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## Orthodontic management of missing maxillary lateral incisors: a systematic review

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# Orthodontic management of missing maxillary lateral incisors: a systematic review

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## Abstract

Agensis of maxillary lateral incisor often present a significant clinical challenge for orthodontists because, in a number of cases, the treatment duration is prolonged and the treatment outcome may be compromised.

The aim of this article is to outline some of the traits of the multidisciplinary management of agensis of maxillary lateral incisors proposed in literature with an emphasis on orthodontic treatment.

Absence of the maxillary lateral incisor creates an aesthetic problem which can be dealt with in various ways.

The condition requires careful treatment planning, evaluation of the options and outcomes following either space closure or prosthetic replacement.

Furthermore, dental agensis carries an aesthetic, functional, psychosocial, and financial burden for affected individuals.

Considering all these points it is crucial to intercept maxillary lateral incisors agensis as early as possible by the clinicians, in order to establish proper therapy.

The diagnosis of this condition consists of clinical examination associated with radiographic examination. Treatment of patients with unilateral or bilateral lateral incisors agensis must be multidisciplinary, involving the interplay of Orthodontics, and a number of clinicians like Restorative Dentistry, Implantology and Prosthodontics.

## Introduction

Congenital absence of one or both of the maxillary incisors in humans has been observed since the Paleolithic period. With the evolution of species, the face and jaws tend to decrease in the anteroposterior direction.

This propensity can limit the space needed to accommodate all the teeth and, accordingly, the last tooth of each series tends to disappear (third molar, second premolar and lateral incisors)<sup>1</sup>.

According to some studies, this is a hereditary process:

a generation that has an anomalous tooth will have descendants that no longer possess this tooth<sup>2</sup>.

The maxillary lateral incisor is the second most frequently missing tooth after the mandibular second premolar ((without including the third molars)<sup>3</sup>.

It was demonstrated that higher frequencies of maxillary lateral incisors agensis have been reported in females than in males, as with all dental agensis<sup>4</sup> and bilateral agensis of maxillary lateral incisors occurred more often than unilateral agensis<sup>3</sup>.

There is an exception in relation to the upper lateral incisors, which often are absent unilaterally, and the left side is more affected than the right side<sup>5,6</sup>.

It is important to note that when only one lateral incisor is absent, its counterpart usually presents anomaly of form (conoid) or size (microdontia)<sup>2,7</sup>.

Agensis of any tooth can cause dental asymmetries, alignment difficulties, and arch length discrepancies but when the missing tooth is in the anterior region of the maxilla, the discrepancies can be quite noticeable<sup>8</sup>.

The treatment of dental agensis of deciduous or permanent series is an increasing problem reflected in the dental practice.

Orthodontists often experience problems related to the management of clinical conditions when patients are congenitally missing a maxillary lateral incisor.

Over the last several decades, dentistry has focused on several treatment modalities for replacement of missing teeth. The two major alternative treatment options are orthodontic space closure or space opening for prosthetic replacements.

Orthodontic management for patients with single or bilateral congenitally missing permanent lateral incisors is a challenge to effective treatment planning.

In order to produce more predictable aesthetic results, it is important to choose the treatment that best suits the initial diagnosis and timing of the intervention<sup>1</sup>.

The aim of this article is to outline some of treatments of agensis of maxillary lateral incisors proposed in the literature with an emphasis on orthodontic treatment.

## Methods

Several orthodontic works have been published in international literature about management of clinical conditions when patients are congenitally missing a maxillary lateral incisor.

So the systematic review of literature has been performed on the principal medical databases: PubMed (Medline), Embase and Scopus.

The keywords used were: congenitally missing lateral incisors, dental agenesis and orthodontic treatment. No restrictions of time and languages have been fixed. The results have been filtered and valued following our eligibility criteria and then organized following the PRISMA method.

The search identified 11,542 abstracts, which were reviewed manually and each article of interest was marked for further review. The full text of the marked studies was retrieved and studies that satisfied our eligibility criteria were included in this review. At the end only 32 full articles have been selected.

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## Review

Dental agenesis can cause orthognatodontic problems such as alteration of intercuspitation, modification of bone bases and their reciprocal relationships, excessive space management, dental medial displacement, lack of antagonist, and aesthetic problems in the frontal section<sup>9</sup>.

The maxillary lateral incisor is the second most frequently missing tooth after the mandibular second premolar even though Muller et al. found that maxillary lateral incisors experience the most agenesis (not including third molars)<sup>10</sup>.

Patients and parents should be counseled about the complexities of this genetically inherited anomaly and the long-term treatment options<sup>9</sup>.

