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DENTAL AGENESIS: DIAGNOSIS, ETIOLOGY AND ORTHODONTIC MANAGEMENT

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Abstract

Dental agenesis is the congenital absence of one or more teeth, occurring in deciduous or permanent teeth, most frequently observed in the daily practice of the dentist, but with low prevalence in our country.

Aim and purpose: The purpose of this study was to evaluate the orthodontic practices followed in the management of cases with dental agenesis at the UFO University Clinic, Albanian University, Tirana.

Methodology: Data were collected through clinical charts, photographs and radiographs in 2023-2024.

Results: After completing the treatment with the combined McNamara expander and FaceMask and ChinCap appliance, a moderate improvement in skeletal and occlusal relationships was achieved. The transverse expansion of the maxilla was successful, with an increase in palatal width of about 3 mm, reducing the discrepancy between the jaws. It was noted that a slight tendency of class III malocclusion remained due to the irregular use of extraoral elastics by the patient.

Conclusions: The use of functional appliances in the first phase and fixed appliances in the final phase provides a more complete and balanced treatment in both skeletal and dental aspects for dental agenesis.

Keywords: *Dental Agenesis, Etiology, Prevalence, Orthodontic Treatment.*

Introduction

In recent decades, various authors¹⁻² have conducted research on dental agenesis due to its relatively high prevalence in the general population, representing a significant proportion of patients who seek orthodontic consultations for treatment. The absence of one or more teeth, referred to as hypodontia or oligodontia, constitutes one of the most common anomalies in embryological development. The teeth most frequently affected are the mandibular second premolars, maxillary lateral incisors, and mandibular central incisors.

The clinical manifestation of dental agenesis is associated with abnormal eruption patterns, a phenomenon that disrupts the dentoalveolar balance, leading to alterations in interocclusal relationships between maxillary and mandibular teeth, as well as facial morphological changes. Consequently, this condition may result in aesthetic, functional, skeletal, and psychological problems in the affected population. Panoramic radiographic examination is an essential diagnostic technique, as it allows visualization of the facial structures in a single image, providing complementary and sufficient information for a comprehensive evaluation of the patient's condition. Therefore, early diagnosis is crucial in the management of

dental agenesis, as it is fundamental for establishing an appropriate treatment plan that guides the eruption of the remaining teeth and prevents the development of complications associated with untreated dental agenesis.²

This anomaly is defined as a genetically determined heterogeneous disorder that manifests as the congenital absence of one or more teeth. It is considered a multifactorial condition influenced by genetic, environmental, pathological, and evolutionary factors involved in the normal mechanisms of odontogenesis.²

In cases where orthodontic space closure is indicated, treatment requires rigorous biomechanical planning, including precise control of torque, inclination, and tooth rotation to maintain occlusal balance and periodontal integrity. Fixed appliances, closing springs, elastic or metallic ligatures, and mini-implants are employed to control orthodontic forces and achieve stable dental movement. Archwire sequencing typically begins with flexible nickel-titanium (NiTi) wires for leveling and alignment and concludes with stainless steel (SS) wires for stabilization, ensuring a controlled and comfortable transition for the patient.

Functional appliances such as Twin Block, Herbst, Bionator, Tandem, Hyrax, Quad Helix, and McNamara devices contribute to the modification of skeletal relationships, stimulation of maxillary or mandibular growth, and preservation of alveolar space for future implant placement or prosthetic rehabilitation. These appliances are particularly effective during the pubertal growth phase.³

Aim and purpose

The aim of this study is to evaluate the orthodontic practices applied in the management of dental agenesis at the University Dental Clinic, Albanian University, Tirana.

Methodology

Data related to the clinical case were collected through orthodontic diagnostic procedures performed at the University Dental Clinic UFO, Department of Orthodontics, Tirana. Initially, a comprehensive clinical record was completed, including a detailed medical and dental history, as well as the patient's subjective concerns regarding aesthetic and functional dental aspects.

Extraoral and intraoral clinical examinations were subsequently carried out, during which facial morphological characteristics, occlusal relationships, deviations of the upper and lower midlines, and the presence of anomalies such as dental agenesis were identified and documented.

For the assessment of dento-skeletal structures, standard radiographic examinations were performed, including panoramic radiography, as well as lateral cephalometric radiographs for cephalometric analysis. In addition, the case was documented using extraoral and intraoral photographs to provide visual records of the initial condition and to monitor therapeutic progress throughout the course of orthodontic treatment.

