

CASE REPORT

Multidisciplinary management of congenitally missing lateral incisors: A minimally invasive approach

Afnan Ben Gassem¹  | Danya Hashem²

¹Department of Pediatric Dentistry and Orthodontics, College of Dentistry, Taibah University, AlMadinah AlMunawwarah, Saudi Arabia

²Department of Restorative Dental Science, College of Dentistry, Taibah University, AlMadinah AlMunawwara, Saudi Arabia

Correspondence

Afnan Ben Gassem, Department of Orthodontics, College of Dentistry, Madinah, P.O Box 41311, Saudi Arabia.
Email: a_bengassem@hotmail.com

Funding information

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors

Abstract

The following case report demonstrates how a multidisciplinary team approach can be utilized successfully for the minimally invasive esthetic treatment of congenitally missing maxillary lateral incisors through space closure and canine re-anatomization.

KEY WORDS

canine re-anatomization, congenitally missing lateral incisors, Hypodontia, minimal invasive management, orthodontic space closure

1 | INTRODUCTION

The developmental absence of primary and/or secondary teeth, with the exception of third molars, is referred to as “hypodontia”.¹ It can present either as part of a syndrome such as cleft lip and palate, ectodermal dysplasia, Van Der Woude syndrome or Down's syndrome, or on its own as a non-syndromic condition.² Although it is a hereditary condition, it has also been found in patients without a family history of hypodontia. While hypodontia's precise etiology remains to be determined, it is thought to be caused by environmental or genetic factors.

Studies have shown that patients suffering from developmentally missing teeth also display different dental and craniofacial characteristics in comparison to those with a normal number of teeth. Skeletally, they may show bimaxillary retrognathism, a Class III skeletal pattern and reduced vertical and transverse dental arch dimensions.³⁻⁶ On a dentoalveolar level, hypodontia is often associated with microdont teeth

resulting in spacing and displacement of adjacent teeth,^{1,7} taurodontism,⁷ ectopic eruption,⁸ delayed eruption,⁹ ankylosis, and infraocclusion.⁹ In addition, hypodontia patients may display reduced alveolar bone development which can be confined to a specific area or generalized to the whole alveolar process resulting in an older appearance as a result of a more prominent mandible and lips. In addition, the free-way space in these patients may be increased which may have negative esthetic and functional (eg, speech and mastication) effects.⁹

Treatment of patients with bilateral lateral incisor hypodontia requires a multidisciplinary approach especially due to the fact that it is located in an esthetically prominent region. Depending on the severity of hypodontia, a decision can be made to either accept, further open or close the space created by the missing lateral incisors.¹⁰ The decision is dependent upon the type of malocclusion, skeletal relationship, arch length tooth size discrepancy, smile line, canine morphology, and ridge thickness. In addition to the clinical characteristics

This is an open access article under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

© 2021 The Authors. *Clinical Case Reports* published by John Wiley & Sons Ltd.

of the patient, it is of utmost importance to determine the patients' expectations as well willingness to cooperate throughout the treatment journey which may be prolonged.¹¹ Replacing the missing lateral incisors after opening the space with a removable, fixed, or implant retained prosthesis is one treatment option which demands long-term maintenance and can be quite costly in the long term.¹² This can be avoided by using canine substitution to close the space.¹² Evidence from practice indicates that patients with canine substitution have improved periodontal health and reported higher levels of satisfaction with their appearance compared to those with dental prostheses.¹³

In the following case report, a multidisciplinary approach for the treatment of a fifteen-year-old female girl with missing maxillary lateral incisors using orthodontics with fixed appliances for closing of the spaces and replacing the congenitally missing maxillary lateral incisors by the canines and the canines by the first premolars, respectively, was done. Thanks to advances in esthetic and restorative dentistry, this approach can produce positive outcomes. Nevertheless, achieving outstanding esthetic and functional results that are as close as possible to natural teeth is challenging, especially when substituting canines for missing lateral incisors. This requires the collaboration of both the orthodontist and the restorative dentist throughout the treatment process.¹² This case study describes the challenges that were faced during the treatment and will provide tips to achieve the ultimate esthetic results.

2 | CASE REPORT

2.1 | Findings and diagnosis

The patient presented at the age of 15 years with a chief complaint of unsatisfactory esthetics due to the missing teeth and spacing between the anterior teeth (Figure 1A-H). She had no medical history and no allergies. Family history revealed the patients' sister affected by hypodontia of the upper lateral incisors which was treated with space opening and implants following orthodontic treatment.

