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Congenital Microcepgaly in One of Dizygotic Twins: Clinical Case Report

Mayana Narde Souza, Bianca Silva Castro, Joelson Ferreira Santana, Rafael Almeida Monteiro, Braúlio Carneiro Júnior, Marina Ferraz Neves Oliveira, Rita de Cássia Dias Viana Andrade, and Maria da Conceição Andrade de Freitas

ABSTRACT

In addition to neuromotor, cognitive, vision and hearing impairments, it is also possible to observe dental occlusion and maxillofacial changes in children with microcephaly diagnosis. But, how about long-term effects on the craniofacial growth and development of children affected by this clinical condition in skeletal maturity? In this context, two clinical cases of teenage dizygotic twins will be presented, in which one had microcephaly, focusing on their oral and maxillofacial features.

Keywords: Craniofacial growth, Dental occlusion, Dizygotic twins, microcephaly.

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M. N. Souza
State University of Southwest Bahia – UESB, Brazil.
(e-mail: mayana_sou@hotmail.com)
B. S. Castro
State University of Southwest Bahia – UESB, Brazil.
(e-mail: biancacasthro@hotmail.com)
J. F. Santana
State University of Southwest Bahia – UESB, Brazil.
(e-mail: jof_santana@hotmail.com)
R. A. Monteiro
State University of Southwest Bahia – UESB, Brazil.
(e-mail: rafael.monteiro11@hotmail.com)
B. C. Júnior
State University of Southwest Bahia – UESB, Brazil.
(e-mail: brauliocj@gmail.com)
M. F. N. Oliveira
State University of Southwest Bahia – UESB, Brazil.
(e-mail: mfnoliveira@yahoo.com.br)
R. de Cássia Dias Viana Andrade
State University of Southwest Bahia – UESB, Brazil.
(e-mail: ritadias784@gmail.com)
M. da Conceição Andrade de Freitas
State University of Southwest Bahia – UESB, Brazil.
(e-mail: conca.freitas@hotmail.com)

Corresponding Author

I. Introduction

Scientific studies that assessed at birth twin pairs, independent of mode of conception, showed higher prevalence in fetal growth restriction, neurodevelopmental impairment and congenital malformations. These developmental disorders have more occurrences in monozygotic twins [1], [2]. When studying data reviewing the clinical charts of 488 neonates twins from 244 pregnancies, observed that microcephaly (Head circumference < 2 standard deviation for gestational age and sex according to the Intergrowth-21st table) [3], [4]. was present in 3% neonates and severe microcephaly (<3 standard deviation) [3], [4]. was present in 0.6%. These twins had the condition of being small for gestational age.

The first report of twin pregnancy affected by microcephaly was described in 1956, in one of a monozygotic twin pair [5], and in 1958, also reported two more twin pairs identical, in which only one neonatal of twins had the diagnosis of microcephaly associated with brain damage [6]. A recent study investigated the genetic susceptibility of 5 dizygotic twin pairs, in which one of each twin was born with microcephaly. Blood exams of these dizygotic twins with microcephaly revealed discordance in RNA sequencing,

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mainly involving the m-TOR (Mechanistic Target of Rapamycin) signaling pathway whose main function is the promotion of the RNAm translation [7].

In addition to neuromotor, cognitive, vision and hearing dysfunctions, it is also possible to observe dental, occlusal and maxillofacial changes in children with microcephaly associated with a syndrome and/or brain impairment [8], [9], [10]. There is no scientific evidence about long-term effects on the craniofacial growth and development of children affected by microcephaly until skeletal maturity. In this context, two clinical cases of teenager dizygotic twins will be presented, in which one with microcephaly, focusing on oral and maxillofacial features.

II. Material and Methods

A. Sample Characterization

According to the Ethics Committee approval (EAACO 49999321.0.0000.0055), the twins' mother signed the Free Informed Consent Term. Data of patients, two young dizygotic twins, reported in this paper were obtained from the archive of the Dentistry course of the State University of Southwest Bahia, which provides dental care to individuals with microcephaly and their families.

