The role of factors in the development of hypoxia in children with secondary deforming osteoarthritis of the temporomandibular joint

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ABSTRACT

Introduction. Secondary deforming osteoarthritis of the temporomandibular joint (SDO TMJ) in children is a multifactorial and polyetiological disease, which is complicated by respiratory apnea with its consequences in the form of hypoxia and acidosis. The main causes and factors of endogenous hypoxia in children with SDO TMJ in connection with general pathology and diseases of the ENT organs have not been sufficiently studied.

The purpose of the study is a comprehensive diagnosis of hypoxia factors of endogenous origin in children with secondary deforming osteoarthritis of the temporomandibular joint.

Material and research methods. 65 sick children with SDO TMJ were examined and the factors affecting external respiration indicators, the state of physical development of children - studies of body weight and height (anthropometry, somatoscopy) and physiometric disorders (vital capacity), as well as methods of cardiointervalography (CIG), electroencephalography, spirometry, rheoencephalography. MRI and multislice computed tomography of the paranasal sinuses, facial bones and skull.

Conclusions. Diseases of the ENT organs that occur with respiratory disorders negatively affect the child's health and lead to the development or progression of somatic pathology. In turn, the presence somatic pathology in children with SDO TMJ leads to delayed physical development and bronchopulmonary syndrome with impairment of external respiration in the form of obstructive, restrictive and mixed forms respiratory disorders, which in many cases are the trigger for the development of hypoxic conditions.

Keywords: hypoxia, secondary deforming osteoarthritis of the temporomandibular joint.

Introduction. The problem of complex rehabilitation of children with secondary deforming osteoarthritis of the temporomandibular joint (SDO TMJ), prediction and prevention of complications is one of the most important tasks of modern pediatrics and pediatric maxillofacial surgery. The multifactorial nature and polymorphism of this pathology are noted. Among the main causes, the authors identify trauma, inflammatory diseases of the ear, hematogenous and

odontogenic osteomyelitis, as well as connective tissue dysplasia [1,2, 3].

A significant role is played by hypoxia, which stimulates the formation and action of osteoclasts, increasing bone resorption, and worsening the remodeling of bone and soft tissues [4, 5,6].

Manifestations of intermittent hypoxia and obstructive sleep apnea syndrome (OSA), are mainly associated with difficulty in nasal breathing, partial or complete restriction of movements of the lower jaw, one- or two-sided retro-microgenia with dislocation of the tongue, aggravated during sleep in the supine position, accompanied by severe snoring. Sleep apnea is a cessation of breathing during sleep with a decrease of up to 90% or absence of pulmonary ventilation for more than 10 seconds. It is accompanied by short-term pauses in breathing (there can be from 5 to several hundred of them during the night), snoring, anxiety, and a feeling of constant fatigue due to lack of proper sleep.

Researchers health-related quality of life and well-being were found to be significantly worse in pediatric patients suffering from four important otolaryngological diseases: chronic sinusitis, deviated septum, hypertrophy of the nasopharyngeal tonsil and hearing diseases [7,8].

Analysis of literature data shows that patients with SDO TMJ experience clinical symptoms. Manifestations of intermittent hypoxia and obstructive sleep apnea syndrome, the main cause of which is local pathological processes - jaw deformation, retromicrogenia, changes in the ENT organs: deformation of the nasal septum, etc.

