stress [4], which obviously activates mitophagy, the utilization of large mitochondria with signs of damage of the "dark" type with the formation of single OB. This may explain the earlier increase in the numerical density of grouped OB compared to the increase in the total numerical density of OB.

Conclusion. Thus, the peculiarity of the morphofunctional organization of the pineal gland, associated with the site of synthesis of the main pineal hormone melatonin in the mitochondria of pinealocytes, causes their frequent fusion with daily frequency, a significant specific volume in the cytoplasm, widespread calcification and osmiophilia of the mitochondrial matrix, utilization in the composition of OT, in place of which hydroxyapatite crystals or concretions of amorphous type. Violation of the circadian rhythm of mitochondrial fusion increases the content of grouped OT in pinealocytes, which can be considered as a residual manifestation of desynchronosis when adapting to round-the-clock lighting.

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STRUCTURAL CHARACTERISTICS OF DENTAL ANOMALIES IN SCHOOLCHILDREN DUE TO THE VAULT HEIGHT OF THE HARD PALATE WITH DIFFERENT DEGREES OF SEVERITY OF CONNECTIVE TISSUE DYSPLASIA

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Nowadays a high level of CTD is prevailed, which has local and general phenotypic signs. At the same time, despite its wide study, the problems of diagnosis, treatment, prevention and comprehensive rehabilitation of its manifestations in the oral cavity and maxillofacial region remain unresolved. In this connection the research aim is to solve these problems, which have an extremely important practical, scientific and theoretical significance in dentistry, and also in medicine. The **research** o**bjective** is to study the structure of dentoalveolar anomalies of schoolchildren due to the hard palate vault height at different degrees of connective tissue dysplasia severity. **Materials and methods**. A clinical and craniometric study was performed in 964 children and adolescents aged from 12 to 15 years old diagnosed with CTD. The CTD severity was determined by the method of T. Milkovska-Dmitrova and A. Karkashev (1985). In this case, anomalies of occlusion, dental deformities and anomalies in the teeth position were determined taking into account the height of the hard palate vault at different CTD severity. The vault height of the hard palate was determined by the method of Ushnitsky I.D. et al. (2018). **Results**. The examined patients most frequently revealed a medium degree of severity, then a mild degree and less often a severe degree in the CTD structure severity. At the same time, in the structure of occlusal anomalies associated with distal occlusion, deep traumatic incisal overlap and underdevelopment of the upper jaw, dental arch anomalies including occlusion of the maxillary and mandibular dental arches, shortening of the maxillary and mandibular dental arches, displacement of the upper and lower central tremes, dental position anomalies such as close position of incisors, vestibular position of upper canines, protrusion of upper incisors, retrusion of upper and lower incisors, primary adentia, dystopia of upper canines are determined by increasing their prevalence in school children due to the height of the hard palate vault depending on CTD severity.

It should be noted that an opposite pattern to the previous pathologies was detected in some dentoalveolar anomalies, which is characterized by their decrease in the examined schoolchildren depending on the CTD severity. Thus, the occlusion anomalies trend was determined in reverse incisal occlusion, crossbite, mesial occlusion, retroposition of the mandible, as well as in some anomalies of tooth position, including palatine positioning of upper second incisors, tortoanomaly of the upper and lower jaws, inverse occlusion of upper incisors, macro dentition, disorders of the premolars eruption, lateropositioning of upper second incisors. **Discussion**. The comprehensive study revealed the main structural characteristics of anomalies of occlusion and position of teeth and dental deformities in schoolchildren due to the hard palate vault height at different degrees of CTD severity. **Conclusion.** The increase and decrease pattern in the prevalence of dentoalveolar anomalies in schoolchildren due to the height of the hard palate vault at different degrees of CTD severity has been established for the first time, which will allow taking timely measures to improve complex medical and social rehabilitation.

Keywords: connective tissue dysplasia, height of the hard palate vault, dentition deformities, occlusal anomalies, dental position anomalies.

Introduction. Nowadays, the problems of general and local phenotypic manifestations of CTD are widely studied [1, 5, 9, 19, 22, 24, 30, 32]. In spite of this, the problems of improving medical and social rehabilitation of patients with CTD have not been completely solved [3, 7, 10, 20, 31, 33]. In the structure of local phenotypic signs of CTD manifested in the organs and tissues of the oral cavity, congenital anatomical deformities of the hard palate and dental rows, abnormal occlusion and position of the upper and lower jaw teeth are most frequently identified [6, 13, 21, 23, 27].