III. clinical Analysis

For clinical evaluation, personal data of twins such as age, sex and information about the birth (normal/cesarean; pre-term/term) were recorded. The cephalic perimeter measured in the first 24/48 hours at birth were collected from their neonates records and classified as microcephaly (Head occipitofrontal circumference <2 standard deviation) or severe microcephaly (<3 standard deviation) for gestational age and sex according to the International Fetal and Newborn Growth Consortium for the 21st Century for neonates [3], [4]. During the anamnesis, it also described information about height, presence or absence of congenital malformations, syndromes, neurological, skeletal, hearing and ocular manifestations.

The maxillofacial examination consisted of a subjective morphological facial analysis by extraoral photographs in frontal and profile views of twins with microcephaly based on the concept of pattern organized by [11]. In the frontal view, the face was classified into three morphological types: dolichofacial, mesofacial and brachyfacial. In the sagittal analysis, the face can be grouped into three distinct patterns: Pattern I, Pattern II, Pattern III. In intraoral exams, dental Interarch and intra-arch characteristics were analyzed by intraoral photographs. The interarch consisted of: sagittal relationship (Class I, II or III, according to first molars); Transverse relationship (presence or absence of unilateral/bilateral posterior crossbite); Incisor relationship: increased overbite and overjet, edge-to-edge or anterior open bite/anterior crossbite. The intra-arch relationship consisted of: presence or absence of anterior and posterior crowding; Arch shape (Normal or constricted).

IV. Clinical Cases

Anamnesis was performed with the twins' mother. According to twins pregnancy history, there was no occurrence of metabolic, infectious and viral diseases during the 37 week gestational age and it was cesarean delivery. There is no family history of microcephaly, craniofacial anomalies or syndromes. At the time of the twins birth, their parents were 21 years old. The couple has no other son or daughter.

A. Clinical Case 1

Dizygotic twin, the patient, female, 15y 3m, was diagnosed at birth with severe microcephaly and her newborn weight was 2,030 g. She doesn't have syndromes or other congenital malformations. The medical history showed severe visual impairment (congenital cataract bilateral, low contrast sensibility and ocular motor disorder), abnormal brain development, bilateral hearing loss and epilepsy. The patient presented short stature compared to her twin brother, speech impairment and severe delayed motor skills such as standing, sitting and walking. Due to neurological disorders, she routinely uses continuous anticonvulsants medications.

B. Dental Occlusion and Maxillofacial Analysis

The frontal and sagittal facial examination of this patient revealed a significant decrease in occipitofrontal circumference, causing disproportion craniofacial and a forehead narrow and protruding. The vertical dimension of the face was evidenced by the mandible clockwise inclination, giving a dolichofacial pattern. It was also observed the absence of passive lip sealing with exposure of the anterior maxillary teeth and tongue interposition between the anterior teeth. A positive sagittal step between maxilla and mandible was noted probably by the maxillary and/or upper incisions dental protrusion, denouncing a facial convexity (Fig. 1a-c).

Regarding functions of the stomatognathic complex, the patient presented dysphagia, unilateral mastication and abnormal swallowing. Her mother reported that the patient ground teeth during the day. On intraoral analysis, the patient was in permanent dentition with prolonged retention of the upper deciduous canine in the right side, that also was localized deviations of the eruptive trajectory of the permanent canine buccally and the upper lateral incisor palatally. (Fig. 1d-e). Regarding oral hygiene, calcified biofilm and generalized gingival hyperplasia were diagnosed as well as enamel hypoplasia on the incisal faces of anterior teeth and occlusal of permanent molars.

The sagittal relationship revealed a dental malocclusion class II. The intra-arch characteristics consisted in anterior dental crowding in upper and lower arches; constricted upper arch associated with a lingual inclination of posterior lower teeth. There was a crossbite in the permanent central incisor, deciduous canine and first premolar (Fig. 1d-h).

The first panoramic radiograph showed, in the upper arch, the prolonged retention of the right deciduous canine in the end process of rhizolysis and deviations in the eruptive trajectory of the permanent canine and lateral incisor. Germs of third molars were intraosseous at the stage of complete crown formation (Fig. 1i).