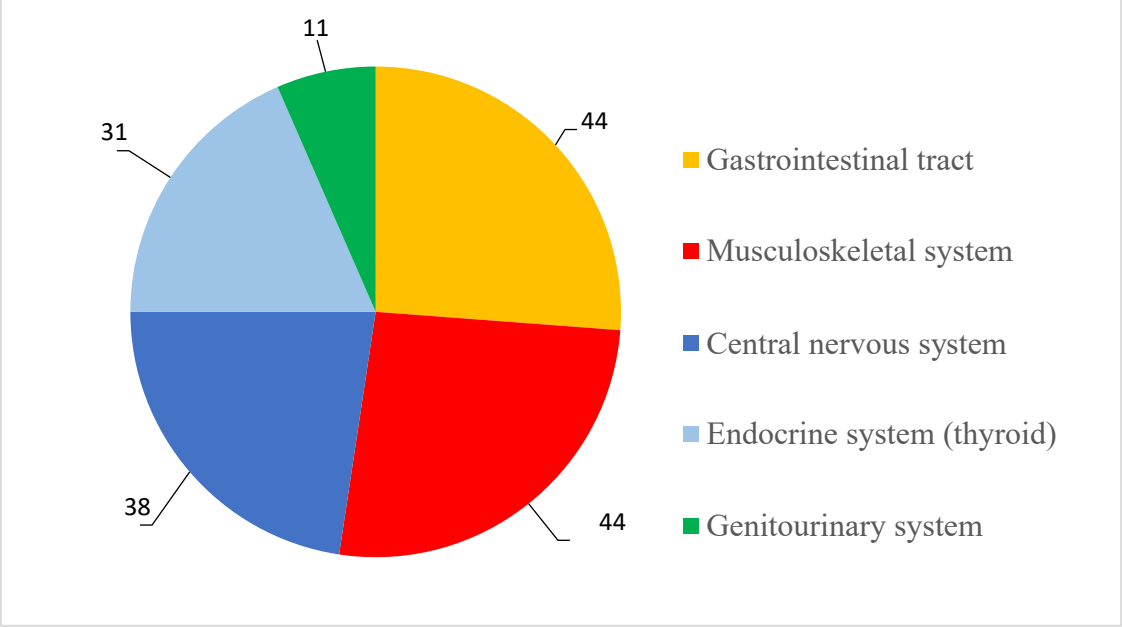
The causes and factors of endogenous hypoxia in children with SDO TMJ in connection with general pathology and diseases of the ENT organs remain unstudied. Many researchers point out the need for an in-depth study of the relationship between local hypoxia factors and the development and chronicity of inflammatory diseases of the nasal cavity and paranasal sinuses.

The purpose of our research is a comprehensive diagnosis of hypoxia factors of endogenous origin with the study of the causes of external respiration impairment in children with SDO TMJ, as a factor leading to hypoxia and contributing to the chronicity of inflammatory processes in the ENT organs.

Material and research methods. For the period from 2013 to 2023, in order to diagnose and treat diseases of the ENT organs during their preparation for surgery under general anesthesia with endonasal intubation using a bronchoscope, there were 65 sick children with SDO TMJ were examined.

Examination methods included standard methods: study of anamnesis, complaints, clinical and laboratory, functional, endoscopic examination of the nasopharynx, multi-slice computed tomography of the maxillofacial region and ENT organs. Among the factors influencing external respiration - the study of the physical development of children, which included: measurement of body size and weight (anthropometry, somatoscopy), description of body features, shape of the chest, legs, feet and joint mobility and appearance, physiometric indicators (vital capacity lungs).

Research results. We divided all complaints presented by patients and their parents into external - and facial symmetry with violation of aesthetic proportions, limited mouth opening, difficulty chewing - in 92.3%. From the ENT organs - 76.9%. 78.4% of patients complained of the presence of neurological disorders, 53.8% of patients complained of dysfunction of the digestive organs.%. (1-fig)



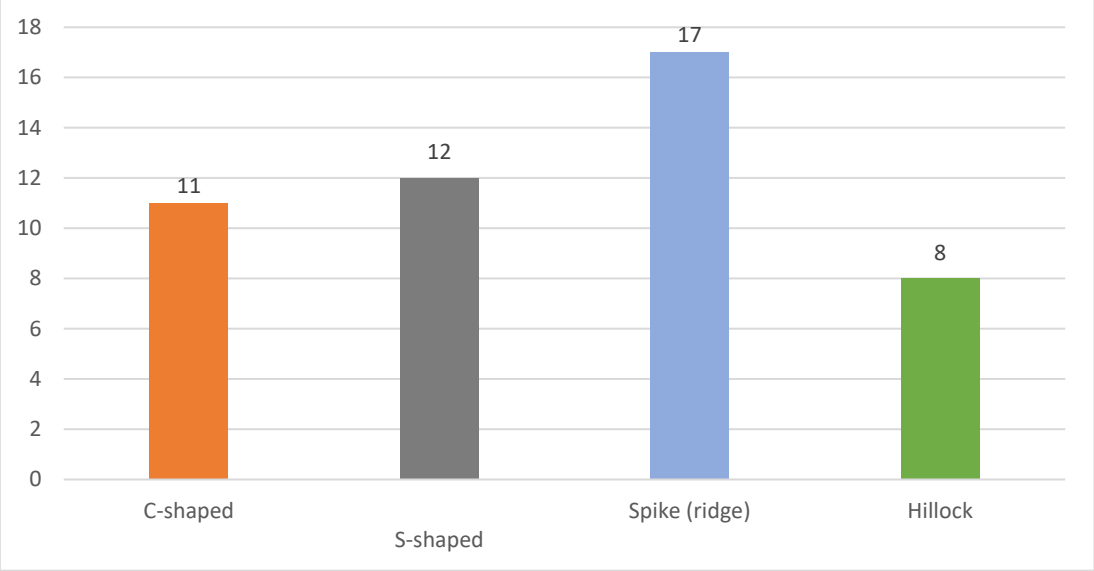
1-fig. General incidence of children with SDO TMJ