It is important to emphasize that constitutional and morphological dysgenesis has a direct impact on the frequency of functional disorders of the maxillary system [11, 12, 26, 28]. Thus, the most frequent lesions of oral organs and tissues are TMJ dysfunction, dental anomalies, occlusion, distal occlusion, high gothic palate, deep incisal overlap, vestibular inclination of the anterior maxilla teeth, tooth dystopia and crowding, curvature of the nasal septum, etc. [4, 14, 15, 25, 29].

It should be noted that the dental problems of this congenital pathology have been insufficiently studied and reported in the literature [2, 8, 16, 34]. It dictates the need for further research improving diagnosis, treatment, prevention and comprehensive medical and social rehabilitation of general and local manifestations of CTD, which is an urgent problem in dentistry and medicine.

The purpose of the research is to determine the structural characteristics of occlusal anomalies and dental position abnormalities, dental r deformities in school-age children taking into account the height of the hard palate vault at different degrees of connective tissue dysplasia severity.

Materials and methods. The clinical and craniometric study was carried out in 964 children and adolescents aged from 12 to 15 years old with the CTD diagnosis. The examination was conducted in the urban district "Yakutsk" (Secondary school №5, №9, №26 and №35, Secondary school №2, Yakutsk City lyceum, Yakutsk City gymnasium, Gymnasium №8, Khangalassky ulus (district) of the Sakha Republic (Yakutia).

The CTD severity was interpreted by the method of T. Milkovska-Dmitrova and A. Karkashev (1985). The CTD severity in the examined children and adolescents was calculated according to the sum of points: 12 points in the mild degree, 23 - in a moderate degree, and in a severe degree - 24 or more points. The depth of the hard palate in case of deformities was determined using a well-known device for measuring the height of the hard palate vault [17].

A biometric study of the hard palate vault height with different CTD degrees was carried out: 633 at dental consultation and 331 jaw models by the method of Ushnitsky I.D. et al. (2018) [18]. Cast impressions of the jaws were obtained at the dental consultation, then biometric measurements were performed at the Department of Therapeutic, Surgical, Orthopedic Dentistry and Pediatric Dentistry of the Medical Institute of M.K. Ammosov North-Eastern Federal University and Yakutsk Specialized Dental Center of the Republic of Sakha (Yakutia). Morphometric studies of anatomical deformities of the upper and lower jaws were performed in the dental clinic and on diagnostic models by a special device including fixed and movable sponges for measuring external dimensions in the form of a truncated plate. These plates have two through holes of oval (rounded) shape each, designed for fixation of removable intraoral pads for fixed and movable measuring jaws, where there is a thread for connection with the screw of the pad in the hole. The measurement results are projected on the display in the digital caliper display.

We used the standard Pon-Linder-Hart method determining the width of the dentitions in children and adolescents, where we determined the relationship between the obtained total values of the mesiodistal incisors and the width of the dentition in the area of the first premolars and molars to obtain objective data. The measuring points were located in the middle of the longitudinal fissures of the first premolars and the anterior point of the intersection of the longitudinal and transverse fissures of the first molars of the maxilla. Mandible constrictions were studied on the measuring points, which are located on the distal point of the first premolar in contact with the second premolar (point between the premolars), and the median point on the vestibular surface or distal-cheeked cusp of the first molar. These measuring points, according to Pon, are used when the bite is permanent. There are anomalies of occlusion, dental deformities and dental position anomalies in various degrees of connective tissue dysplasia severity by standard methods.

The research was done by regulatory documents based on Russia's basic documents on the organization of scientific research.

The studies were conducted in compliance with the ethical principles of scientific medical research involving human subjects, as defined by the Declaration of Helsinki of the World Medical Association (1964, 2000), and the requirements set forth in the main regulatory documents of the Russian Federation on clinical trials. Prior voluntary parental consent was obtained in all examined children.

Statistical analysis of the results was performed with the software package "SPSS" version 22, license "IBM SPSS 22", as well as Pearson correlation analysis (r) and factor analysis by "Varimax" method.

Results and discussion. The most frequently revealed CTD structure data was medium severity degree (55,12±1,05%), then mild degree - 32,05±1,59%, and less frequently severe degree - 12,83±2,04% in the examined children. The results of the hard palate vault height using our device characterize that the hard palate vault height was up to 18.2±0.02 mm in children with mild CTD degree. At the same time, school-age children with medium (19.3±0.04 mm) and severe (32.4±0.02 mm) CTD show pronounced biometric changes in the height of the hard palate vault.