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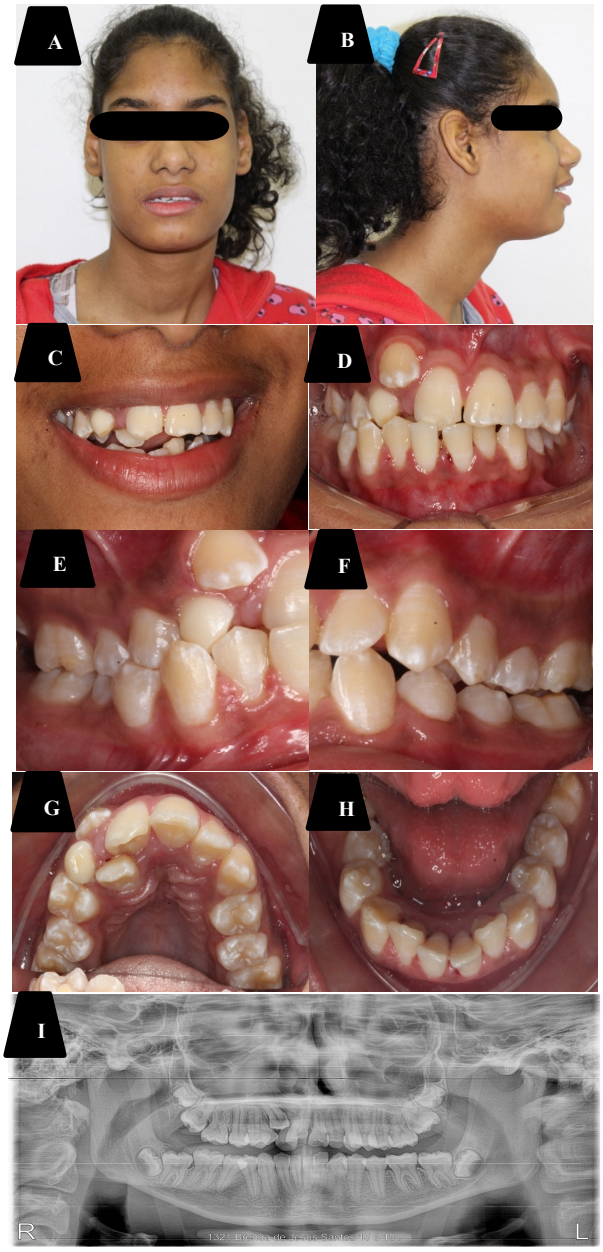

Fig. 1. Facial and intraoral photographs of the twin patient, 15a3m, with severe microcephaly diagnosis in the permanent dentition (a-h). The panoramic image showed the ectopic position of the permanent canine in the right side (i).

C. *Oral Treatment and Follow-up*

The dental treatment included scraping of supra and subgingival calculus presented in the cervical third of lower incisors and posterior teeth. The right upper deciduous canine and permanent lateral incisor were extracted (Fig. 2). There were no reports of pain or postoperative complications.

After two years and three months, the upper canine spontaneously followed an eruptive trajectory towards the occlusal plane in the panoramic imaging. In a second phase, dentistry intervention possibilities include the transformation of the clinical crown of the permanent canine in the lateral incisor and the clinical crown of the first premolar in the canine in order to establish oral functional and aesthetic. Dental check-up was performed every three months (Fig 2).

D. *Clinical Case 2*

Dizygotic twin, the patient, male, 15y 3m, without congenital malformations or syndromes at birth. His newborn weight was 2,670 g and his cephalic perimeter was within the specific normality pattern for sex and gestational age. During the anamnesis, no medical history of neurological disorders, ophthalmic and auditory abnormalities.

The patient came for university dental care with his twin sister, using an orthodontic appliance. His mother related that his orthodontic treatment started one year and eleven months ago. She showed his orthodontic documentation that revealed a diagnostic of a vertical growth pattern of the face, Angle class II dental malocclusion with maxillary atresia, severe upper and lower anterior dental crowding. The planning included extraction of four first premolars and the use of corrective orthodontic appliances to closure of the remaining spaces and alignment of dental arches.