CLINICAL CASE

A male patient, A.T., aged 13 years and 2 months, presented to the clinic with aesthetic dental concerns. Extraoral examination revealed a brachyfacial pattern with a tendency toward hypodivergence.



Fig.1 Extraoral photography

Intraoral examination revealed an edge-to-edge incisal occlusion in the anterior region, a transverse discrepancy characterized by maxillary underdevelopment relative to the mandible, and a Class III dental malocclusion. Additionally, panoramic radiographic examination demonstrated the congenital absence of tooth 13 and a 2 mm deviation of the maxillary dental midline to the right.



Fig.2 Intraoral photography



Fig.3 Orthopantomogra

Cephalometric analysis confirmed a skeletal Class III diagnosis, with an ANB angle of -3.5° and a Wits appraisal of -7.7 mm, indicating a retrusive maxilla and a protrusive mandible. The vertical parameter FMA measured 22.4° , confirming a brachyfacial growth pattern.

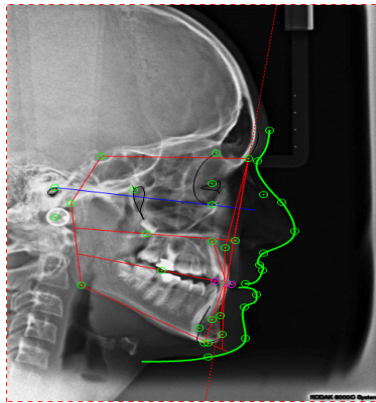


Fig.4 Lateral radiography and cephalometric analysis

The treatment protocol consisted of three phases:

Phase I – Dental impression taking for a bonded McNamara expander (4–6 weeks).

Phase II – Placement of extraoral appliances, including a facemask and chin cup, combined with extra-

oral traction for a duration of six months.

Phase III – Removable retainer.

The early treatment included taking a dental impression for a bonded McNamara expander integrated with a palatal screw designed for rapid maxillary expansion. The appliance was activated by a quarter-turn once daily to achieve approximately 3 mm of expansion over a four week period.

Additionally, the appliance was designed to incorporate two metal hooks, intended for the attachment of extraoral elastics during the second phase of the treatment.

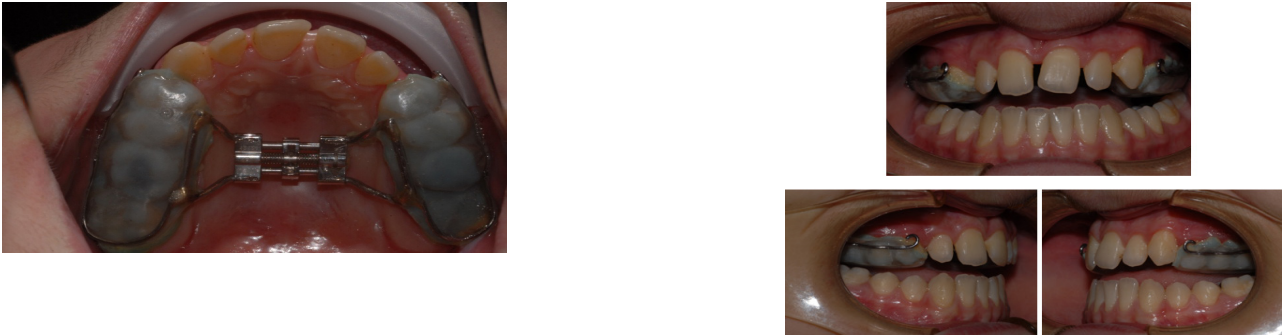


Fig.5 Four weeks after orthodontic therapy with the bonded McNamara expander

After one month, the treatment progressed to the second phase, which involved combined therapy using extraoral appliances, including a facemask and a chin cup, with heavy extraoral circular elastics 1/8", worn for 12–14 hours per day.

