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Modern Aspects of the Problems of Dental Diseases in Children with Connective Tissue Dysplasia

ABSTRACT

The present review of modern problems of dysplasia of connective tissue (DCT) has analyzed its manifestations of cardio-vascular system, musculoskeletal system, diseases of inner organs, vision organs, organs and tissues of the oral cavity and maxillofacial area. Thus it was noted that the DCT syndrome forms had a high medical-social importance as they often led to the disability of patients at the young age, which, as a rule, reduced quality of life and its duration. It is important to note that organs and tissues of the oral cavity, also as well as other organs and systems of organism have a connective-tissue origin where their compound components determine the level of protective processes in various diseases. Frequent manifestation of the phenotypic signs of DCT in the oral cavity are anomalies of tooth alignments, a vestibular inclination of anterior teeth of the upper jaw, deep cross bite, distal occlusion, high Gothic palate, dystopia and teeth overcrowding and also deviation of the nasal septum.

Thus multiple damage of DCT can affect the frequency of dysfunction of temporal-mandibular joint (TMJ) developing caries and non-carious damages, diseases of paradontium, damages in teeth development, parafunctions of chewing muscles. There is a direct interrelation of back posture disorders at the DCT phenotypic signs connected with the musculoskeletal system, formation and development of the dentoalveolar anomalies among children. There are deep crossbite and distal occlusion in the structure of dentoalveolar anomalies. Thus the main forms of scoliosis are characterized as the main manifestations of bone connective dysplasia (except idiopathic scoliosis). Also there is the interrelation of TMJ dysfunction syndrome and condition of the backbone which characterize that pathogenetic mechanisms of their formation are connected with the musculoskeletal disorders, bite anomalies leading to TMJ dysfunction. The dentoalveolar anomalies and deformations are major factors of defects of occlusion, area of occlusive contacts, emergence of supercontacts,

which create prerequisites to the development of discoordination of chewing group of muscles where the functional TMJ disorders appear. But, at the same time, the predominating role of the deep bite to the developing of TMJ dysfunction has been determined due to the expressed disorder of occlusive surface where the development of the expressed functional changes of chewing group of muscles were connected with the disorder of relative positioning of elements of the joint caused by shift of articulate head and meniscus due to articulate pole and articulate eminence.

In this regard the assessment of individual risk of children with different degrees of DCT expressiveness will promote searching of new means and methods which will interfere with the development of dental diseases and characterize the health prophylaxis of the children's population in a certain degree.

Keywords: dysplasia of connective tissue, collagenopathy, phenotypic signs, dentoalveolar anomalies, occlusion, dysfunctions of temporal and mandibular joint, caries of teeth, diseases of paradontium.

INTRODUCTION

Nowadays problems of dysplasia of connective tissue (DCT) where its basis is a hereditary collagenopathy [6, 25, 43] are widely studied. It should be noted that morphological and functional feature of organs and systems of organism depends on "maturity" of connective tissue [30]. Thus morphohistological feature of connective tissue are universality, plasticity, polymorphism of cellular systems which define a wide range of functionality and high level of adaptation by the influence of aggressive factors of the external and internal environment [24,38].

It should be noted that the classification developed by V.V. Serov, A.B. Shekhter (1981) who allocated 3 main types of connective tissue has been applied in medical practice: actually connective tissue; blood cells and hematogenic tissue; cartilaginous bone tissue. The connective tissue is divided into fibrous (quaggy and dense) and connective tissue with special properties (reticular, fat, pigmentary, mucous). The prevalence of collagenic fibers are characterized by dense connective tissue, the division of tissue to the formed (ligaments, sinews, cartilages, bones) and non-formed depends on orientation in the space (aponeuroses, reticular derma, capsules and covers of organs). Friable connective tissue consists of intercellular substance and cells (fibroblast, macrophages, corpulent, endothelial, adventitial, adipcytes, plasmocytes) [2, 20]. The research has established that connective tissue of smorphologic and structural points

in organs and systems of organism is the main and occupies 50% of the body weight of the person [20, 24, 36. 40]. Thus it equally carries out a basic and exchange-physiological role and as a functional element unites integrity of organs and systems[3].

It should be noted that the system component of connective tissue is controlled by genes and can have genetic damage as congenital and hereditary anomalies create a wide range of clinical syndromes far from each other [32, 52]. Besides, a genetic factor with multifactorial origin is in the basis of the differentiated defects of connective tissue [1, 39]. Also the connective-tissue defects localized only in one organ and DCT which shown external phenotypic signs of dysplasia are known as syndromes.

