

Therapeutic Possibilities for Maxillary Lateral Incisor Agenesis: a Literature Review

Possibilidades Terapêuticas para Agenesia de Incisivo Lateral Superior: uma Revisão de Literatura

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Abstract

Tooth agenesis or hypodontia is a developmental anomaly, where there is absence of one or more dental elements. The absence of maxillary lateral incisor can be uni or bilateral, has an incidence of 20% and is more frequent in females. Is directly related to the establishment of malocclusions and aesthetic dissatisfaction, so it is important to evaluate multidisciplinary parameters for a treatment decision. The objective of the present study is to establish, according to the present literature, clinical criteria for the therapeutic approach of opening or closing dental space of the Maxillary Lateral Incisor Agenesis. A systematized literature review was carried out in online databases: PubMed, Embase and Lilacs. Health descriptors and free terms were combined with Boolean operators to search: "Tooth Agenesis" or "Anodontia" and "Lateral Incisors" and "Treatment" and "Opening Space" or "Space Closure". Clinical studies that presented diagnostic criteria and therapeutic possibilities for Maxillary Lateral Incisor Agenesis, in English and without publication time frame, were included. During the clinical examination, skeletal, dental and periodontal parameters must be carefully observed. The intervention will always consist of a multidisciplinary approach, which may involve orthodontics, prosthetics, dentistry, periodontics and implantology for functional and aesthetic rehabilitation. The interceptive approach is based on early diagnosis and maintenance of the dental space, so orthodontic corrective treatment can be minimized later on. Late intervention includes closing the space with the reanatomization of adjacent dental elements or opening the space for implant and prosthesis installation.

Keywords: Anodontia. Incisor. Orthodontics, Corrective. Dental Care.

Resumo

A agenesia dentária ou hipodontia é uma anomalia de desenvolvimento, onde há ausência de um ou mais elementos dentários. A ausência do incisivo lateral superior possui uma incidência de 20%, mais frequente no sexo feminino e pode ser unilateral ou bilateral e estão diretamente relacionadas ao estabelecimento de maloclusões e insatisfação estética, assim, é importante que os profissionais saibam avaliar os parâmetros multidisciplinares para uma tomada de decisão sobre seu tratamento. O objetivo do presente estudo é estabelecer, segundo a literatura presente, os critérios clínicos para a tomada de decisão terapêutica de abertura ou fechamento de espaço para a Agenesia de Incisivo Lateral Superior. Foi realizada uma Revisão Sistematizada da Literatura nas bases de dados online: PubMed, Embase e Lilacs. Foram combinados descritores em saúde e termos livres com operadores booleanos para realizar a pesquisa nas bases de dados: "Tooth Agenesis" or "Anodontia" and "Lateral Incisors" and "Treatment" and "opening space" or "space closure". Foram incluídos estudos clínicos que apresentaram critérios para o diagnóstico e possibilidades terapêuticas para a Agenesia do Incisivo Lateral Superior, na língua inglesa e sem recorte temporal de publicação. Durante o exame clínico devem ser observados minuciosamente os parâmetros esqueléticos, dentários e periodontais. A intervenção sempre consistirá na abordagem multidisciplinar, podendo envolver ortodontia, prótese, dentística, periodontia e implantodontia para a reabilitação funcional e estética. A abordagem interceptativa consiste em diagnosticar precocemente e manter o espaço dentário, para que possa minimizar terapias ortodônticas corretivas de maior magnitude posteriormente. A intervenção tardia engloba o fechamento do espaço com a reanatomização dos elementos dentários adjacentes e abertura do espaço para instalação de implante e prótese.

Palavras-chave: Anodontia. Incisivo. Ortodontia Corretiva. Assistência Odontológica.

1 Introduction

Tooth agenesis or hypodontia is a developmental anomaly, where there is absence of one or more dental elements. It is present in both deciduous and permanent dentition and occurs due to disorders in the proliferation and development of dental lamina¹. It is more common in permanent dentition, affects 2 to 17% of the population and can occur unilaterally or bilaterally. The third molar, second premolar and upper lateral incisor (ILS), has a higher prevalence of dental agenesis. ILS

has an incidence of 20%, which is more frequent in females and may be unilateral or bilateral².

Dental agenesis has multifactorial etiology, being related to genetic and environmental factors, and may be associated with other types of genetic anomalies, such as microdontias, ectopic canine, disto-angulation of the second premolar, delay in dental eruption and lack of alveolar bone growth³.

ILS agenesis contributes to the development of occlusal problems, since the lack of interproximal contacts may lead dental elements to inadequate positions, exaggerated

inclinations and space loss⁴. They also promote a negative impact on the smile esthetics, which may cause psychological, emotional disorders and affect the social interaction of these patients⁵.

