

Oral rehabilitation of a patient with dental agenesis using osseointegrable implant

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Abstract— Dental agenesis is one of the most common anomalies in numbers, affecting mainly women, occurs in both primary and permanent teeth, but more frequently in permanent teeth. Can be classified as hypodontia is the absence of one or more teeth, oligodontics of six or more teeth and anodontia total absence of tooth development. Its diagnosis can be made through radiographs and clinical examination, when performed early, they can assist in a broad treatment plan with the aim of solving this problem. Among the main treatment options that can be performed such as prostheses, implants and orthodontics depending on each case. The treatment plan of choice obtained with the patient was the osseointegrated implant with the aid of orthodontic treatment to open the ideal space. Thus, the objective of this review article is to examine the etiology, clinical properties and treatment of dental agenesis using an osseointegrable implant. This literature review sought a sample in the literature in the PubMed and Science Direct databases. The inclusion criteria were articles published between 2015 and 2020 in Portuguese and English. The following query terms were used: agenesis, oligodontia, hypodontia, agenesis, oligodontia and hypodontia. The results show that dental agenesis is one of the most common genetic abnormalities among humans. In most of the study results that in the case of agenesis, the osseointegrated implant approach has proven to be a reliable and predictable treatment for restoring function and aesthetics.

Keywords— Agenesis, Orthodontics, Dental implants.

I. INTRODUCTION

Dental agenesis is a common developmental anomaly that affects approximately 20% of the population and results in a reduction in the number of teeth present in the oral cavity. It is classified according to the number of teeth involved, divided into hypodontia, oligodontia and complete anodontia. Thus, hypodontia is defined as the congenital absence of less than six permanent teeth, oligodontics as the congenital absence of more than 6 teeth and complete anodontia as the absence of all permanent teeth (BARBOSA et al., 2016; FERNANDES, OLIVEIRA; COSTA, 2015).

Dental agenesis is the result of disturbances in the initiation and proliferation stages during tooth formation. Its etiology is associated with environmental factors such

as infections, trauma, chemotherapy, radiotherapy and genetic causes (ANDERSSON et al., 2017).

The most used method for the diagnosis of dental anomalies is the clinical examination accompanied by the imaging exam. Periapical and panoramic radiographs are generally used for the radiographic diagnosis of dental agenesis (RETROUVEY et al., 2019).

There are several treatment options for adult and young patients with agenesis, although there are few studies demonstrating treatment in pediatric patients. A specialist with the patient must make the decision about the treatment, as it is based not only on the lack of teeth, but also on the length of the arch, the position of the incisors and lips and the aesthetic profile. Early diagnosis and treatment are important to improve masticatory function,

speech and self-appearance to reduce psychosocial impact (EIMAR et al., 2016).

In cases with congenital missing teeth, missing teeth occur very early in life, in contrast to many other patients who have lost teeth due to caries or periodontitis in later stages. The starting point has an advantage that young patients are generally well adapted to defects. However, prosthetic treatments are usually needed already in childhood (ATTIA et al., 2019; FAUZI et al., 2018).

In childhood and adolescence, prosthetic treatments can be complicated, because teeth should not be ground as crown pillars due to the large pulp cavity, and prostheses may not be suitable if the jaws are still growing. It is also questionable whether dental implants can be placed before the end of growth due to the well-known problems of secondary infraocclusion due to the ankylotic cure of osseointegrated implants and for other biological reasons (EIMAR et al., 2016).

In addition, children and their young parents and families often have a cost problem because, unlike other groups of patients with implants, dental defects appear in the early stages of life, when income is low or is needed for other purposes (ANDERSSON et al., 2017).

Thus, the objective of this integrative review article is to examine the etiology, clinical properties and treatment of dental agenesis using an osseointegrable implant.