General assessment of condition ENT organs were assessed by examining the external nose, nasal cavity and pharynx. The condition of the nasopharyngeal and palatine tonsils, nasal septum, paranasal sinuses was assessed.

Among the local causes of impaired external respiration in sick children with SDO TMJ, an important place may be occupied by difficulty in air passage caused by an increase in the parapharyngeal tonsils associated with the inflammatory process and hypertrophy, deviated nasal septum, inflammatory diseases of the paranasal sinuses, as well as retroposition of the lower jaw and tongue. When studying the condition of the nasopharyngeal tonsils, out of 65 examined - 8 patients had normal tonsil sizes, 1 - mild degree of enlargement in 12 patients, 43 patients had 2 - moderate degree, in two cases, 3-severe degree. This indicated a significant narrowing of the nasopharynx in most patients.

Diagnosis of the curvature of the nasal septum in its various parts, the relationship with the degree of retroposition, was carried out by analyzing multi-slice tomograms in sagittal, axial and coronal projections using the Radiant DICOM program. (2-fig.)

A deviated nasal septum significantly impairs nasal breathing by reducing air flow speed, reducing turbulence and aerodynamic filtration of inhaled particles [9].



2-fig. Frequency of occurrence and forms of deviated nasal septum

Of the 65 patients examined, 48 had radiological and clinical signs of a deviated nasal septum.

Depending on the period of development of the body, the children were divided into 3 age groups. At the age of 3-6 years, 19 patients were examined, 7-12 years - 24, 12-18 years - 22 patients. The frequency of referrals in all groups was approximately the same.

The study of intrauterine development of children revealed normal centile weight-height indicators in newborns within the following range:

Weight 3334.74±109.97 gr. In centile with average indicator - 67%

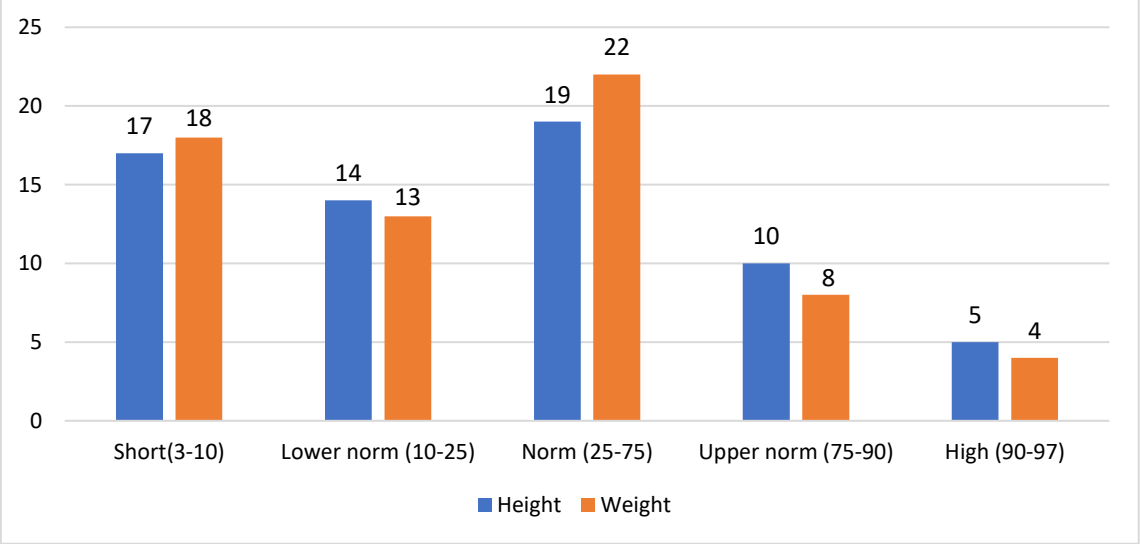
Height 51.71± 0.94 cm. In centile caverage indicator - 79%