Today it has been established that aggressive factors of the external and internal environment, where their pathogenic influences take place in ontogenesis, which are connected with environment, food habits, psycho-emotional stress, etc. [5, 25] take part in the development of DCT. Nevertheless, the set the phenotypic DCT signs and microanomalies with external manifestations which are found at the physical examination [46, 53] has been revealed. So, characteristic external phenotypic signs of DCT are cranial and eye signs, changes in oral cavity and auricles, skin and its derivatives and also respiratory organs, urinary system, digestive tract, blood system, disorders of reproductive system, extremities, bones, joints, backbone and cardiovascular system [44]. Thus these disorders make negative impact on functional condition of organs and systems of organism which definitely reduce the quality of life of children [34].

Nowadays, despite broad studying of DCT, there are various opinions about its origin. So, some authors characterize that DCT has the monofactorial character connected with the developing diseases of the established and unspecified gene defect and also with diseases of connective tissue of the multifactorial nature [54]. But, at the same time, disorders connected with congenital and acquired, differentiated (syndrome) and undifferentiated (non syndrome) disorders in ontogenesis is most widely used among experts classification of the connective tissue [46]. In their structure the DCT undifferentiated forms which consist of stigma of dysembryogenesis (phenotypic manifestations), locomotory manifestations and locomotory-visceral manifestations [45] are mostly revealed. Thus Marfan's syndrome, Ehlers-Danlos syndrome, imperfect osteogenesis, pseudoxanthoma elasticum, etc. belong to the differentiated DCT [7, 17].It was established that DCT was developed at the gene level and level of disbalance of ferment and protein exchange with hyperactivity of lysyl oxidase and transglutaminase, RNA disorders and also disorders at the level of macro - and microelements

disbalance [2]. Thus it was established in the pathogenetic plan that deficiency of magnesium in connective tissue led to synthesis delay of all structural molecules, including proteoglycans, glucosaminoglycans, collagens and elastin [14]. It is known that system of DCT defeat is connected with the structural feature of connective tissue of organs and systems of organism. It also characterizes the multiorgan defect connected with disorders of bone and cartilage tissue, change of skin, vascular and valve formations of heart, urinary, digestive systems, etc. [12].

It defines the relevance of DCT problems which has medical-social aspects.It should be noted that the DCT hereditary syndrome forms, as a rule, lead to disability of patients at young age who reduce quality of life and its duration that defines its medical-social importance [11, 48].

Thus the DCT prevalence of undifferentiated forms in Russia fluctuates ranging from 2-30% [21]. Meanwhile, it was established that humans with DCT have features of clinical current of the postoperative period and outcome of surgical interventions which are connected with more expressed and long hypostasis of soft tissues, as a rule, followed by hemorrhages and hematomas and also complications in the form of development of fibrosis or a necrosis of soft tissues [27, 32].

It should be noted that today DCT problems connected with changes in the musculoskeletal and cardiovascular systems [10] are most widely studied. Thus actually there is no standard algorithm of diagnostics of DCT, reflecting requirements of various medical experts in their practice. Also, today, there is no consensus on "stigmatization thresholds". The concept "threshold level" was for the first time entered by A.A. Lazarus (1989) where the ability of various people to transfer negative incentives at excess of which there comes further deterioration of state with sharp and, perhaps, irreversible changes of negative character was characterized. Thus some authors approve absence or existence of DCT signs by four and five external signs among females and males [21]. According to V.N. Gorbunov (2010), identification of DCT syndrome requires existence of 6-8 signs of dysplasia where disorders of two-three organs of genetic factor were revealed. The revealed phenotypic signs of DCT, as a rule, were confirmed by the laboratory researches testifying the disorders of connective tissue exchange.

It should be mentioned that there is no their accurate gradation in the frequency and structure of these or those external signs with visceral pathology and small anomalies of development [53]. But, at the same time, the DCT symptom complexes connected with bone and muscular, copular and articulate, skin, and cardiac changes were revealed. Thus organs and

tissues of oral cavity of TMJ dysfunction were revealed in 55%, disorders of back posture – 51%, skin manifestations – 57%, bone and muscular changes – 52%, and also cardiac manifestations in 28% cases. According to B.V. Golovskaya with others (2002) it was noted that the expressed disorders of health were observed with combination of three of the listed symptom complexes.