II. HELITERATURE REVIEW

2.1 CLASSIFICATION OF CONGENITAL DENTAL AGENESIA

Disorders in the early stages of dental formation can cause developmental problems or congenital absence of one or more teeth. The congenital absence of at least one tooth is a common dental anomaly. This definition refers to the word "hypodontia" in medical terminology that originates from the Greek, with "hypo" means less and "odious" means tooth. The etiology of congenital dental agenesis is not fully understood, but it is believed to be multifactorial, where the roles of many genetic and environmental factors contribute. In addition, several syndromes, cleft lip and palate, congenital deformities and some systemic diseases have been reported in the literature that could lead to dental agenesis. The congenital type requires a multidisciplinary approach to treatment, in which orthodontists, pediatricians, protodontists, oral and maxillofacial surgeons, laboratory technicians, clinical geneticists, dermatologists, speech therapists work as a team (ATTIA et al., 2019).

There are many different classifications for congenital tooth absence in the literature. Some researchers classify according to hereditary form, some according to the number of missing teeth and some classify according to severity. Generally, permanent third molars are not taken into account when assessing the presence and severity of dental agenesis. Consequently, the absence in the development of one or more teeth, excluding the third molars, is defined as "hypodontia". Some other researchers have suggested that the absence of one to six teeth should be called "hypodontia" and the absence of more than six teeth should be called "oligodontia" (RAKHSHAN, 2015; TAMBURINI et al., 2020).

To reflect the genetic or morphological differences in terminology, it was suggested the use of subsections such as isolated hypodontia or isolated oligodontia for non-syndromic cases and syndromic hypodontia or syndromic oligodontia for cases related to syndromes (DURE-MOLA et al., 2019; LU et al., 2016).

Some researchers have assessed the severity of congenital tooth absence to help with diagnostic classification. Consequently, the absence of 1-2 teeth is mild, that of 3-5 teeth is moderate and 6 or more teeth are noted as severe hypodontia (ATTIA et al., 2019; LIMA et al., 2019).

2.2 ETIOLOGY OF CONGENITAL DENTAL AGENESIA

The etiology of congenital dental agenesis is classified as general and local factors. The general factors are several genetic conditions, such as Down syndrome, cleft lip and palate, ectodermal dysplasia. Local factors are conditions such as trauma to the tooth germ in the early stages of development, hormonal conditions, radiation, infectious diseases and unintentional removal of the tooth germ. Diseases such as syphilis, birth injuries and diseases that the mother has during pregnancy are also contributing factors (SANTOS and SILVA, 2018).

In addition to the familiar nature of hypodontia, it is believed that this condition may occur as a result of a genetic mutation without a family history. It is not surprising to see problems resulting in dental agenesis in the complex process of dental formation that is defined as odontogenesis (LIANG et al., 2016).

During odontogenesis, the epithelial-mesenchymal signal at the molecular level is under the control of the family members of the wingless protein (Wnt) gene, fibroblast growth factor and bone morphogenic proteins. Defects observed in any of these pathways can cause problems with dental morphology (tooth size or shape),

dental mineralization and number of teeth (hypodontia or supernumerary teeth) (TAMBURINI et al., 2020).

Studies have shown that the interactions of mutations in the MSX1 and PAX9 homeobox genes during odontogenesis are associated with dental agenesis in mice and may be associated with hypodontia in humans. The PAX9 gene is expressed in mesenchymal elements of tooth germ development and is necessary in the subsequent stages of dental development. It was observed that tooth growth stagnated in the budding stage in mice with the mutant PAX9 gene (LU et al., 2016; TAMBURINI et al., 2020).

Mutations in the MSX1, PAX9, EDA1, WNT10A and EDARDD genes are proven to be responsible for isolated cases of hypodontia. It is also shown that hypodontia is associated with the Gene AXIN2, responsible for the increased risk of colorectal cancer. The specific mutations of four genes (EDA1, EDARADD, EDAR and WNT10A) that are effective in 90% of cases of ectodermal dysplasia are demonstrated in the etiology of oligodontics and hypodontia (ATTIA et al., 2019).