A thorough clinical examination should be performed, observing factors such as patient age, facial and smile analysis, quality of the protection period, presence and type of malocclusion, canine shape and color, and whether agenesis is uni or bilateral. In addition, it is necessary to request radiographic examinations to assist the professional in the diagnosis and preparation of the treatment plan⁶.

It is important that professionals know the clinical characteristics of this condition and know how to evaluate multidisciplinary parameters for an assertive decision-making. Treatment possibilities may include maintenance of the deciduous tooth, orthodontic treatments for the opening of space followed by prosthetic replacement of the absent tooth and the closing of the space with the canine reanatomization^{5,6}.

Thus, the objective of the present study is to establish, according to the present literature, clinical criteria for the therapeutic approach of opening or closing dental space of the Maxillary Lateral Incisor Agensis.

2 Development

2.1 Methodology

A Systematized Literature was performed in the following online databases: The guiding question of the research problem was created through the PICO Strategy: "What clinical criteria are observed in patients with superior lateral incisor agenesis for therapeutic decision-making regarding the opening or closing of space?" Health descriptors and free terms were combined with Boolean operators to search: "Tooth Agensis" or "Anodontia" and "Lateral Incisors" and "Treatment" and "Opening Space" or "Space Closure".

Clinical studies that presented diagnostic criteria and therapeutic possibilities for Maxillary Lateral Incisor Agensis, Systematic Reviews with or without Metanalysis, in English and without publication time frame, were included. Case reports, animal studies and studies in the form of a literature review without data search criteria, duplication between databases and studies whose titles and/or objectives were not consistent with the proposed theme of the present study were excluded.

2.2 The importance of early diagnosis

Early diagnosis of Agensis of the Superior Lateral Incisor allows professionals to determine an adequate multidisciplinary rehabilitation treatment plan. Patients who have this condition may present, in addition to uni or bilateral dental absence, another type of malocclusion that is usually aggravated without early intervention⁷.

The performance of an intercepting treatment simplifies posterior therapy in terms of magnitude and complexity

of movements, often reducing the duration of corrective treatment. Moreover, it provides the patient with more possibilities for rehabilitation, analyzing the advantages and/or disadvantages of each approach to correct the esthetic and functional complaint^{7,8}.

2.3 Clinical criteria to be evaluated for diagnosis and treatment plan

Clinical examination should be thorough since these patients have biological characteristics that determine the choice of therapeutic approach⁷. The skeletal, dental, periodontal and facial pattern should be analyzed. Periodontal health is one of the primary factors to be assessed, observing the level of clinical insertion, periodontal phenotype, its height and thickness relations throughout its extension, its interaction with the clinical crowns of dental elements, outline of gingival zeniths and the height of the canine bossae prominence⁹.

It is important to diagnose the presence of other malocclusions, dental crowding, diastemas, need for extractions, evaluate the patient occlusion pattern, maxillo-mandibular skeletal pattern and inclination of the anterior teeth. Tooth characteristics such as the coloring of the elements, the proportions between central, canine and premolar incisors and their spatial interactions with the periodontal and the height of the smile line¹⁰ should also be observed.

Orthodontic procedures will normally be necessary and may involve closing or opening the absent tooth space to suit the dental position and dimensions and equalize the gingival margin. In cases of replacement of the lateral incisor by the canine, the canine orthodontic movement is necessary for the lateral incisor position and the canine and adjacent teeth reanatomization, returning the esthetic dental proportion. When the treatment option is prosthetic rehabilitation, the opening of space is fundamental to create adequate dimensions for the site receiving the implant and/or dental prosthesis that will be installed later^{4,11}.

Treatment planning needs to be interdisciplinary, taking into account the patient's age, main complaint and economic conditions, aiming at the more conservative option that meets the patient's individual esthetic and his or her functional needs¹².

2.4 Closing the space

Orthodontic treatment will be performed in order to move teeth and provide a harmonic position in the dental arch¹³, creating a more favorable condition of esthetic parameters and a better restorative and/or periodontal treatment. The closing of space consists of the canines and premolar mesialization and/or central incisors retraction, depending on the dental and skeletal characteristics of each patient¹⁴.

The dental inclination and angulation and the presence of prominent canine bossae will determine the need for individualized torque, *artistic* and *in set* so that canines

resemble the lateral incisor positioning. To correct the position of gingival zeniths, intrusion or extrusion of these dental elements is performed, providing esthetic parameters for the follow-up of restorative treatments¹⁵.

Restorative procedures are indicated to provide the smile harmony along with the gingival esthetic, following parameters such as the smile curvature, the buccal corridor and the golden proportion between the anterior teeth, associated or not to periodontal surgical procedures such as gingivoplasty, gingivectomy and increase of clinical crown¹⁶.

