Table 4 and Figure 8). Total and partial superimposition of initial and final cephalometric tracing revealed the changes that occurred with the treatment (Figure 9).

Table 4: Patient's cephalometric values comparison

Angles	Patient's initial values	Patient's final values
SNA	91,5°	91,5°
SNB	88,5°	88,5°
ANB	3°	3°
AoBo	-2,5 mm	-1,5 mm
FMIA	78°	72°
IMPA	80°	88°

FMA	22°	20°
GoGn/SN	28°	26°
I/i	130°	127°
I/F	111°	117°

Figure 9: Post-treatment cephalometric radiograph

Lastly, the panoramic radiograph shows satisfying root parallelism and good bone healing (Figure 10).

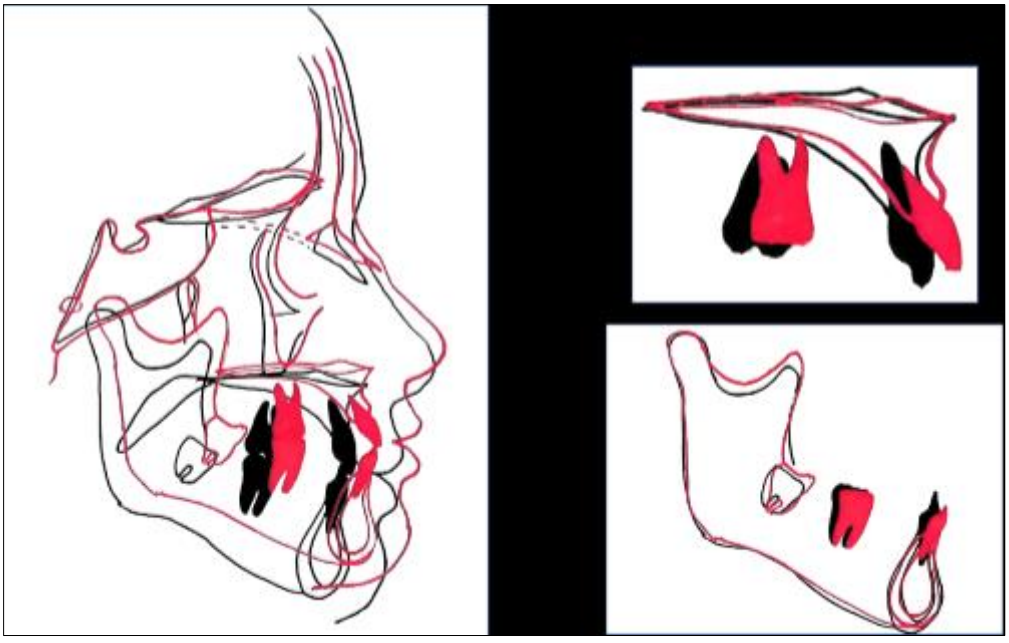

Figure 10: Total and partial cephalometric superimpositions

Figure 11: Post-treatment panoramic radiograph

DISCUSSION

A variety of esthetic problems are associated with maxillary lateral incisor agenesis. This includes median diastema, spacing between permanent incisor and canine, mesial migration of canines, midline shift in case of unilateral missing tooth [6]. Over-retention of maxillary deciduous lateral incisor and canine, ectopically erupted canines, absence of canine eminence, asymmetric loss of primary teeth, dental asymmetries are significant apparent factors that are useful for diagnosing the entity. Confirmed diagnosis of a missing tooth requires radiograph like periapical view or an OPG. Among them, tomography is the most reliable method for diagnosing congenitally missing teeth [6-8].

In the case presented in this report, the patient's chief complaint was her maxillary inter-incisal diastema resulting in a significant psychosocial impact. This patient was 17 years old at the beginning of treatment. She came looking for a solution for her unaesthetic smile appearance. She presented a class I skeletal malocclusion (ANB = 3°) with an anterior deep bite. Both maxillary lateral incisors were congenitally missing, an Angle class I molar relationship associated with an Angle class II canine on both sides and a normal vertical skeletal pattern (GoGn/SN = 28° and FMA = 22°).

In fact, the treatment options were: an orthodontic treatment without premolars extraction and space opening for the upper lateral incisors or an orthodontic treatment with space closure. The decision is based on her facial profile, dental arch characteristics, occlusion and the amount of crowding.

The elastics used in this case were 4 mm/4 Oz. The objectives of using intermaxillary elastics, besides reaching Angle class I relationship, are also to help open space for prosthetic replacement by canines retraction. The elastics are recommended to be used as much as possible except during meals, which corresponds to approximately 18 – 20 hours per day [9]. If the patient complies with these guidelines, they will achieve the best possible results in their orthodontic treatment. Consistent wear ensures that the desired tooth movements occur efficiently, reducing overall treatment time and improving final outcomes. If elastics are not worn as instructed, progress may be delayed, and the treatment plan may need to be extended.

Finally, the treatment outcomes were very favorable, all objectives were fulfilled. In fact, the achievement of treatment objectives was clinically and radiologically confirmed: there was a significant improvement in lower incisors retrusion: IMPA angle varied from 80° to 88°. A notable enhancement in the soft tissue profile, reflected in the positioning of the lips and chin, can be observed. Her smile aesthetics significantly improved, with better tooth alignment, enhanced symmetry, and a more harmonious relationship between her lips and facial structure. The corrected bite and proper positioning of the teeth contributed to a more balanced and confident smile.

In conclusion, the orthodontic treatment of maxillary lateral incisor agenesis with space opening is a highly effective approach that allows for the restoration of both functional and aesthetic outcomes. By creating space for prosthetic replacement, such as dental implants or fixed bridges, this treatment option ensures the long-term stability of the occlusion while enhancing the patient's smile. The success of this approach is highly dependent on careful planning, patient compliance, and collaboration among orthodontists, prosthodontists, and oral surgeons [10]. Additionally, the use of intermaxillary elastics plays a crucial role in facilitating the desired tooth movement and achieving the necessary space for the prosthesis. Ultimately, with proper management and individualized care, orthodontic treatment for maxillary lateral incisor agenesis can significantly improve the patient's dental function and overall appearance, leading to high levels of satisfaction and confidence.

CONCLUSION

Maxillary lateral incisor agenesis presents both functional and aesthetic challenges, requiring a well-planned and individualized treatment approach. Advances in orthodontics, prosthetics, and implantology offer various solutions to restore dental harmony and improve oral function [7, 8]. Early intervention and a multidisciplinary collaboration between orthodontists, prosthodontists, and surgeons are key to achieving optimal results. In this case, the management of Angle class II malocclusion, space opening and prosthetic replacement were shown successfully. Clearly, good facial esthetics, functional and occlusal results were achieved.

Declaration of Patient Consent: The authors certify that they have obtained all appropriate patient consent.

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