Tooth germ infections, trauma or traumatic removal of primary teeth are the main environmental factors for dental agenesis. It is also reported that exposure to some systemic diseases such as syphilis, scarlet fever, rickets during pregnancy and childhood are influential in dental agenesis. Smoking during pregnancy or exposure to radiation at a young age can cause problems in the formation of some glands and teeth. Chemotherapy and, mainly, radiotherapy affect teeth irreversibly (EIMAR et al., 2016).

Some syndromes are seen as one of the properties of hypodontia and many genetic defects have been shown in these syndromes. Syndromes such as Rieger's syndrome, Down's syndrome, facial clefts, cleft lip and palate and ectodermal dysplasia are associated with hypodontia (TAMBURINI et al., 2020).

2.3 PREVALENCE OF DENTAL AGENESIA

Dental agenesis is rarely seen in primary dentition, although there is a relationship between hypodontia in primary and permanent teeth. Children who show absence in primary teeth are reported to be absent in permanent teeth, replacing those teeth. In one study, hypodontia in primary dentition showed a prevalence of less than 1% in Caucasians, while a much higher prevalence was reported in the Japanese population. The central lateral and lower maxillary primary incisors represent 90% of the affected primary teeth (SIRIANNI and GONÇALVES, 2019).

The absence of anterior teeth in mild hypodontia is the dominant pattern, whereas severe hypodontia is

characterized by the absence of posterior teeth. Bilateral agenesis is most often seen in the upper lateral incisors. The most frequent unilateral agenesis is seen in the lower second premolars. The most frequent patterns of tooth absence in the population are upper lateral incisors, lower second premolars and lower central incisors (BORALI et al., 2019).

2.4 SKELETAL AND DENTAL ANOMALIES OBSERVED IN HYPODONTICS

Severe hypodontia has been reported to cause a decrease in quality of life associated with oral health. Unfavorable aesthetics is the most common complaint in patients with hypodontia. The aesthetic problems caused by hypodontia depend on the number of missing teeth, the size and shape of the remaining teeth, the size of the jaws and the position of the toothless spaces. Despite being a less common complaint presented by patients with hypodontia, the lack of teeth can also cause difficulties in chewing and speaking (ATTIA et al., 2019).

There are several reasons for a possible relationship between congenital absence of teeth and facial skeletal pattern. Neural crest cells play a critical role in the formation of dentoeskeletal structures in the facial area. Therefore, the skeletal pattern may develop differently in patients with congenital missing teeth. In addition, according to Moss's concept of functional matrix, bone grows by responding to the functional relationships created by functional units. The teeth serve as a functional unit in the jaw growth process. Therefore, the absence of dental germs can cause deficiencies in the development of the apical bone. The dentofacial structure exhibits functional compensation, showing a different growth pattern in individuals with severe hypodontia (ATTIA et al., 2019; TAMBURINI et al., 2020).

The cephalometric values of patients with congenital missing teeth show a significant difference in anteroposterior dimensions compared to the norms. It is observed that the jaws are in a slightly posterior position in patients with hypodontia. Therefore, patients with missing teeth have reduced vertical facial dimensions, with a flat and retrognathic profile in general. The upper and lower incisor teeth are significantly more retroclined compared to the control groups in patients with congenital missing teeth. This situation is more serious in people with 10 or more missing permanent teeth. This dentofacial structure caused by hypodontia is perceived to be much more unsightly, since a broader profile has recently been perceived as aesthetic (BORALI et al., 2019).

2.5 ANOMALIES OF TOOTH SIZE AND SHAPE IN HYPODONTICS

Microdontia is a condition characterized by smaller than normal teeth and is a widely reported feature of hypodontia. In addition to small sizes, the affected teeth usually have abnormally contoured crowns. The roots of these teeth are almost shrunk and abnormalities in root formation can be seen in addition. Ectopic eruption of permanent teeth is common in cases of hypodontia. One study showed a significant relationship between the lack of upper lateral incisors and the position of other permanent teeth. A similar relationship is also found between the superior lateral microdontia and the palatal positioning of the canines or the distal angulation of the lower secondary premolars (LU et al., 2016).