Â The treatment reflects the pattern of tooth absence, the amount of residual spacing, existing malocclusions and patient attitudes. The following options are available:

- Accept spacing
- Space closure
- Redistribution of space<sup>11</sup>

Since the maxillary lateral incisor is located in the esthetic zone, it is essential that bone height, papilla height, enamel color, and shape match the surrounding teeth.

Clinicians attempt to maintain the proper anterior overbite, overjet and ideal interarch relationships of the canine teeth while creating enough space for a fixed partial denture or more commonly, an implant with a single crown restoration, but few treatment options are available for patients with agenesis of one or both maxillary lateral incisors<sup>9</sup>.

The two common treatment options are orthodontic space opening for a fixed partial denture or implant; or orthodontic space closure using canines to replace the missing maxillary lateral incisors<sup>11</sup>.

Factors relating to the patient; the size, shape, position and color of the teeth; the effect on occlusion; patient age and analysis of the standard profile; and overall facial and dental esthetics should be considered when deciding on whether to create an orthodontic space opening or space closure.

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### Orthodontic closure of the spaces and aesthetic replacement of the canine

As suggested by Kokich e Kinzerit is important to select the appropriate patient through specific criteria such as malocclusion, dental crowding, profile, shape of the canine, lips<sup>12</sup>.

Robertsson et al. (2000) state that canine substitution isÂ the best approach for patients with: Angle class II without senza dental crowding in the lower arch; Angle class I with severe dental crowding; protrusion involving extractions in the lower arch; presence of dental elements with correct inclination of the front teeth and absence of spaces; severely protruding upper front teeth where the orthodontic opening of the space would worsen the situation; canines very close to the incisors<sup>13,14</sup>.

Colour and shape of the canine are important factors to be considered. Indeed canine and lateral exhibit different dimensions, surface, colour and translucency. It is therefore necessary a reduction of canine dimension that, without the amount of enamel, will show dentine which is darker and opaque. This is detrimental for the aesthetics. In this case, the literature suggests reducing the enamel-cement joint and the mesio-distal juncture and also the labial surface and the depth of the crown in its central part in the buco-lingual sense<sup>12</sup>.

The incisal should be modeled: the canine is broader in the mesio-distal direction of the side incision of 1.2 mm on average and the distal surface, which is more convex than the lateral surface, has to be reduced.

Robertsson and Mohlin(2000) pointed three advantages of space closure orthodontic treatment. So,

they concluded that orthodontic space closure produces results that are well accepted by patients, does not impair temporomandibular joint function, and encourages periodontal health in comparison with the prosthetic replacements<sup>13</sup>.

The color and shape of the canines also needs to be taken into account before choosing this as the best option for treatment.

A flattened incisal edge is produced by reduction of the canine tip and the addition of composite to the mesial and distal corners. This is normally undertaken after completion of orthodontic tooth movement, as is the desirable reduction of the buccal contour.

If the canines are overly bulky or more yellow in hue than the central incisors, they may need bleaching, enameloplasty or restoration before treatment is complete<sup>15,16</sup>.

Â A further disadvantage of the use of the canine to mimic the lateral incisor is the more apical position of the gingival margin commonly associated with this tooth<sup>11</sup>.

Though acceptable with low smile lines, the discrepancy in the levels of the gingival margins between the canine and central incisors can be disagreeable when high smile lines reveal the gingival tissues. Canines in the positions of lateral incisors may also preclude the prosthodontic convenience of canine guidance in lateral excursions<sup>11</sup>.

Kokich believes that canine substitution can be an excellent option for some patients, especially if they are Angle Class II with excessive overjet or are Class I with enough crowding in the mandibular arch to warrant extractions<sup>15</sup>. The profile of the patients is another factor to consider. Protrusive faces are often more esthetically conducive for canine substitution than creating space for an implant by proclining the incisors and potentially making the lips more protrusive<sup>15</sup>.

Rosa and Zachrisson, however, in support of the closure of spaces, do not recognize differences between canine guide and group function<sup>17</sup>.

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#### **Orthodontic opening of the spaces and prosthetic or implant-prosthetic rehabilitation**

The purpose of this therapeutic approach is to provide an adequate space where the upper incisor lacks and maintain or establish the first class of Angle by prosthetically rejuvenating the agenetic site that was created after the orthodontic opening of the spaces<sup>18</sup>.

The functional and morphological conditions

underlying this therapeutic option are the following: excessive arc space, malocclusion of III class, stable Angle Class I relationship or aesthetically incompatible color difference between central incisor and canine. With the opening of space the orthodontist tries to redistribute the space available from the diastemes between the front teeth due to maxillary incisor agenesis and the ectopic canine eruption.