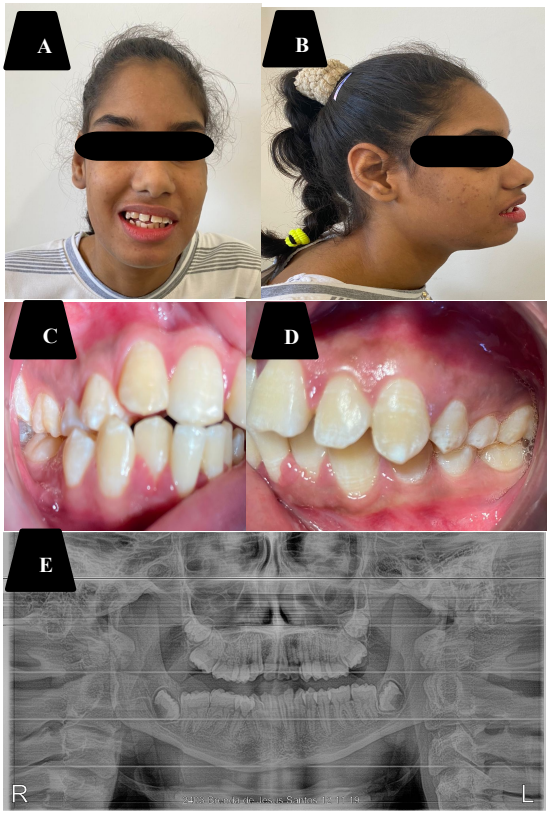

Fig 2. Clinical and radiographic follow-up after two years and three months.

E. *Dental Occlusion and Maxillofacial Analysis*

The patient, 15y 3m, was at the end of the orthodontic treatment. The facial analysis showed a dolichofacial pattern with mandible clockwise inclination and passive lip sealing. After the extraction of four first premolars, the fixed corrective mechanics demonstrated sagittal, transverse and vertical relationships within the normal range (Fig 3a-h). The patient presented generalized gingival hyperplasia near the orthodontic brackets. It was also observed the presence of supra and subgingival calculus on lingual surfaces of lower incisors and canines. Oral functions such as speech, swallowing and chewing were normal.

F. *Oral Treatment and Follow-up*

Periodontal treatment was proposed to this patient by the mechanical remotion of sub and supragingival calculus and dental prophylaxis during orthodontic treatment. After aligning the dental arches, the corrective orthodontic treatment was completed with satisfactory periodontal,

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aesthetic and functional results. The dental treatment also planned extraction of upper and lower third molars after the end of orthodontic treatment due the lack of space to these dental units.