She presented with a Class I incisor relationship on a Class I skeletal base and extra-oral evaluation of the face showed a mesofacial growth pattern, symmetrical and proportional face without upper central incisor show at rest and interlabial space of 0mm (Figure 1A-B). Smile evaluation showed 50% exposure of the upper incisors upon smiling with no gingival show and the upper centerline coincident with the facial midline. The patients showed a convex profile and thin retruded lips (Figure 1C).

Intraorally, she had an average overjet of 2mm, a normal overbite, Angles' Class I first molar relationship on both sides, and coincident upper and lower midlines (Figure 1D, E, F).

The maxillary and mandibular arches showed relatively well-aligned labial segments with moderate spacing in the upper arch and mild crowding in the lower arch. The upper lateral incisors were missing, and both canines have drifted mesially into the lateral incisor spaces (Figure 1G, H). In the frontal view, the canines were in the position of the lateral incisor teeth and the gaps for the missing lateral incisors were almost closed (Figure 1D). The panoramic radiograph confirmed the bilateral agenesis of the maxillary incisors (Figure 1I).

2.2 | Treatment planning

Initial photographs were taken of the patient followed by maxillary and mandibular diagnostic impressions using irreversible hydrocolloid (Tropicalgin, Zhermack SpA, Badia Polesine, Italy) were made and poured with dental stone. A diagnostic wax-up was made to help the patient visualize the outcome after space closure and canine re-anatomization. After taking the patients' consent, a treatment plan was formulated by both the orthodontist and the restorative dentist and a decision was made to close the spaces of the lateral incisors especially due to the fact that she had a low smile line, reduced gingival show and the canines have already migrated partially into the lateral incisor spaces. Also the canines' gingival margins were low, and the canines themselves were small in size and of favorable color.

The treatment plan was as follows:

1. Non-extraction orthodontic therapy
2. Upper and lower fixed appliances
3. Leveling and aligning the upper arch
4. Positioning the canine teeth in place of the lateral incisors and closing the spaces
5. Alignment of the lower arch
6. Maintaining the midline, overbite and overjet
7. Recontouring and building up the canines to camouflage as lateral incisors (re-anatomization).

2.3 | Orthodontic treatment progress

The patient was bonded with upper and lower 022" slot MBT™ prescription (3 M-UNITEK, Monrovia, California, USA). Lateral incisor brackets were placed on the upper canines to allow a more palatal root torque and reduce the canine eminence. The upper first premolar brackets were bonded in a slightly distal position which will rotate the premolars mesially for better esthetics.¹² After leveling and aligning the arches using 0.012, 0.014, and 0.018 NiTi archwires, respectively (Rocky Mountain® Orthodontics), space closure was achieved using medium 5/16" (3.5oz) Class III elastics (Ortho Organizers, Inc.) on a rectangular 19 × 25



FIGURE 1 Pretreatment facial (A-C) and intraoral (D-H) photographs. Initial panoramic radiograph (I)



FIGURE 2 Postorthodontic treatment/ pre-restorative intraoral photos (A-C)

stainless steel archwire (Rocky Mountain[®] Orthodontics) on the upper arch and a 0.018 (Rocky Mountain[®] Orthodontics) round stainless steel wire in the lower arch with loops distal to the lower canines. Labial root torque of the upper first premolars was also achieved to help reduce the show of the palatal cusp and increase the root eminence (Figure 2A-C).

Before the debonding, an interdisciplinary discussion with the restorative consultant was conducted to agree on the final position of the canine both esthetically and functionally with no working side interferences. After twelve months of orthodontic treatment, all objectives were achieved, the appliance was debonded, and the patient was referred to the restorative consultant (Figure 2A-C).

2.4 | Restorative treatment progress

A minimally invasive approach was chosen for canine re-anatomization by the fabrication of direct veneers using composite resin restorations. Maxillary and mandibular diagnostic impressions using irreversible hydrocolloid (Tropicalgin, Zhermack SpA) were made following orthodontic treatment and poured in dental stone. A diagnostic wax-up was done using inlay wax (Occlusal wax aroma) to re-anatomize the canines to resemble lateral incisors and to restore the fractured incisal edge of the upper left central incisor (Figure 3). A silicone index using vinyl polysiloxane (Virtual, Ivoclar Vivadent, Schaan, Italy) was fabricated from the cast and cut into labial and palatal aspect using a scalpel (Braun, Aesculap, Tuttlingen, Germany). All the material unnecessary for the stability of the putty matrix was removed using the scalpel. The silicone index was checked in the patient's mouth. Shades selection was done under natural daylight using a shade guide (Tetric N-Family Shade Guide, Ivoclar Vivadent, Liechtenstein). Isolation was done using a rubber dam (Dentsply; Maillefer). The surface of the upper canines and left central incisor was roughened using a diamond point (Dendia GmbH). Enamel acid etching was performed with 37% orthophosphoric acid (Extra Gel, Willmann & Pein) followed by washing, air drying, adhesive system