Table 1

Structural characteristics of occlusion anomalies at different degrees of connective tissue dysplasia severity, (%)

CTD severit degree based on the height of the hard palate vault	Distal occlusion	Reverse incisal occlusion	Intersecting occlusion	Deep trauma-traumatic incisal overlap	Vertical incisal overlap dysocclusion	Undeveloped upper jaw	Mesial occlusion	Open bite	Retroposition of lower jaw (sagittal gap)	Direct occlusion
Mild	10.69 ± 0.44^{2}	8.36 ± 0.45^{2}	5.97 ± 0.47^{2}	5.62 ± 0.46^{2}	5.38 ± 0.46^{2}	0.36 ± 0.28	6.78 ± 0.42^{2}	0.44 ± 0.31	31.57 ± 0.33	5.51 ± 0.41^{2}
Medium	$28.93 \pm 0.36^{1.2}$	$2.77 \pm 0.56^{1.2}$	$5.35 \pm 0.46^{1.2}$	$16.52 \pm 0.42^{1.2}$	$12.97 \pm 0.44^{1.2}$	0.71 ± 0.50^{2}	$5.85 \pm 0.47^{1.2}$	7.71 ± 0.46^{2}	$18.98 \pm 0.41^{1.2}$	$1.29 \pm 0.49^{1.2}$
Severe	$37.58 \pm 0.38^{1.2}$	2.61 ± 0.49^{2}	$3.64 \pm 0.55^{1.2}$	$38.88 \pm 0.38^{1.2}$	$4.69 \pm 0.55^{1.2}$	$5.12 \pm 0.55^{1.2}$	$2.77 \pm 0.56^{1.2}$	$5.14 \pm 0.55^{1.2}$	$11.86 \pm 0.51^{1.2}$	2.95 ± 0.56^{1}
Average values	25.73 ± 0.25	4.58 ± 0.04	4.98 ± 0.02	20.34 ± 0.11	7.68 ± 0.07	2.91 ± 0.01	5.13 ± 0.05	6.42 ± 0.03	20.80 ± 0.06	3.25 ± 0.03

Notes: 1 - degree of reliability calculated between CTD degrees of severity; 2 - degree of reliability calculated between mean values and indices of different CTD degrees of severity.

Table 2

Structural characteristics of dental anomalies in different degrees of connective tissue dysplasia severity, (%)

CTD severity degree due to the hard palate vault height	Dento-alveolar arches constriction of the upper and lower jaw	Shortening of dentoalveolar arches of upper and lower jaws	Displacement of upper and lower center line	Diastema	Tremes
Mild	27.51 ± 0.11^{2}	17.54 ± 0.16^{2}	0.18 ± 0.22	2.52 ± 0.23	2.29 ± 0.23
Medium	$28.49 \pm 0.10^{1.2}$	$21.18 \pm 0.14^{1.2}$	0.26 ± 0.24^{2}	4.22 ± 0.22	2.55 ± 0.23
Severe	$31.48 \pm 0.09^{1.2}$	$27.37 \pm 0.11^{1.2}$	$2.67 \pm 0.23^{1.2}$	1.29 ± 0.24	3.07 ± 0.23
Average values	29.16 ± 0.29	22.03 ± 0.22	1.46 ± 0.01	2.67 ± 0.02	2.63 ± 0.02

Distal occlusion was the most frequent in the occlusal anomalies data structure at different CTD degrees severity taking into account the hard palate vault height (Table 1), where the average rate was 25.73+0.25%, lower jaw retrosession (sagittal gap) - 20.80+0.06% and deep traumatic incisal overlap - 20.34+0.11%. Next in frequency were vertical incisional dysocclusion, which was 7.68+0.07%, open bite - 6.42+0.03%, mesial occlusion - 5.13+0.05%, cross bite - 4.98+0.02%, and reverse incisional occlusion - 4.58+0.04%. Straight occlusion 3.25+0.03% and underdevelopment of the maxilla 2.91+0.01% were less common.

The research revealed a pattern of increased frequency of occlusion anomalies depending on the CTD severity. Thus, distal occlusion in the moderate degree of congenital dysgenesis increased by 2.71 times compared with the mild degree and by 1.30 times compared with the moderate degree of CTD in the severe degree. A similar trend is determined in deep traumatic incisor overlap, where the rates were 2.94 and 2.35 times, and 1.97 and 7.21 times, respectively in maxillary underdevelopment data ($p \leq 0,05$).