Root resorption of a deciduous tooth is usually delayed if there is no permanent bud under it. Persistent deciduous teeth can provide satisfactory service for years, although significant amounts of root resorption are observed. However, they often remain in infraocclusion due to the localized insufficiency of alveolar development and the relatively excessive eruption of adjacent teeth. As a result, persistent deciduous teeth generally become ankylosed (TAMBURINI et al., 2020).

Another characteristic of hypodontia is the delayed tooth eruption. Children with mild to moderate hypodontia showed a significant delay of 0.3 years in dental development in both sexes. There was no correlation between dental and chronological age or the severity of hypodontia (BORALI et al., 2019).

2.6 TREATMENT OPTIONS IN DENTAL AGENESIA

Comprehensive treatment, covering a long period of time, must be planned in cases of hypodontia to achieve the best results for a lifetime. A treatment plan can be prepared depending on the patient's age, complaints and dental development.

2.6.1 Space closure with eruption orientation

The rash orientation described by Hotz can be applied in the congenital absence of the teeth of the upper incisor during the initial stage of mixed dentition in children with a tendency to increase overjet, open bite, protruding incisors and crowding. This method makes it possible to spontaneously close cracks belonging to teeth with congenital defects due to the eruption of upper canines instead of upper lateral incisors and obtaining a class II occlusion. The enamel reduction should be applied to the 1st and 2nd upper deciduous molars on the mesial and distal sides for this purpose. In the case of absence of a

congenital mandibular 2nd bicuspid, the first deciduous molars must be reduced on the distal side and the 2nd deciduous molars must be reduced on the mesial and distal sides, if the intention is to close the missing teeth spaces with orientation of eruption. Alternatively, the eruption can be guided by the early removal of the 1st and 2nd deciduous upper and lower molars (ANDERSSON et al., 2017; DIAZ et al., 2020; TAMBURINI et al., 2020).

The purpose of arrangements in toothless spaces with orthodontic mechanics is to create an ideal size area for prosthetic prostheses, implants or microdontic tooth restorations. Fixed orthodontic appliances that allow parallel movement are more preferable for this purpose and an adequate root parallelism is guaranteed (BARBOSA et al., 2016; BORALI et al., 2019).

Congenital lateral absence is one of the most common dental agenesis. One of the treatment alternatives is the opening of spaces and the application of prosthetic restorations. The other option is the closure of spaces with orthodontics, followed by the retelling of canines and premolars. It is suggested that the age of the patients, the type of skeletal and dental malocclusion in the sagittal and vertical dimensions, the crowding in the dental arches and in the facial profile should be analyzed before choosing the best treatment alternative. Overjet, overbite and posterior occlusion should be carefully evaluated when deciding to open or close the spaces of the congenital absent teeth in the alveolar bone. It is best to open the spaces if there is a favorable molar relationship, a decent overlap or a deep bite. In addition, when a tooth is planned to replace another tooth, parameters such as size, shape, color and eruption level need to be assessed (COSTA, 2015; SILVA et al. 2019).

2.6.2 Opening the orthodontic space followed by prosthetic treatment

If the treatment plan involves opening spaces for missing teeth, these spaces can be replaced by fixed partial prosthetic restorations bonded by resin, conventional fixed partial prosthetic restorations, implant supported prosthetic restorations or modified partial adhesive prosthetic restorations (ANDERSSON et al., 2017).

There are three ways to determine the proper space for missing lateral incisors. They are using the golden ratio, Bolton analysis or the mesiodistal size of the contralateral lateral incisor tooth. The golden ratio or Bolton's analysis can be used to measure toothless spaces in patients with unilateral or bilateral upper lateral incisors in congenital absence (BORALI et al., 2019).