The individual dental characteristics should also be observed, such as more yellowish color of canines in relation to incisors, the volume of canine crown in relation to premolar crowns, the arrangement of gingival zeniths in incisors, canines and premolars. The restorative techniques may include whitening, a sequence of wear in canines and premolar and reanatomization with composite resins and/or fixed prostheses of ceramic veneers types and ceramic crowns¹².

When the patient needs to wear prior to restorative treatment, periapical or interproximal radiographs should be performed to evaluate the amount of enamel present, so that dentin is not involved in dental preparation¹⁷. The assembly of the models in semi-adjustable articulator should also be carried out to study, diagnose and plan which teeth will be included, identifying the dental sizes, the amount of changes needed and which areas of the teeth will require wear. During the surgery, the high rotation cooling should be carefully checked and new diamond tips used so that iatrogenesis do not occur in dental elements or postoperative sensitivity¹⁸.

At the end of the treatment, a functional occlusion with adequate and stable posterior retention is obtained, anterior disocclusion guidance during the mandibular protrusion and guidance in group during movements of mandibular laterality. Permanent palatine retention is indicated, with wire glued to the palatine face of 6 teeth to prevent recurrence and space opening¹⁹.

The main disadvantages of this treatment modality are the possibility of opening space in the anterior teeth, the need for fixed palatine contention and the formation of the group de-occlusion guidance, according to some authors it is considered deficient and may cause damage to the teeth integrity^{14,19,20}.

2.5 Opening the space

The opening of space through corrective orthodontic treatment is preferably indicated in patients with normal intercuspation of the posterior teeth or when there is malocclusion of class III that requires compensatory orthodontic treatment, presence of generalized diastemas in the upper arch, and a large size discrepancy between the canines and the first premolars²¹.

This treatment modality should be analyzed in a multidisciplinary way, since it will involve the integration between pre-prosthetic orthodontic treatment to promote adequate dental alignment and functional occlusion,

periodontal surgery, installation of implant and subsequent manufacture of dental prosthesis to rehabilitate the patient in an esthetic-functional way²².

Dental implants will dictate the amount of space required for their installation, and the orthodontist will assess the feasibility of performing orthodontic moves to promote the opening of this space. Typically, a dental implant indicated for the lateral incisors rehabilitation can range from 2.35mm to 3.75mm in diameter and up to 13mm in height. The implant requires, on average, a space from 1 to 2 mm mesial and distal between the platform and the adjacent tooth to facilitate adequate healing and the development of an postoperative interdental papilla^{23,25}. Totaling at least 7mm of space between crowns^{6,25}.

During the planning of installation of a dental implant, the ideal amount of bone to accommodate the implant should be evaluated in the examinations by patient image. It should have 10mm of vestibular bone and minimum 6mm of tongue bone, besides evaluating the need to use bone grafts and/or bone biomaterial application for bone neoformation and the success of implant installation surgery²⁵.

The patient's age is one of the determining factors in the indication of this treatment, since the period of vertical bone growth stabilizes on average at 18 years of age. In case implants are installed before this period, teeth will continue to erupting and discrepancies between teeth and gingiva heights will be noticeable, since the implant will not be moved during this period²⁶.

In the anterior region, esthetic parameters are a great challenge and are influenced by some variables. Among them the structures that are closely related to the peri-implant mucosa, implant position, smile type, bone topography of the edentulous space, adjacent teeth, antagonistic teeth, type of restoration to be carried out and the health of biological structures surrounding the dental element that will be replaced^{10,11,20}.

Currently, several esthetic problems associated with rehabilitation with prostheses and implants in the maxilla anterior region have been solved through the use of metal-free monolithic ceramic crowns associated with the use of ceramic prosthetic pillars and totally ceramic implant systems that have better optical properties without losing mechanical properties and their biocompatibility, promoting long-term rehabilitation and esthetic treatment of success^{13,20}.

The main disadvantage of this treatment modality is prolonged waiting after orthodontic treatment, where the patient needs to be with adequate skeletal development for the implants installation¹³.

3 Conclusion

The treatment of Agenesis of the superior lateral incisor has several rehabilitation possibilities with excellent prognosis for the patients. During the clinical examination, skeletal, dental and periodontal parameters must be carefully observed.

Taking into account also the patient's age and socioeconomic condition. The intervention will always consist of a multidisciplinary approach, which may involve orthodontics, prosthetics, dentistry, periodontics and implantology for functional and aesthetic rehabilitation. The interceptive approach is based on early diagnosis and maintenance of the dental space, so orthodontic corrective treatment can be minimized later on. Late intervention includes closing the space with the reanatomization of adjacent dental elements or opening the space for implant and prosthesis installation.

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