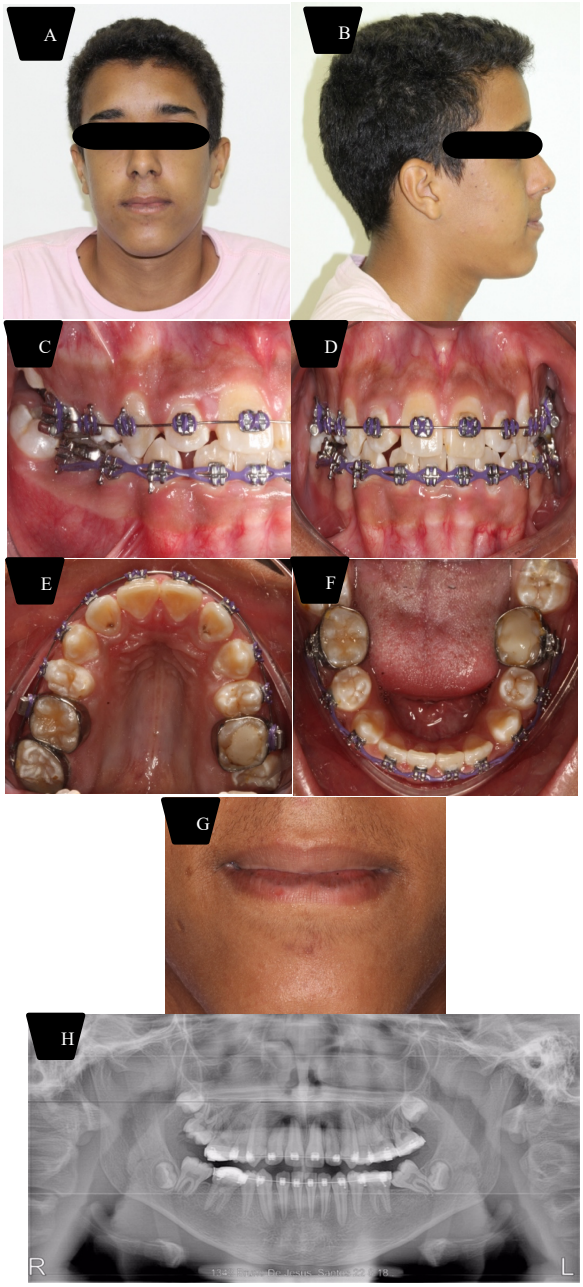

Fig. 3. Facial and intraoral photographs of the twin patient, 15 a 3m, without microcephaly diagnosis. The panoramic image revealed dental alignment with orthodontic fixed appliances after extraction of four first premolars.

V. Discussion

Primary microcephaly is a malformation that occurs in the embryonic period and can cause a series of sequelae that accompany the individual throughout his life. Moreover, the head circumference must be followed in infancy to monitor a child's brain growth for a final diagnosis of microcephaly and possible structural or functional impacts [6], [7]. In this present study, we reported teenage dizygotic twins that did not present any type of syndrome, but the girl was diagnosed with severe microcephaly at birth 37 week gestational age at cesarean delivery. A recent study showed, in the microcephalic newborns group, a greater prevalence in born to term (83.6%) of cesarean delivery (60.7%) and a predominance of girls (52.5%) [8].

According to zygosity and congenital malformations, a retrospective cohort study analyzed data of 3,386 twins pairs that showed significantly higher concordance rates in monozygotic than in dizygotic twins with congenital malformations such as circulatory/nervous system and cleft lip/palate [1]. Although several studies have revealed that different types of congenital malformations in dizygotic twin pregnancies can affect only one of the newborns, as in this case report, the explanation for this is still unclear [2], [13].

Studied data of 488 newborns from 244 pregnancies that showed the diagnosis of microcephaly in 3% and severe microcephaly in 0,6% of neonates [2]. These twins with microcephaly presented a condition of low-weight for gestational age. In this present case, the female twin with severe microcephaly presented lower weight at birth than her brother twin. So far, main clinical reports have shown that severe microcephaly had a higher incidence of genetic and malformative diseases affecting the central nervous system in twin sample [2], [6]. In this context, specific patterns of brain impairment characterized by a wide spectrum of ophthalmologic, hearing, neuromotor and cognitive abnormalities could be observed in our microcephalic twin**.** Her brother's twin presented healthily.

Several studies related to the dentofacial characteristics of children with microcephaly, observed maxillary atresia, anterior open bite [8]. In this case report of adolescent dizygotic twins, regardless of the diagnosis of microcephaly in one of them, they presented the same implications of dental malocclusion in permanent dentition: Angle class II dental malocclusion with maxillary atresia, severe upper and lower anterior dental crowding. It will require orthodontic interventions in both cases. In relation to vertical craniofacial growth, they had the same long facial pattern. Showed an extremely strong genetic control in vertical growth of craniofacial structures in mono- and dizygotic twins up to 15-18 years of age [14].

Due to neurological impairments, children with microcephaly routinely use continuous-use antiepileptic drugs and showed tooth demineralization potential [15]. These kinds of medication have well-known an increased risk of developmental enamel defects in primary and permanent dentition evidenced clinically by diffuse opacities in tooth crown [16]. In the present case, the twin with microcephaly used since childhood continuous medications such as phenobarbital, oxcarbazepine and carbamazepine and revealed white opacities located to the incisal part of the tooth crown in both their primary and permanent teeth. On the other hand, her brother twin presented white opacities located to the cervical part of permanent teeth indicative of demineralization of the enamel by dental caries.

VI. Conclusion

According to these case reports of dizygotic twins in which one had microcephaly diagnosis, concluded that, in the teenage, they showed the same oral and maxillofacial features. Scientific studies about these characteristics should be researched in order to significantly contribute to health

professionals properly carrying out preventive and interceptive procedures and, in this way, establish a treatment health protocol to this congenital malformation.

CONFLICT OF INTEREST

The authors declare that they do not have any conflicts of interest.

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