Weight-height index (Quetelet I), reflecting the nutritional status in the prenatal period, was within60.37 - 69.55% (normal 60-80%), which corresponded to the lower normal values.

The assessment of a child's physical development (PD) is based on the parameters of height, body weight, proportions of development of individual parts of the body, as well as the degree of development of the functional abilities of his body (vital capacity of the lungs, muscle strength of the hands, etc.; muscle development and muscle tone, state of posture, musculoskeletal apparatus, development of the subcutaneous fat layer, tissue turgor), which depend on the differentiation and maturity of the cellular elements of organs and tissues, the functional abilities of the nervous system and the endocrine apparatus [9].

Based on centile estimates of body length (LB), body weight (BW), the harmony of the morphological state of the body was determined. Optimal ratios of these indicators ensure perfect functioning of the musculoskeletal system, cardiovascular, respiratory and other body systems [10].

3-fig.



3-fig. Results of height and weight assessment by centiles

Analysis of the results of a study of the weight and height of the body of children with SDO TMJ indicates their low indicators in 11 and 13, respectively.

Low weight was observed in 18 patients, the lower limit was observed in 13. The results obtained indicate a lag in physical development and indicate a decrease in strength indicators.

Body mass index (BMI) was determined to assess nutritional status. Calculated using the online BMI calculator for children Children BMI. com.

When determining the index in the 25-75th centile zone, “sufficient” nutrition is stated; “low” (“very low”) nutritional status is said to occur when the body mass index is below the 10th centile; about “high” (“very high”) nutritional status – in the zone above the 90-97th centile. When the index value corresponds to 10-15 or 75-90 centile intervals, we can talk about a “borderline” nutritional state (below or above average), requiring medical supervision. [10]

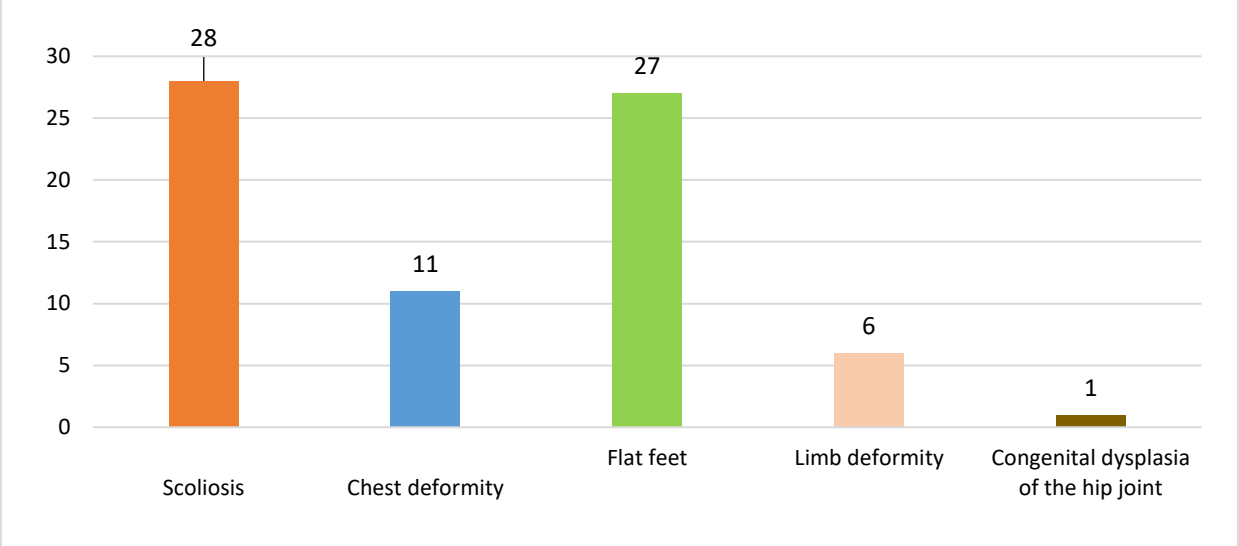
During somatoscopy of patients, the following results were obtained:

the correct physique was assessed in 32%, incorrect - in 68% of children.