The orthodontic opening of the spaces can be done by closing the diastema between the central incisors and distalizing the canine.

Literature indicates that, in cases of orthodontic opening of the spaces, it is critical to identify the space needed to replace the upper lateral incisor<sup>13</sup>.

A possible option is to reduce the width of the posterior teeth in order to move the maxillary canine distally to increase the amount of space for the implant.

One prosthetic option for replacing the missing lateral incisor is a resin bonded (Maryland) bridge, cantilevered bridge, or full-coverage bridge. Some benefits to these restorations include being less invasive than an implant, they can be completed in a growing individual, and there is more freedom with the space requirements when compared to the minimum of 6mm required for an implant.

Kokich reports that the resin bonded bridge is especially conservative since the preparations are only on the lingual of the incisors when compared to the full-coverage abutments of a traditional bridge<sup>19</sup>.

A cantilevered bridge is the second most conservative option, followed by the full-coverage bridge. Mobility of the abutment teeth, angulations of the incisors, gingival contours and occlusion are all factors to take into account before choosing one of these treatments for a patient<sup>19</sup>.

Replacing the missing lateral incisor with an implant is another prosthetic alternative to closing the space. Kokich states that the smallest implant for this site is about 3.2mm in diameter and recommends having at least 1mm of bone between the implant and adjacent tooth<sup>20</sup>.

Therefore, the implant alone requires at least 5.2mm of space and with the restoration of the crown at least 6mm of space is required.

Frequently, clinicians cannot maintain the proper occlusion and create a minimum of 6mm of space for an implant. Kokich advises the interproximal reduction of the central incisors, canines, or premolars to create enough space for an implant when this situation arises<sup>5</sup>.

More recently, he recommended only slenderizing teeth distal to the canines so as not to adversely affect

anterior papillae in the esthetic zone<sup>8</sup>.

This type of treatment is the most conservative of prosthetic options, as it does not require any preparation of adjacent dentures<sup>21,22</sup>.

This, additionally, has other advantages: the maintenance of the alveolar bone; high occlusal function; aesthetic appearance in the short term; long-term survival; Short and relatively simple orthodontic treatment<sup>22</sup>.

Although single tooth implants have a high rate of success, long-term biological complications have a negative impact on the smile area.

Among the complications we can include: the dark color of the gingiva; the display of metal or porcelain stump over time; the recession of the distal papilla; the absence of a long-term follow-up<sup>22</sup>.

Studies show that space opening can be started after 13 years to prevent the risk of relapse and a higher degree of bone resorption<sup>22</sup>.

Excessive protrusion of the incisors can cause stress to the implant.

The insertion of the implant must be avoided before the jaw growth and the end of the development of the alveolar processes<sup>22,23</sup>.

If inserted early, there may be discrepancies between the gingival edges of the implant and that of the natural tooth and consequently there will be occlusal and functional complications<sup>22</sup>.

Overall, the variables considered for restoration of the maxillary lateral incisor depend upon the clinical situation, esthetics and personal preference of patients and parents. While canine substitution may be a viable option for some patients, an implant and crown may be a better treatment plan for others<sup>8</sup>.

Treatment plans needed to manage the missing teeth of hypodontia patients are complex and require an interdisciplinary approach, which usually comes at a financial cost to both the patient and their family because Treatment plans also involve long-term maintenance and family counselling<sup>24</sup>.

## Conclusion(s)

Treatment options to close spaces orthodontically or maintain these spaces for future prosthodontics rehabilitation should be discussed with the patient and/or parents.

The orthodontist should explain all of the advantages and disadvantages of each treatment option.

Is crucial to intercepting maxillary lateral incisors agenesis as early as possible by the clinicians order to establish proper therapy, consideration of possible treatments taking into account the aesthetic, functional, psychosocial and financial problems of affected individuals.

The treatment of patients with missing lateral incisors must be multidisciplinary. It can involve orthodontics, esthetic dentistry, implantology and prosthodontics.

The interdisciplinary approach can achieve not only an optimal occlusion, but also a well-balanced, natural smile that will be stable over the long-term.