2.6.3 Fixed partial dentures bonded with resin

Fixed partial dentures bonded with resin can be used to replace only a few missing teeth. The most conservative approach to prosthetic treatment supported by teeth is a fixed partial denture attached to the resin, because the adjacent teeth remain almost untouched. The thickness and translucency of the supporting teeth have an important effect on the design of fixed partial dentures bonded with resin. If the metal retaining unit is positioned too incisally, it may cause gray reflection through adjacent highly translucent teeth in the incisal third (TAMBURINI et al., 2020).

2.6.4 Conventional fixed partial dentures

One type of restoration supported by a less conservative tooth is a conventional fixed partial denture. The main disadvantage of these prostheses is the necessary preparation of the adjacent teeth. Fixed partial dentures are not the best treatment options for young patients who have congenitally absent upper lateral incisors due to the need for preparation. It is reported that patients with fixed partial dentures supported by teeth have unfavorable periodontal conditions compared to patients who have only natural teeth after orthodontic treatment with space closure (MANGANO et al., 2016; TAMBURINI et al., 2020).

Important issues when planning these restorations are the alignment and leveling of the adjacent teeth. The orthodontist must carefully evaluate the inclination and angulation of the central incisor and canine teeth during the alignment process.

2.6.5 Prostheses supported by implants

The spaces in the anterior and posterior regions can be replaced by implants supported by implants, after the teeth adjacent to the edentulous spaces are leveled with orthodontic treatment. Dental implants can remain by infra-occlusion after completion of growth, if they are placed in growing patients. For this reason, treatments with dental implants must be postponed after completion of growth (ZARONE et al., 2016; BARBOSA et al., 2016).

A frequent feature in hypodontic patients is that the thickness of the alveolar crest is not adequate in edentulous areas. If the crest width is unsuitable for a dental implant, the use of small diameter implants or surgical procedures to enlarge the alveolar crest can be applied. Alternatively, alveolar distraction osteogenesis techniques can be applied if there is sufficient patient cooperation or bone augmentation procedures, if necessary. Autogenic bone grafts are the gold standard in these situations. On the other hand, replacing lost teeth with dental implants has some disadvantages, such as

accumulation of dental plaque, gingival inflammation and increased treatment costs (ANDERSSON et al., 2017).

III. METHODOLOGY

This integrative literature review followed the following steps:

1st - elaboration of the guiding question (identification of the theme and selection of the hypothesis or research question for the elaboration of the integrative review);

2nd - literature search or sampling (establishment of criteria for inclusion and exclusion of studies / sampling or literature search) in the PubMed and Science Direct databases. The inclusion criteria were articles published between 2015 and 2020 in Portuguese and English. The following query terms were used: agenesis, oligodontia, hypodontia, agenesis, oligodontia and hypodontia. The query terms were combined by the Boolean operator 'OR' to request a comprehensive search of the available literature. All other samples were immediately excluded. The exclusion criteria were: duplicate studies, available only in the abstract or with the presentation of only the topic, with the content unavailable and paid articles.

3rd - data collection (definition of information to be extracted from selected studies / categorization of studies);

4th - critical analysis of the included studies (evaluation of the studies included in the integrative review);

5th - discussion and interpretation of results and;

6th - presentation of the integrative review, that is, presentation of the review / synthesis of knowledge)

The screening was carried out independently by the three authors. Disagreements regarding inclusion during the first and second stages of study selection were resolved by discussion.

The items recovered were selected based on a three-step selection process, which later considered titles, abstracts and full texts. In stage 1, a list of titles was obtained from the databases and titles that clearly did not refer to the theme. In stage 2, the abstracts of the selected titles were selected and, if it was clear from the abstract text that the article did not deal with the theme, it was excluded from the review. In step 3, full-text articles were read carefully and it was verified whether the studies were relevant to the review objectives.