It should be noted that the diagnostics is important for time identification and prevention of various DCT complications [47]. Today there is a wide range of methods of diagnostics. So, the diagnosis can be made for patient identification of 6-8 and more clinical diagnostic DCT signs in undifferentiated DCT, besides, involvement not less than 2-3 organs in pathological process and laboratory confirmation of disorders of exchange of connective tissue (increase of level of a daily excretion of glizaminoglican and oxyproline with urine is found), and also fact identification of the family accumulation of DCT signs. Thus an innovative and perspective method of diagnostics is the molecular and genetic way of research. But, despite it, today pathogenetic mechanisms of DCT development as underestimation of the DCT importance, as a rule, makes negative impact which leads to the defective organization of preventive actions, untimely diagnostics of multiorgan disorders and incorrect choice of tactics of maintaining patients. They are not described and studied.

It is known that DCT makes negative impact on the functional condition of organs and tissues of the oral cavity, and also maxillofacial area. In structural morphological components the connective-tissue origin, including maxillofacial area [44] have many organs and systems of organism. Thus, such phenotypic signs of DCT as anomalies of dentition (64,8%), disoclussion (35,4%) are mostly often revealed. Vestibular inclination of anterior teeth of the upper jaw, descending occlusion, distal occlusion (71%), high Gothic palate (44,4%), dystopia and overcrowding of teeth (55,6%), deflection of nasal septum (16,7%) [21, 29].

Besides, there are data confirming influence of undifferentiated DCT on the processes of reduction of dentoalveolar system which are followed by changes of structure and sizes of maxillary bones and hard tissues of teeth. Thus it was established that reduction processes make negative impact on tooth tissue to a lesser extent as they possess bigger stability. In this regard its maximum values can reach 8,5% which often are followed by formation of teeth contrusion to 63%, and also some anomalies of position of separate teeth where the indicator can reach 40% [37].

Nowadays there are data of interrelation of back posture disorders of the phenotypic signs of DCT connected with the musculoskeletal system, with formation and development of

the dentoalveolar anomalies in children where their frequency varies within digital values from 70 to 96% in some literature [9]. In structure of the dentoalveolar anomalies, deep crossbite and distal occlusion are mostly often revealed [37]. Thus the main forms of scoliosis are characterized as the main manifestations of bone connective-tissue dysplasia (except for idiopathic scoliosis) [48, 50].

At the same time, some researchers have established the interrelation of syndrome of TMJ dysfunction and condition of backbone which characterize that pathogenetic mechanisms of their formation are connected with dysfunction of the musculoskeletal system, anomalies of bite leading to TMJ dysfunction [8]. During the last period in the literature there were data that the dentoalveolar anomalies and deformations were major factors of occlusion defects, occlusive contacts, emergence of supercontacts, which, in turn, create prerequisites to the development of incoordination of chewing group of muscles where there are functional TMJ dysfunctions with the reliable importance. But, at the same time, the predominating role of deep bite to the development of TMJ dysfunction due to the expressed disorder of occlusive surface was defined [33]. According to their data of development of the expressed functional changes of chewing group of muscles are connected with the disorder of relative positioning of elements of joint caused by deviation of articulate head and meniscus of articulate pole and articulate eminence.

According to some authors there is a direct interrelation of underdevelopment of front part of the lower jaw or distal position of the lower jaw among children with scoliosis [21, 47]. Thus F.Ya.Khoroshilkina (2002) noted that children with scoliosis had a high level of prevalence of dentoalveolar anomalies. Besides, the interrelation of TMJ dysfunction with generalized hypermobility of joints and defect of the mitral valve [18] was established. Meanwhile, some authors specify the high level of prevalence of inflammatory processes in the gingival margin among the children having scoliosis [21].

It should be noted that the range of the DCT abnormality are the factors contributing to formation and development of diseases of paradontium which are connected with defects of bite, haemodynamic deviation in system of microcirculation and defect of tissue immunity [32]. Thus there are authentically significant indicators of prevalence of diseases of paradontium among children with DCT, than among somatic healthy children [28]. Meanwhile, there are data that children with DCT have certain diagnostic stomatological markers which are connected with a small threshold of the oral cavity, deep bite, prognathia, congenital shortening of

frenulum of tongue, narrowing of the lower jaw, upper palate, crossbite in frontal part of the lower jaw, diastema, a gum recession in the literature [32, 41].

Nowadays broader studying of dental manifestations of the differentiated DCT forms has been carried out. So, the main phenotypic signs of Marfan's syndrome are the extended and narrow face, various pathologies of auricles up to their absence, deep cavernous eyes and hypertelorism due to the increased ethmoidal labyrinth, frontal eminence which are sharply acting forward, pressed and expanded root of nose,micrognathia, Gothic palate, partially edentulous connected with defects of follicular development of teeth [26]. Thus Ehlers-Danlos syndrome is characterized by existence of cheilitisexfoliativa (dry and exudative form), and also prominent chin, underdeveloped wings and bones of nose, upper jaw, Gothic palate, clefts of hard and soft palate, anomaly of bite, generalized periodontal disease, high prevalence of caries, lack of some teeth or formation of supercontacts are possible [42].

