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# Clinical features of maxillary lateral incisor agenesis and associated dental anomalies: a systematic review

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# Clinical features of maxillary lateral incisor agenesis and associated dental anomalies: a systematic review

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## Abstract

The maxillary lateral incisor is the second most frequently missing tooth in the dental arch.

The aim of this study was to review literature data for maxillary lateral incisor agenesis, unilateral and bilateral, and associated dental anomalies in an orthodontic population.

Research suggests that several clinical features are commonly seen, dental anomalies commonly associated with agenesis of maxillary lateral incisors should be investigated in adults and especially in young people for early diagnosis, which is crucial for the orthodontist in order to design a proper therapeutic plan.

## Introduction

Tooth agenesis is one of the most common congenital anomalies occurring in the permanent dentition. The condition concerns the non-development of six or more teeth. It can occur as part of a recognised genetic syndrome or as a nonsyndromic isolated trait<sup>1</sup>.

Agenesis is the result of a disorder of the dental lamina during the training process. Should anomalies occur during the calcification and dental gems formation processes, the dental lamina may remain involved and damaged giving rise to phenomena of dental absence that can be total or partial, affecting both the dental elements of the deciduous and permanent dentition. Although local, systemic and genetic factors have been implicated in the aetiology of this anomaly, the extent to which genetic and environmental factors are involved remains unknown<sup>2,3</sup>.

The maxillary lateral incisor is the second most frequently missing tooth after the mandibular second premolar (not including third molars)<sup>4</sup>.

They represent one of the most common number anomalies in dental practice<sup>5</sup>.

It was demonstrated that higher frequencies of maxillary lateral incisors agenesis have been reported in females than in males, as with all dental agenesis<sup>6</sup>.

Furthermore Polder et al. (2004) found that bilateral agenesis of maxillary lateral incisors occurred more often than unilateral agenesis<sup>4</sup>, and that it is often associated with dental anomalies<sup>6</sup>.

Dental anomalies such as peg-shaped incisors, taurodontism, transposed teeth, supernumerary teeth, and ectopic eruption may occur in subjects with tooth agenesis<sup>7,8</sup>. Anomalies of the eruptive path related with agenesis of upper lateral incisors are also associated with upper canines and lower second premolars.

The aim of this study was to review literature data for maxillary lateral incisor agenesis and associated dental anomalies in an orthodontic population.

## Methods

Many works have been published on international literature about maxillary lateral incisor agenesis and associated dental anomalies. The systematic review of literature has been performed on the principal medical databases: PubMed (Medline), Embase and Scopus.

The keywords used were: dental agenesis, congenitally missing lateral incisors, associated dental anomalies.

No restrictions of time have been fixed but the search only included Italian, Spanish and English language.

The results have been filtered and valued following our eligibility criteria and then organized following the PRISMA method.

The search identified 15,322 abstracts, which were reviewed manually and each article of interest was marked for further review.

The full text of the studies was retrieved and studies that satisfied our eligibility criteria, such as agenesis of MLI: unilateral or bilateral absence and presence of associated dental anomalies were included in this review. At the end only 48 full articles have been selected.

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## Review

Tooth agenesis is often nonsyndromic, but it can also be associated with oral clefts and several other syndromes<sup>9</sup>. The prevalence of hypodontia is higher in more severe clefting cases, most likely presenting with the agenesis of a maxillary lateral incisor (in either dentition)<sup>9</sup>.

Other conditions that have hypodontia as one of their features include Down's Syndrome and ectodermal dysplasia. Down syndrome is characterized by a combination of phenotypic features that includes typical dysmorphic features, mental retardation, congenital malformations of the heart and gastrointestinal tract are common. Congenital absence of teeth has been reported in 23 to 47%. Lateral maxillary incisors, lower incisors, second premolars, and third molars are the most commonly missing. One or both primary upper lateral incisors are missing in more than 10% of the patients, and peg-shaped maxillary lateral incisors are seen in 10%<sup>9</sup>.

Dental agenesis is also found in other pathologies like some endocrinopathies (hypopituitarism, hypothyroidism) syphilis, rubella, cleaved palate, radiating deficits of feeding (rickets) or therapies in the first months of pregnancy<sup>10</sup>. In these syndromes, there is a characteristic pattern of agenesis that is usually different from the overall population<sup>11</sup>.

The maxillary lateral incisor is the second most frequently missing tooth after the mandibular second premolar<sup>4</sup>, even though Muller et al. Found that maxillary lateral incisors experience the most agenesis (not including third molar<sup>12</sup>. It is known that tooth agenesis, especially agenesis of maxillary lateral incisor, contributes to abnormal occlusion and is often associated with various anomalies in other teeth<sup>11</sup>.

Commonly reduction in the mesiodistal dimensions of tooth crowns has been reported in individuals with hypodontia<sup>13</sup>.

Tooth-number reduction was associated with crown-size reduction, so that the more teeth were missing the greater the possibility of clinically apparent microdontia in the same individual and the more reduction measured in remaining tooth crowns. A relationship between tooth agenesis and molar crown morphology has also been demonstrated<sup>13,14</sup>.