FIGURE 3 Laboratory wax-up of the upper right and left canines as well as the upper left central incisal edge

application (Tetric-n-bond, Ivoclar Vivadent, Liechtenstein), and light curing (Satelec Acteon, Merignac Cedex) using standard protocol and following manufacturers' instructions. Palatal silicon index was resealed, and incremental layering of direct composite resin restorative material (Tetric-N-Ceram, Ivoclar Vivadent, Liechtenstein) was done on the upper canines and left central incisor. Finishing and occlusal adjustment was done using white stone finishing burs (Dura-White Stones, Shofu Inc.), and polishing was done using the composite polishing kit (OptiDisc, Kerr). Finishing strips (OptiStrip, Kerr, Bioggio, Switzerland) were used interproximally to eliminate flash and obtain smooth line angles, and silicone polishing points (Enhance, Dentsply) were used on the lingual surface after occlusal adjustment (Figure 4). Oral hygiene instructions were given to the patient. The final esthetic evaluation of shade and texture of the restoration was done 15 days postoperatively.

2.5 | Retention

After the re-anatomization of the canines, the patient was referred back to the orthodontic clinic and Ortho-Flextech[™] bonded retainers (Reliance Orthodontic Products Inc.) were placed from the right first premolar to the left first premolar in the upper arch and from right canine to left canine in the lower arch. In addition, Essex retainers were fabricated for both the upper and lower arches.