It should be noted that an opposite pattern to the previous pathologies of the maxillary system has been revealed in some occlusal anomalies, which is characterized by their reduction depending on the CTD severity degree. Thus, reverse incisal occlusion in the moderate degree decreased by 3.01 times compared with the mild degree, and the severe degree by 1.06 times compared with the moderate degree of CTD. A similar situation is determined in the crossbite, where the values were 1.11 and 1.47 times, and in the mesial occlusion 1.17 and 2.11 times and the retrolateralization of the mandible (sagittal gap) 1.66 and 1.60 times, respectively ($p<0.05$). At the same time, in the indices of vertical incisal dysocclusion, open bite and straight occlusion, a variety of their frequency at different degrees of CTD severity was determined.

The indicators of the maxillary and mandibular arches occlusion prevailed, where their average value was at 29,16+0,29% in the structure of dental anomalies, due to the hard palate vault height (Table 2). Then there were shortening of maxillary and mandibular arches - 22,03+0,22%, less often we detected diastems - 2,67+0,02% and tremors - 2,63+0,02%, where the lowest value was noted in the data of upper central line displacement - 1,46+0,01%.

It should be noted that the narrowing of the maxillary and mandibular arches jaws at the average degree of congenital dysgenesis increased by 1.03 times compared to the mild degree, and at the severe degree by 1.10 times compared to the average degree of CTD. This trend is determined in deep traumatic incisor overlap, where the rates were 2.94 and 2.35 times, and in data of maxillary underdevelopment 1.97 and 7.21 times, three times 1.11 and 1.20 times, respectively. At the same time, no upward dynamics was detected in the rates of diastema detection, where the maximum value was detected in CTD of moderate severity. In general, the data characterize the presence of a trend increasing frequency of dentition anomalies depending on the severity of CTD.

In the general structure of tooth position anomalies due to the hard palate

Table 3

Structural characteristics of dental position anomalies in various degrees of connective tissue dysplasia severity

CTD severity degree due to the hard palate vault height	Tight incisor position	Vestibular position of upper canines	Palatine position	Mesio position	Protrusion	Linguaposition	Tortoanomaly	Multiple	Supraposition	Retroversion pf upper canines	Reverse occlusion	Macrodontis of incisors	Retroversion of low incisors	Disturbance of bigeminy, sequence of eruption	Primary edentulism	Failure of premolar eruption	Lateral position	Retention	Protrusion	Dystopy	Direct occlusion
Mild	17.83±0.41[1,2]	7.48±0.46[2]	12.47±0.44[2]	8.24±0.46[2]	1.39±0.49[2]	2.63±0.49[1]	19.28±0.40[1,2]	0	0	0.47±0.52[2]	8.31±0.46[2]	12.82±0.44[2]	0.71±0.48[2]	0	1.35±0.50[2]	1.94±0.49	2.74±0.49[2]	1.34±0.49[2]	0	0.55±0.53[2]	1.41±0.51[1,2]
Medium	22.03±0.39[1,2]	9.51±0.45[1,2]	5.72±0.47[1,2]	11.57±0.44[1,2]	4.25±0.48[1]	4.51±0.47[1,2]	17.34±0.41[1]	3.01±0.49	0.30±0.50	1.50±0.49[1,2]	2.86±0.49[1,2]	7.59±0.46[1,2]	1.66±0.49[2]	1.79±0.49	2.15±0.49	0.81±0.50[2]	0.77±0.52[1]	0.84±0.50[2]	0.30±0.50	1.20±0.50	3.68±0.48[1,2]
Severe	37.86±0.31[1,2]	14.24±0.43[1,2]	4.59±0.48[1,2]	9.67±0.45[1,2]	6.47±0.47[1,2]	1.52±0.49[1,2]	15.63±0.42[1,2]	0	0	5.03±0.48[1,2]	0.37±0.57[1,2]	7.28±0.46[2]	5.11±0.48[1,2]	0	2.35±0.49	0.72±0.50[2]	0.27±0.25[2]	4.31±0.48[1,2]	0	2.18±0.49[2]	0
Average values	25.75±0.25	10.41±0.05	7.59±0.06	9.79±0.09	4.03±0.04	2.88±0.02	17.41±0.17	3.01±0.49	0.30±0.50	2.33±0.03	3.84±0.02	9.23±0.09	2.49±0.01	1.79±0.49	1.95±0.01	1.57±0.01	1.26±0.01	2.16±0.02	0.30±0.50	1.31±0.01	2.54±0.01