IV. RESULTS AND DISCUSSION

In the first stage of the study, 342 articles were found, which referred to the etiology, clinical properties and treatment of dental agenesis using an osseointegrated implant. Then, an attentive and systematic reading of the titles of the selected articles was carried out according to the theme addressed in the research, and 64 articles were selected. Subsequently to reading the abstracts, only 47 studies were chosen to be included in a more detailed analysis, of a critical and integral character. At the end of these verification and analysis steps, 15 studies remained that met the inclusion criteria. It was found that the most significant portion of articles was found in the SCIELO database, followed by the periodicals PUBMED and LILACS, as shown in Figure 1.

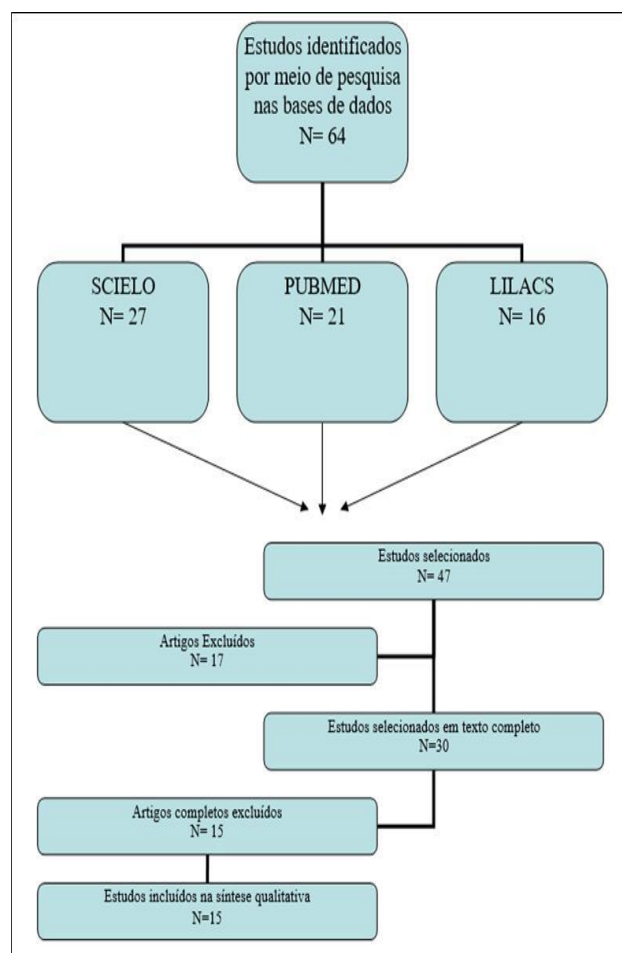


Fig. 1: Selection of studies for review.

In view of the research carried out, it was found that this is a topic of great relevance to the academic and scientific scope, however, it has a great shortage of literature, especially in national journals.

Of the 15 selected studies, six were published in a national journal and nine were published in American journals, shown in Table 1.

This review consists of 15 articles published between 2015 and 2020. Of the selected sample, six were case studies, one was a literature review, three were retrospective studies, four cross-sectional studies and a clinical study, distributed as shown in the table 1.

Table.1: References used in this review.

Autores	Título	Ano	Periódico	Metodologia
Ferreira; Oliveira; Costa	Retratamento ortodôntico em paciente com agenesia de incisivo lateral superior.	2015	Revista UNINGÁ Review	Case study
Rakhshan	Congenitally missing teeth (hypodontia): A review of the literature concerning the etiology, prevalence, risk factors, patterns and treatment	2015	Dental research journal	Literature review
Barbosa et al.	Agnesias múltiplas, planejamento e hereditariedade	2016	Revista Faípe	Case study
Citak et al.	Dental anomalies in an orthodontic patient population with maxillary lateral incisor agenesis	2016	Dental Press Journal of Orthodontics	Retrospective study
Andersson et al.	Mutations in COL1A1 and COL1A2 and dental aberrations in children and adolescents with	2017	PLoS One	Clinical study