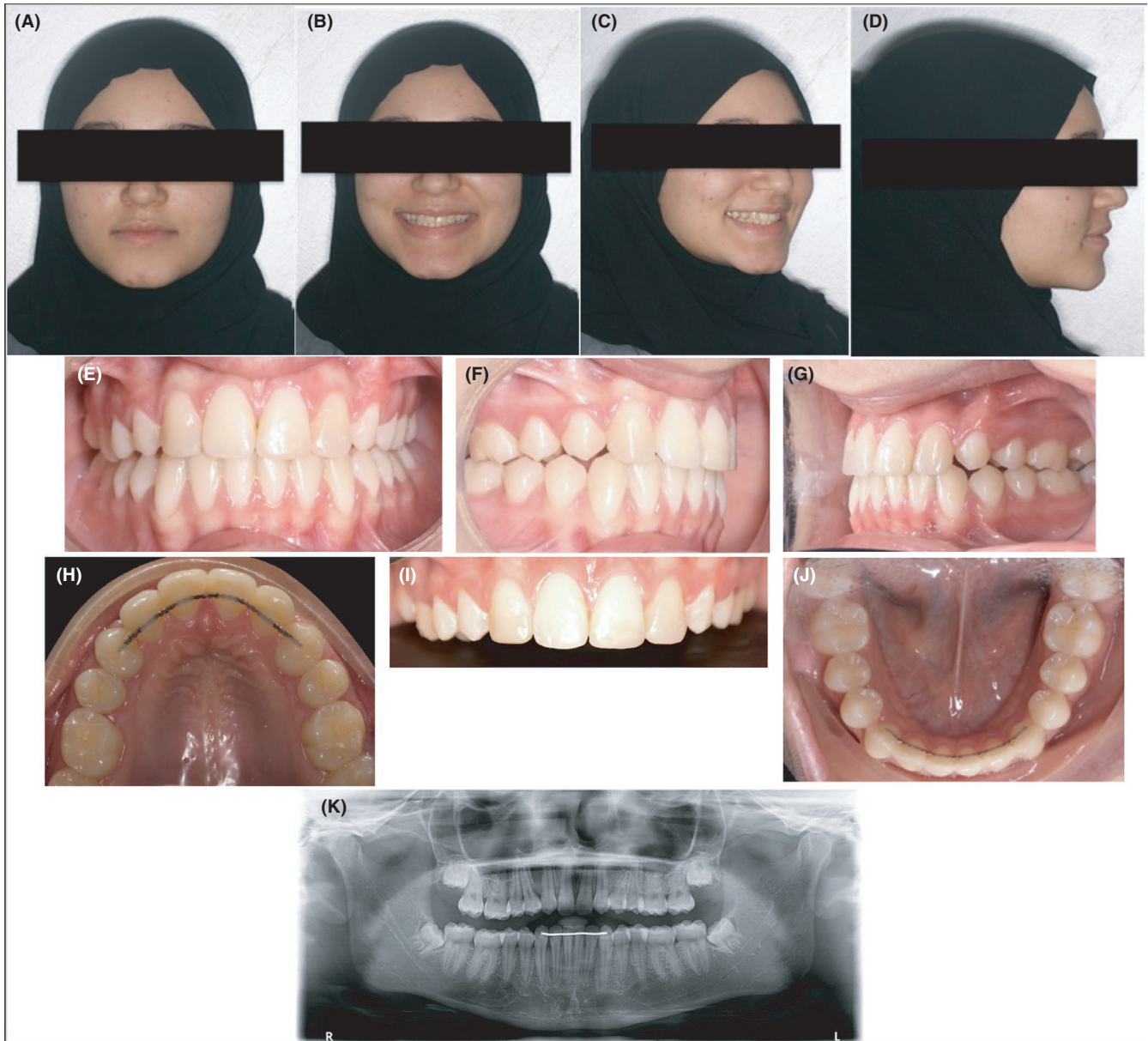


FIGURE 4 Post-treatment facial (A-D) and intraoral (E-J) photographs. Post-treatment panoramic radiograph (K)

3 | DISCUSSION

A substantial proportion of the population suffer from hypodontia specifically missing upper lateral incisor teeth.^{1,14,15} As this can have a significant impact on dental and facial esthetics, this leads to a considerable demand for orthodontic treatment. In the present case report, the patient was successfully treated using a multidisciplinary approach with orthodontic space closure and re-anatomizing the canines to resemble upper lateral incisors over a period of 24 months. The treatment of these patients are more often than not challenging for both the orthodontist and the restorative dentist to achieve maximum esthetics especially due to the high demand these patients carry because of the obvious impact that this condition

has on the facial and dental esthetics. However, studies have shown that space closure when possible is always the best option for patients with congenitally missing teeth for a number of reasons such as enhanced periodontal health, long-term maintenance is considered low, and excellent esthetic and functional results can be achieved if the re-anatomization was done properly.¹⁴ The literature has also shown that patients tend to be more satisfied with the space closure treatment outcome compared to patients who underwent space opening and prosthetic rehabilitation.¹⁶

The original treatment aims were accomplished, and the patients presenting complaints were addressed. Her extra-oral features remained largely the same except the relationship of the upper and lower lips to Ricketts' Eline which has

improved probably more due to growth than the treatment itself (Figure 4A-D). The overjet was successfully corrected to +2mm, and an average overbite was achieved which should significantly improve the prognosis for stability of overjet correction (Figure 4E-F). However, the overbite stability will largely depend on future vertical and antero-posterior skeletal growth, and since the patient was 18 years old at the end of treatment, facial growth is probably completed and J.S. is unlikely to grow significantly in both the vertical and horizontal planes.

The upper and lower arches were well-aligned, and the final anterior occlusal fit was good (Figure 4E-J). Some studies have reported that when space closure of congenitally missing lateral incisor space is chosen, changes occur in dental intercuspation, such as group or premolar disocclusion, which can affect the periodontal integrity, dental health, and temporomandibular joint function.¹⁷ In JS's case, group function was achieved on lateral guidance and studies have shown that that the premolar is considered an adequate substitute for the canine from a functional standpoint.¹⁶ Dental contact time during mastication seems to be insufficient to affect the TMJ and associated musculature.¹⁷ A clinical study, showed that no differences in occlusal function, prevalence of cervical abfraction, or signs of TMD symptoms were present in patients treated with space closure and recontouring of the canines.¹⁸ The study also revealed that neither canine nor group disocclusion were found to be related with TMD.¹⁸

A Class II full unit molar relationship was achieved at the end of treatment; however, the premolars would have benefited from further settling, and second order bends or intraoral elastics to extrude them may have helped to achieve this (Figure 4E-F). In addition, the post-treatment panoramic radiograph (Figure 4K) showed ideal dental axial inclinations of the upper central incisors and canines confirming the stability of the closed spaces. However, the upper first premolars could have afforded some mesial root tip to enhance the stability of the final result.

4 | CONCLUSION

This study presented the successful management of a patient with developmentally missing lateral incisors with space closure and canine re-anatomization. Patients with missing bilateral lateral incisors require multidisciplinary planning that involves the orthodontist, restorative dentist, implantologist, and prosthodontist to formulate treatment objectives that are in line with the patients' needs. Successful interdisciplinary management of the condition critically relies on sustained communication between the members of the clinical team and the patient throughout the treatment process which can achieve successful esthetic outcomes that not only involves

an ideal, stable occlusion, but also a natural, well-balanced smile.