vault height in various degrees of CTD severity (Table 3), the average indicators of close incisors prevailed, where their average value was at the level of 25.75+0.25%, followed by tortoanomalies - 17.41+0.0, 17% and vestibuloposition of upper canines - 10.41+0.0.5%, followed by mesioposition of first molars - 9.79+0.09%, palatine position of upper second incisors - 7.59+0.06% and less frequently other anomalies of tooth position were revealed, where the average values ranged from 0.30+0.50% to 5.58+0.02%.

It should be emphasized that there is a definite pattern of increase depending on the severity degree in some anomalies of tooth position. Thus, an increase of 1.23 times compared to the mild CTD degree and an increase of 1.72 times compared to the moderate degree of severity in the data of close incisor positioning. This trend was found for vestibuloposition of upper canines, protrusion of upper first incisors, retrusion of upper incisors, retrusion of lower incisors, primary adentia of lower jaw incisors and dystopia of upper canines, where the rates were 1.21 and 1.50 times, 3.06 and 1.52 times, 3.19 and 3.35 times, 2.33 and 3.08 times, 1.59 and 1.09 times, 2.18 and 1.82 times respectively.

It should be stressed that a certain group of dental position anomalies revealed a decrease in their indicators depending on the CTD severity. Thus, the index decreases by 2.18 times compared to the mild degree, and by 1.25 times compared to the moderate degree in the severe degree in the palatine positioning data of the upper second incisors. Such a situation was observed in upper and lower jaw incisor tortoanomalies, upper incisor reverse occlusion, incisor macrodentia, premolar eruption timing disorder, and lateroposition of upper second incisors, where the rates were 1.11 and 1.10 times, 2.90 and 7.73 times, 1.69 and 1.04 times, 2.39 and 1.12 times, 3.56 and 2.85 times respectively.

It should be noted that other anomalies of tooth position have been identified that do not tend to increase or decrease in their frequency depending on the severity of CTD. It includes mesioposition of the first molars, lingual position of premolars, supercomplex teeth in the area of the upper incisors, supraposition of the upper first incisors, violation of pairing and sequence of eruption, retention of lower premolars, protrusion of upper first incisors, and direct occlusion of upper first incisors, where their averages were 9.79+0.09%, 2.88+0.02%, 3.01+0.49%, 0.30+0.50%, 1.79+0.49%, 2.16+0.02%, 0.30+0.50%, and 2.54+0.01%.

It is important to emphasize that various aspects of the local and general manifestations of CTD, which are represented by a wide range of symptoms, have been studied. However, studies of dentoalveolar anomalies are conducted without taking into account the CTD severity and hard palate height data.

Pearson correlation analysis revealed the presence of correlation between the gothic palate (r=0.64) and anomalies of teeth position (r=0.73) and narrowing, deformation of dental arches (r=0.85) and anomaly of occlusion (r=0.82), which characterizes the presence of direct correlation between the hard palate vault height and dentoalveolar anomalies at various degrees of CTD severity.

Conclusion. Our research has established the presence of actual pattern of increased prevalence of occlusal anomalies depending on the CTD severity, taking into account the hard palate vault height (distal occlusion, mandibular retroversion and deep traumatic incisal overlap), as well as dental deformities (narrowing of the maxillary and mandibular arches, deep traumatic incisal overlap, underdevelopment of the maxilla and trims) and anomalies of the teeth position (close position of incisors, vestibuloposition of upper canines, protrusion of the upper first incisors, retrusion of upper incisors, retrusion of lower incisors, primary adentia of lower jaw incisors and dystopia of upper canines). In addition, a pattern of decreasing prevalence of occlusal anomalies (reverse incisal occlusion, crossbite, mesial occlusion, retroposition of the lower jaw) as well as dental position anomalies (palatinoposition of the upper second incisors, tortoanomalies of upper and lower incisors, upper incisors backward occlusion, macrodentia of incisors, premolar eruption timing disorders, lateral position of upper second incisors) taking into account the hard palate vault height in different degrees of CTD severity. For the first time, the established regularities of frequency and structure of dentoalveolar anomalies at different degrees of CTD severity due to the hard palate vault height will have a positive effect in the timely development of an individual plan of complex medical and social rehabilitation of school-age children with congenital collagenopathy.

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