	osteogenesis imperfecta ± A retrospective cohort study			
Redua; Redua	Hypodontia of mandibular incisors: considerations on the orthodontic treatment.	2018	Dental Press Journal of Orthodontics	Case study
Santos; Silva	Reabilitação protética em paciente portadora de agenesia dentária: relato de caso	2018	RvAcBO	Case study
Attia et al.	Oral Rehabilitation of Hypodontia Patients Using an Endosseous Dental Implant: Functional and Aesthetic Results	2019	Journal of Clinical Medicine	Retrospective study
Borali et al.	Association between agenesia and root morphology of anterior teeth	2019	Revista de Odontologia da UNESP	Cross-sectional study
Martins et al.	Digital smile designing, pressing and stratifying ceramic lithium disilicate veneers to rehabilitate dental agenesia: a clinical report	2019	RGO - Revista Gaúcha de Odontologia	Case study
Moreno et al.	Third Molar Agenesis an Anomaly or Just a Sign of Variation?	2019	International journal of morphology	Cross-sectional study

	Prevalence and Manner of Presentation of this Condition in a Sample from the Metropolitan Region of Chile.			
Sirianni; Gonçalves	Avaliação da prevalência de agenesia de segundos pré-molares dos pacientes do curso de Odontologia do Centro Universitário da Serra Gaúcha	2019	Journal of Oral Investigations	Cross-sectional study
Yu et al.	Genetic analysis: Wnt and other pathways in nonsyndromic tooth agenesia.	2019	Oral Diseases	Retrospective study
Zeng et al.	KDF1 is a novel candidate gene of non-syndromic tooth agenesia.	2019	Archives of Oral Biology	Case study
Tamburini et al.	Dental anomalies in the deciduous dentition of non-syndromic oral clefts patients.	2020	Revista Brasileira de Saúde Materno Infantil	Cross-sectional study

Orthodontics is a specialty that gathers knowledge about biological, mechanical and artistic factors. Some conditions require maximum interaction and use of this extensive knowledge. Some examples of this are the cases of missing teeth that need to be replaced in the anterior region, in the aesthetic zone. These teeth can be replaced by different techniques, such as orthodontic movement of other teeth, autotransplantation, and the use of fixed or

implant-supported prostheses. Various aesthetic factors, such as symmetry, morphology, shade, width, length, angulation, thickness and gingival architecture of the replaced teeth, must be considered in the treatment planning (SIRIANNI and GONÇALVES, 2019; TAMBURINI et al., 2020).

Dental agenesis is one of the most frequent dental anomalies. Dental agenesis is clinically apparent due to the lack of one or more teeth: that is why such alteration is one of the best candidates for implant-prosthetic rehabilitation. The literature reports that lateral incisors are affected by agenesis in 2.2% of cases (SANTOS and SILVA, 2018; BORALI et al., 2019; TAMBURINI et al., 2020).

When agenesis reaches the lateral incisors, in addition to functional issues, the greatest discomfort is represented by aesthetic reasons. The most adequate solution for these clinical conditions is, obviously, an implant-prosthetic rehabilitation, but this surgical approach is not always viable (LIANG et al., 2016; SIRIANNI and GONÇALVES, 2019).

The ideal proportion of a tooth can be calculated as the width-length ratio. An upper central incisor (ICS) has an acceptable proportion when its width is 75% -85% of its length. Another fundamental factor is the visibility of the teeth in a frontal view of the smile (SANTOS and SILVA, 2018; BORALI et al., 2019).

When a tooth needs to be replaced, some considerations should be included in the treatment planning, such as: patient's age and skeletal maturation at the time the agenesis was diagnosed or the tooth was lost, the amount of time from orthodontic treatment to definitive restoration and stability or longevity of results (SIRIANNI and GONÇALVES, 2019; TAMBURINI et al., 2020).

The relatively common agenesis with upper lateral incisors (ILS), one of the most frequent types of agenesis in the permanent dentition, as well as other atypical morphological changes, substantially compromises the smile's aesthetics. Its frequency varies according to the characteristics of the population studied and the sex of the participants, and the values vary from 0.8% to 4.25% in the permanent dentition, with a slight predominance in the female sex. Individuals with agenesis who most seek treatment are those whose anterior teeth, especially the lateral ones, are absent (ZARONE et al., 2016; SANTOS and SILVA, 2018).