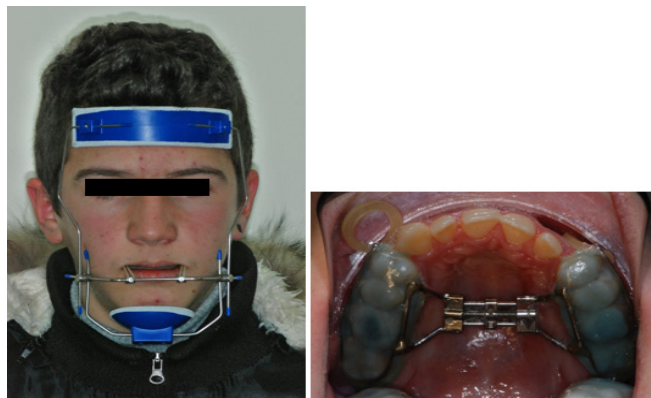


Fig. 6 Initiation of Facemask and Chin Cup therapy with extraoral elastics

After two weeks, the patient returned to the clinic for follow-up evaluation. At this stage, 1/4" extraoral elastics were crossed in order to balance the symmetry of maxillary expansion in the lateral segments.



Fig. 7 The evaluation of orthodontic treatment after 2 weeks

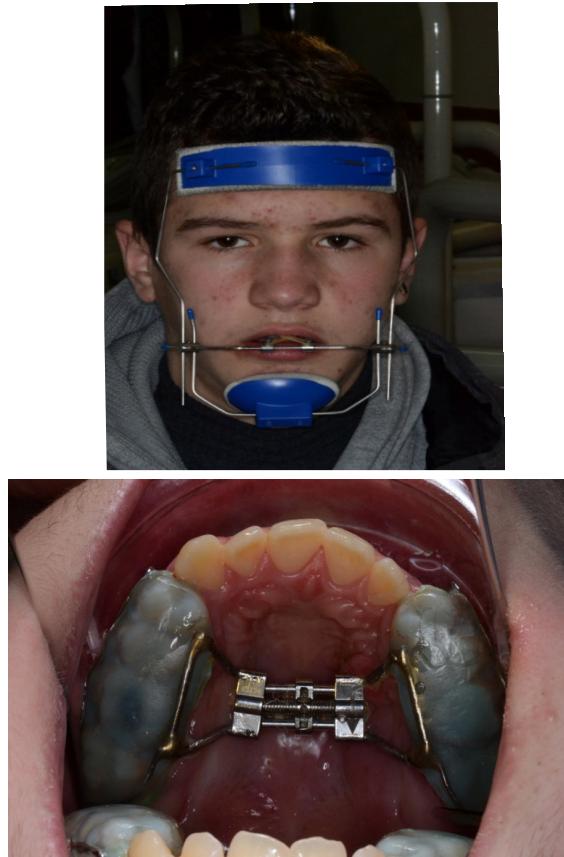


Fig. 8 The evaluation of orthodontic treatment after 3 months

After three months of orthopedic treatment, the patient demonstrated poor compliance with the wear and replacement of elastics, resulting in only moderate treatment outcomes.

The patient remains under post-treatment follow-up, with ongoing retention using a removable retainer.



Fig. 9 Intraoral clinical evaluation after 5 months of treatment

DISCUSSION

In selected cases, particularly when dental agenesis is associated with skeletal pathological features such as mandibular retrognathia or maxillary protrusion, functional appliances such as Twin Block, Herbst, or Tandem are employed to modify skeletal relationships and to prepare the patient for fixed orthodontic treatment.

These appliances influence the development of the maxillary and mandibular skeletal bases as well as tooth positioning, thereby contributing to the restoration of balanced myofunctional activity.

Compared with fixed appliances, functional appliances offer the advantage of orthopedic correction and the prevention of subsequent-occlusal complications.⁴

In cases where smile aesthetics and arch symmetry require space preservation, the orthodontic approach involves opening and stabilizing space for subsequent replacement with a dental implant or fixed prosthesis. This strategy is particularly appropriate in patients with bilateral agenesis of the lateral incisors, where space maintenance allows the recreation of natural dental proportions. In such cases, the orthodontist must ensure adequate space, approximately 6–7 mm, and proper root angulation of adjacent teeth to facilitate accurate implant placement. Compared with space closure, this method provides more harmonious aesthetic outcomes; however, it requires close interdisciplinary collaboration with the oral surgeon to prevent future complications.⁵

CONCLUSIONS

Functional appliances such as maxillary expanders, extraoral force appliances, and McNamara functional appliance play a key role in modifying skeletal growth during the developmental period of the jaws, contributing to the improvement of skeletal relationships and the long-term stability of orthodontic treatment.

The combination of functional and fixed orthodontic treatment phases ensures more stable and physiologic outcomes, as it addresses both the dentoalveolar and skeletal components. Retention of treatment results through fixed or removable retainers remains essential to prevent relapse of malocclusion and to ensure long-term orthodontic stability.

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