## References

- [1] Mattheeuws N., Dermaut L., Martens G. Has hypodontia increased in Caucasians during the 20th century? A meta-analysis. *Eur J Orthod*. 2004 Feb;26(1):99-103.
- [2] Vastardis H. The genetics of human tooth agenesis: new discoveries for understanding dental anomalies. *Am J Orthod Dentofacial Orthop*. 2000 Jun;117(6):650-6.
- [3] Polder B.J., Van't Hof M.A., Van der Linden F.P., Kuijpers-Jagtman A.M. A meta-analysis of the prevalence of dental agenesis of permanent teeth. *Community Dent Oral Epidemiol*. 2004 Jun;32(3):217-26.
- [4] Pini N.I., Marchi L.M., Pascotto R.C. 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*. 2015 Jan 6;8:289-94.
- [5] Bailit H.L. Dental variation among populations. An anthropologic view. *Dent Clin North Am*. 1975 Jan;19(1):125-39.
- [6] Woodworth D.A., Sinclair P.M., Alexander R.G. Bilateral congenital absence of maxillary lateral incisors: a craniofacial and dental cast analysis. *Am J Orthod*. 1985 Apr;87(4):280-93.
- [7] Mossey P.A. The heritability of malocclusion: part 2. The influence of genetics in malocclusion. *Br J Orthod*. 1999 Sep;26(3):195-203.
- [8] Wright J., Bosio J.A., Chou J.C., Jiang S.S. Maxillary lateral incisor agenesis and its relationship to overall tooth size. *J Prosthet Dent*. 2016 Feb;115(2):209-14.
- [9] Sabri R. Management of missing maxillary lateral incisors. *The Journal of the American Dental Association* 1999;130:80-4.

- [10] Muller TP, Hill IN, Peterson AC, Blayney JR. A survey of congenitally missing permanent teeth. *J Am Dent Assoc* 1970;81:101-7.
- [11] Jepson N.J., Nohl F.S., Carter N.E., Gillgrass T.J., Meechan J.G., Hobson R.S., Nunn J.H. The interdisciplinary management of hypodontia: restorative dentistry. *Br Dent J.* 2003 Mar 22;194(6):299-304.
- [12] Kinzer GA, Kokich VO. Managing congenitally missing lateral Incisors. Part II: Tooth-supported restorations. *J Esthet Restor Dent* 2005;17:76-84.
- [13] Robertsson S, Mohlin B. The congenitally missing upper lateral incisors. A retrospective study of orthodontic space closure versus restorative treatment. *European Journal of Orthodontics* 2000 Dec;22(6):697-710.
- [14] Favero L, Pizzo C, Farronato D, Balercia A, Favero V. A new methodological and clinical approach for the treatment of upper lateral incisors agenesis: the posterior space opening. *Eur J Paediatr Dent* 2012 Jun;13(2):151-4.
- [15] Kokich VO Jr, Kinzer GA. Managing congenitally missing lateral incisors Part I: Canine substitution. *J. Esthet Restor Dent* 2005;17(1):5-10.
- [16] Thordarson A, Zachrisson BU, Mjor IA. Remodeling of canines to the shape of lateral incisors by grinding: a long-term clinical and radiographic evaluation. *Am J Orthod Dentofac Orthop.* 1991;100(2):123-132.
- [17] Rosa M1, Zachrisson BU. The space-closure alternative for missing maxillary lateral incisors: an update. *Journal of Clinical Orthodontics* 44: 540-549
- [18] McNeill R.W., Joondeph D.R. Congenitally absent maxillary lateral incisors: treatment planning considerations. *Angle Orthod.* 1973 Jan;43(1):24-9.
- [19] Kokich VO Jr, Kinzer GA. Managing congenitally missing lateral incisors Part II: Tooth-supported restorations. *J. Esthet Restor Dent* 2005;17(2):76-84.
- [20] Kokich VG. Maxillary lateral incisor implants: planning with the aid of orthodontics. *J Oral Maxillofac Surg.* 2004;62:48-56.
- [21] Park JH, Okadakage S, Tai K, Sato Y, Akamatsu Y. Orthodontic treatment of congenitally missing maxillary lateral incisors. *Journal of Esthetic and restorative Dentistry* 2010;22(5):297-312.
- [22] Shapiro SD, Farrington FH. A potpourri of syndromes with anomalies of dentition. In: Jorgenson RJ, ed. *Dentition genetic effects.* Birth Defects: Original Article Series. New York: March of Dimes Birth Defects Foundation, 1983:129-40.
- [23] Faccioni F, Bertelà G, Consolo U, Filippini P, Cortelazzi R. Indicazioni terapeutiche nelle agenesie dentari. *Quintessence International* 1995;11:733.
- [24] Al-Ani A.H., Antoun J.S., Thomson W.M., Merriman T.R., Farella M. Hypodontia: An Update on Its Etiology, Classification, and Clinical Management. *Biomed Res Int.* 2017;2017:9378325