The absence of the lateral incisor is usually diagnosed early, during mixed dentition, or even during adolescence, when parents seek treatment for their children for aesthetic reasons. There are three options for replacing the ILS:

replacement with an orthodontically moved and remodeled canine; dental implants; or tooth supported restorations. The challenge here is to develop a comprehensive treatment plan according to the diagnosis, age and needs of each patient (ANDERSSON et al., 2017; MARTINS et al., 2019).

The replacement of an absent ILS with osseointegrated implants has some frequent complications. The growth of the alveolar process, more intense during the patient's growth, but continuous throughout life, does not cease with the patient's aging. Therefore, this type of treatment often presents unsatisfactory aesthetic results in the medium and long term. In addition, the verticalization of the incisors occurs as the patient ages and the implants appear to become more protrusive. However, implants in the aesthetic zone of patients with a high smile line are contraindicated due to the darkening of the gingival margin, reported in more than half of the patients after rehabilitation (MORENO et al., 2019; TAMBURINI et al., 2020).

An argument in favor of using orthodontic movement to close the space is that the possible complications of minimally invasive or non-invasive procedures are relatively easy to correct or repair, while implant treatments are difficult or impossible to change later. Despite the aesthetic complications observed in these cases, most patients with implants appear to be satisfied with the results of their treatment (CITAK et al., 2016; MORENO et al., 2019; ATTIA et al., 2019; TAMBURINI et al., 2020).

Authors report that the critical condition for good osseointegration is to have a quantity of at least 2 mm of healthy bone around the implant (RÉDUA et al., 2015; ZENG et al., 2019).

It is also necessary to guarantee a good dental emergency profile, in order to obtain a correct prosthetic rehabilitation from the aesthetic and functional point of view. These conditions are not always possible and the presence of a small bone thickness forces the surgeon to change the implant insertion axis, exposing the prosthetic restoration to the concrete risk of failure (ANDERSSON et al., 2017; ATTIA et al., 2019; ZENG et al., 2019).

Over the past few years, several methods have been offered to address the problem of sparse bone thickness in cases requiring prosthetic-implant rehabilitation. In fact, thanks to several Guided Bone Regeneration (GBR) strategies, the idea of placing implants where the amount of bone is abundant has become an inclined guided bone arrangement (RÉDUA and RÉDUA, 2018; YU et al., 2019).

Many authors have proposed the use of bone grafts by taking samples of oral tissues (mandibular branch); others preferred extra-oral tissues (eg, iliac crest bone). These methods generally lead to good results, but are very aggressive and cannot exclude complications, such as additional surgical procedures. To find an alternative solution to increase the thickness of the crest, a crest approach was proposed, divided between the buccal and lingual cortical layers, in order to induce new bone formation in the internal region (BARBOSA et al., 2016; ANDERSSON et al., 2017).

Studies have evaluated dental implants in patients with dental agenesis, focusing on the implant survival rate. The soft tissue parameters were not assessed in most of these studies, and the implant's success was assessed with self-defined parameters. Standard success criteria were not used in any of these studies (ANDERSSON et al., 2017; ATTIA et al., 2019).

V. CONCLUSION

The present literature review showed that dental agenesis is one of the most common genetic abnormalities among humans. In most of the study results that in the case of agenesis, the osseointegrated implant approach has proven to be a reliable and predictable treatment for restoring function and aesthetics.

It has been found that replacing a tooth with a congenital defect in the maxillary region with implants is often preferable to conventional supported dental restorations, such as bridges or an adhesive restoration, because this replacement technique avoids the preparation of an adjacent tooth substance intact and requires a time of relatively short treatment. Osseointegrated implants have shown great potential for issues related to agenesis. In addition, implants have broadened their indications and have become a reliable and widely accepted treatment modality in all fields of dentistry.

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