ACKNOWLEDGMENTS

Published with written consent of the patient.

CONFLICT OF INTEREST

The authors do not have any financial interest in the companies whose materials are included in this article.

AUTHOR CONTRIBUTIONS

Afnan Ben Gassem completed the orthodontic treatment of the patient, provided pre- and postorthodontic photographs and X-ray images, and the write up of the manuscript. Danya Hashem completed the restorative treatment of the patient, provided postrestorative treatment photographs and the write up of the manuscript.

ETHICAL APPROVAL

This study was approved by the Taibah University College of Dentistry Research Ethics Committee (approval no. TUCDREC/27112020/ABGassem). A written informed consent was obtained from the patient for the publication of this case report.

DATA AVAILABILITY STATEMENT

Data sharing not applicable to this article as no datasets were generated or analysed during the current study.

ORCID

Afnan Ben Gassem  <https://orcid.org/0000-0002-9576-960X>

REFERENCES

- Hobkirk JA, Gill DS, Jones SP, et al. *Hypodontia: A Team Approach to Management*. West Sussex, UK: John Wiley & Sons; 2010.
- Nieminen P. Molecular genetics of tooth agenesis. 2007.
- Woodworth DA, Sinclair PM, Alexander RG. Bilateral congenital absence of maxillary lateral incisors: a craniofacial and dental cast analysis. *Am J Orthodont*. 1985;87(4):280-293.
- Nodal M, Kjaer I, Solow B. Craniofacial morphology in patients with multiple congenitally missing permanent teeth. *Eur J Orthodont*. 1994;16(2):104-109.
- Bondarets N, McDonald F. Analysis of the vertical facial form in patients with severe hypodontia. *Am J Phys Anthropol*. 2000;111(2):177-184.
- Vucic S, Dharmo B, Kuijpers MAR, et al. Craniofacial characteristics of children with mild hypodontia. *Am J Orthod Dentofacial Orthop*. 2016;150(4):611-619.
- Goodman JR, Jones SP, Hobkirk JA, King PA. Hypodontia: 1. Clinical features and the management of mild to moderate hypodontia. 1994.
- Peck S, Peck L, Kataja M. Mandibular lateral incisor-canine transposition, concomitant dental anomalies, and genetic control. *Angle Orthod*. 1998;68(5):455-466.

9. Dhanrajani PJ. Hypodontia: etiology, clinical features, and management. *Quintessence Int.* 2002;33(4):294-302.
10. Jepson NJ, Nohl FS, Carter NE, et al. The interdisciplinary management of hypodontia: restorative dentistry. *Br Dent J.* 2003;194(6):299-304.
11. Paduano S, Cioffi I, Rongo R, Cupo A, Bucci R, Valletta R. Orthodontic management of congenitally missing maxillary lateral incisors: a case report. *Case Rep Dent.* 2014;2014:1-7.
12. Savarrio L, McIntyre GT. To open or to close space—that is the missing lateral incisor question. *Dental Update.* 2005;32(1):16-25.
13. Abu-Hussein M, Watted N, Hegedűs V, Peter B. Congenitally missing upper laterals. clinical considerations: orthodontic space closure. *Int Res Pub Med Sci.* 2015;1(3):82-89.
14. Zachrisson BU, Rosa M, Toreskog S. Congenitally missing maxillary lateral incisors: canine substitution. *Am J Orthod Dentofacial Orthop.* 2011;139(4):434.
15. Polder BJ, Van't Hof MA, Van der Linden FPGM, Kuijpers-Jagtman AM. A meta-analysis of the prevalence of dental agenesis of permanent teeth. *Commun Dent Oral Epidemiol.* 2004;32(3):217-226.
16. Robertsson S, Mohlin B. The congenitally missing upper lateral incisor. A retrospective study of orthodontic space closure versus restorative treatment. *Eur J Orthodont.* 2000;22(6):697-710.
17. Pini NIP, De Marchi LM, Pascotto RC. Congenitally missing maxillary lateral incisors: update on the functional and esthetic parameters of patients treated with implants or space closure and teeth recontouring. *Open Dent J.* 2014;8:289.
18. Silveira GS, de Almeida NV, Pereira DMT, Mattos CT, Mucha JN. Prosthetic replacement vs space closure for maxillary lateral incisor agenesis: a systematic review. *Am J Orthod Dentofacial Orthop.* 2016;150(2):228-237.

How to cite this article: Ben Gassem A, Hashem D. Multidisciplinary management of congenitally missing lateral incisors: A minimally invasive approach. *Clin Case Rep.* 2021;00:e04521. <https://doi.org/10.1002/ccr3.4521>