100% of the examined children had a cosmetic syndrome in the form of various deformities of the maxillofacial region (MFR).

76% of children had various types of posture disorders and 30% had an abnormal chest shape.

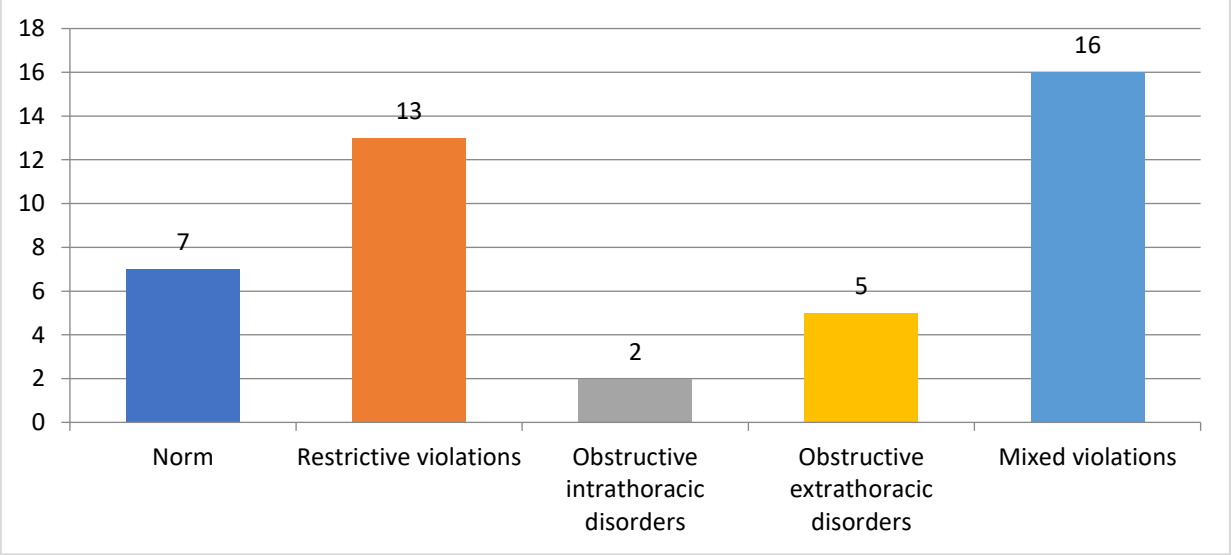
The correct shape of the legs was noted in 36% of children, 41% had O-shaped and 23% X-shaped deformities of the limbs. (4-fig.)



4-fig. Combined pathology of the skeletal system in children with SDO TMJ (n=37)

These changes are associated with disruption of the structure of cartilage and delayed maturation of the epiphyseal growth zone, which is manifested by elongation of tubular bones. The basis of chest deformities is the inferiority of the costal cartilages [11].

Ventilation disorders were expressed in obstructive, restrictive and mixed disorders. Based on the results of spirometry, normal breathing was diagnosed in only 7 patients. The rest had various forms of disorders: restrictive in 13 patients, obstructive in 7, and mixed disorders in 16 cases. (5-fig.)



5-fig. Detected external respiration disorders according to spirometry findings

Conclusion.

In children with retarded physical development, diseases of both the gastrointestinal tract, nervous, endocrine, and musculoskeletal systems were observed, manifested by poor posture, deformities of the chest, changes in muscle tone involved in ventilation of the lungs, masticatory muscles and other parts of the body.

Diseases of the ENT organs that occur with respiratory disorders negatively affect the child's health and lead to the development or progression of somatic pathology. Somatic pathology in children with SDO TMJ leads to

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