Brook proposed that microdontia and hypodontia are linked genetically as a continuum of tooth size, where a tooth will fail to develop if the tooth germ does not reach a particular tooth size and tooth number thresholds<sup>4</sup>. However, agenesis of maxillary lateral incisors and associated dental anomalies were

limited in the literature. Most of the papers published about maxillary lateral incisors agenesis investigated reduced crown size or peg shaped form of the contralateral maxillary lateral incisors among the subjects with unilateral absence of this tooth<sup>15</sup>.

Woolf presented data on anomalies associated with agenesis of the maxillary lateral incisor, such as peg laterals. Woolf studied 103 participants who had either unilateral or bilateral agenesis of the maxillary lateral incisor, and the relatives of this test group acting as controls. Results showed that 17.7% of parents and brothers of the sample population also had agenesis of the maxillary lateral incisor or peg-shaped laterals, compared to only 2.8% in the control group. 24 of the 103 participants who had agenesis of the maxillary lateral incisor also had a peg-shaped lateral incisor. Members of the same family tended to show the same location and pattern of agenesis. Evidence of a genetic association was demonstrated in this population<sup>16</sup>.

Subsequently Garib et al. observed that in the 80.3% of the sub-sample of patients with unilateral upper agenesis of the upper incisor had microdontia of the contralateral incisor<sup>17</sup>.

In a study published in 1998, Baccetti showed significant reciprocal associations between agenesis of second premolars and reduced upper lateral incisors. The group with agenesis of second premolars showed a higher prevalence (18%) of small maxillary lateral incisors than did the control group. and, conversely, the group with small maxillary laterals showed a higher prevalence (42%) of aplasia of second premolars than did their control group<sup>18</sup>. In the same study Baccetti reported palatal canine displacement showed significant reciprocal associations with small size of maxillary lateral incisors and absence of second premolars in a study of a population with no orthodontia<sup>18</sup>.

In a study by Garib et al. (2009) in 203 patients with unilateral or bilateral agenesis of the lower second premolar, 8.1% of the sample exhibited concomitant palatal impacted upper canine, five times higher than the general population<sup>19</sup>.

Becker et al. (1981) and Brin et al. (1986) reported that displaced canines and missing or peg-shaped upper lateral incisors appeared simultaneously<sup>9</sup>. Zilberman et al. (1990) in a study of orthodontic patients with at least one palatal canine showed that, in a high percentage of cases, the lateral incisors adjacent to these canines were missing<sup>20</sup>. In this study, 46% of the probands with palatal canines had an anomalous lateral incisor; 5% of the parents and

11% of the siblings also had palatal canines and anomalous lateral incisors, in 31% and 28%, respectively<sup>19</sup>.

Another common feature of dental agenesis is the ectopic positioning of the permanent teeth. This is likely caused by the absence of neighbouring teeth available to guide them during eruption or by the lack of space for them to erupt into. Transposition of teeth is also seen more commonly in individuals with dental agenesis<sup>21</sup>.

As far as the ectopic eruption of the second lower premolar in the distal direction is concerned, Garib et al., In a study of 126 patients, found that 4% of subjects with agenesis of the lateral area had a lowering of the second lower premolar but inclusion was thought to be a rare occurrence<sup>16</sup>.

Ectopic permanent canines were shown to associate with hypodontia in another Finnish study. The frequency of hypodontia was analyzed in 106 patients treated for ectopic canines and their family members: 36% of the patients and 20% of the first-degree relatives were missing some permanent teeth<sup>22</sup>.

Peck et al. (1996, 1998) reported significantly elevated hypodontia frequencies in individuals with either maxillary canine-first premolar transposition, palatal displacement of the maxillary canine, or mandibular lateral incisor-canine transposition<sup>23,24</sup>.

The prevalence of tooth rotation, together with agenesis of nonadjacent teeth, was studied by Baccetti (1998) in a sample of 1620 subjects and in a control group of 1000 individuals. The occurrence of tooth rotation in association with agenesis of nonadjacent teeth was significantly higher than in the control group for all the categories of tooth rotation. This study concluded that rotation of premolars is significantly associated with congenitally missing upper lateral incisors. Significant associations also appeared between unilateral agenesis of upper lateral incisors and rotation of the lateral incisor on the other side of the dental arch, and between unilateral agenesis of premolars and rotation of premolars on the other side of the arch<sup>17</sup>.

Pinho et al. investigated other associated developmentally absent teeth and supernumerary teeth.

Although no supernumerary tooth was found, they found that 12.8 % of the subjects with maxillary lateral incisors agenesis had absence of other teeth and most frequently observed missing teeth were maxillary and mandibular premolars<sup>25</sup>.

Delays in tooth development are another common

feature, whereby the absence of a permanent successor delays the normal resorption of the roots of the primary teeth. Indeed, the deciduous teeth may be retained for up to 40 or 50 years<sup>26</sup>.

Furthermore, approximately 46% of individuals with tooth agenesis also have short roots of other permanent teeth<sup>9</sup>.

## Conclusion(s)

There are dental abnormalities associated with dental agenesis that should be sought and investigated in patients with agenesis, particularly with agenesis of upper lateral incisors, and especially in young children for whom it is crucial to intercept these anomalies as early as possible by the orthodontist, in order to establish proper therapy.

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