It is necessary to emphasize that the main phenotypic signs of undifferentiated DCT are craniofacial anomalies of development: dolichocephalia, anomalies of development of ears, microgenia, micrognathia, Gothic palate, defects of growth of teeth, anomalies of bite, narrowing of tooth alignments, dense position of teeth of the upper and lower jaw, anomaly of position of separate teeth, pathologies of parodontium of dystrophic and inflammatory character, displastic-dependent form of TMJ defect, increase in excretion of metabolites of connective tissue with urine and saliva [22]. Besides, TMJ dysfunction of syndrome type of connective tissue dysplasia were defined [31].

It should be noted that heavy clinical symptom of TMJ dysfunction is the miofacial pain syndrome that in some references is expressed as Costen's syndrome and maxillofacial dyskinesia. Thus there can be a number of neurodental symptoms which are connected with irradiation of pain in various parts of the face and neck, and usually it is followed with emergence of trigger points in muscles[16]. Besides, similar symptoms in the form of musculo-tonic manifestations are revealed in osteochondrosis of muscles of cervical part of backbone [48]. During the last period the accurate interrelation of influence of the psychoemotional sphere of the patient with expressiveness of the painful symptom in TMJ pathologies [48] was established.

It is necessary to emphasize that the multiorgan DCT defects in a certain degree promotes the development of chronic all-somatic diseases [35]. Development of these diseases promotes decrease in immunobiological reactivity of organism in children and often leads to the

development of secondary immunological insufficiency which are followed with activation of parodontium pathogenic microflora [19]. In this regard the modern concept of etiology and pathogenesis of inflammatory diseases of tissues of parodontium provides, as a key factor decrease in children's immunity [51]. Thus the activated parodontium pathogenic microorganisms promote development of anti-inflammatory cytokines which damage tissues of parodontium [13]. Besides, cytokines which affect the biochemical messengers regulating stimulation and braking of inflammatory reactions which initiate the immune answer and indicate interaction between systems, cells in general [23]. Meanwhile, some authors characterize that IL-1 and TNF, in particular IL-1β and TNF-α have the greatest damaging effect in inflammatory and destructive processes of paradontium tissues. Besides, there are data that pro-inflammatory cytokines define expressiveness of inflammatory process and resorption of bone tissue, especially in generalized defects of parodonium tissues [4]. It should be noted that one of key links of the pathogenetic mechanism of development of chronic inflammatory process in paradontium is the condition of immune system of organism (humoral and cellular) [13].

It is necessary to emphasize that environment and its ecology has important value for certain etiologic and pathogenetic factors of development of inflammation of marginous gum. So, continuous influence of a complex of climatic and ecological factors causes tension of functional activity of organs and systems of organism where "favorable" conditions for emergence and development of pathological processes of organs and tissues of the oral cavity [32, 49] in inhabitants of the North. Among children of school age of 7-14 years of Yakutia the prevalence of diseases of paradontium fluctuates from 39,60 to 84,25% and among teenagers of 15 years this indicator makes 89,36%. Thus the intensification of the peroxidation of lipids (POL) in response to influence of extreme factors is one of pathogenetic mechanisms of development of inflammatory diseases of paradontium. Besides, among the children's population of the North the high level of frequency of congenital cleft of upper lip and palate 1 was noted: 765±68,16 (1,42±0,17%0) where nearly a half (41,21%) of anomalies was presented by one - and bilateral clefts of upper lip, dental arch, hard and soft palate demanding more long-term and difficult treatment. Meanwhile, in this group of children the pH deviation of the mixed saliva to the sour one which leads to decrease of the activity of alkaline phosphatase was noted. Thus concentration of calcium in oral liquid in children with congenital defects was

characterized as the low level which, as a rule, reduces the remineralizing potential of the mixed saliva [15].

It is necessary to emphasize that there is a wide range of various systems of treatment, rehabilitation of patients with DCT. So, T.I. Kadurina (2000) recommends physiotherapy exercises, massage, dietotherapy, vitamins, physical therapy, microcells and metabolites treatment for complex treatment and dispensary supervision of hereditary diseases of connective tissue. These actions, according to the author, stimulate collagen formation and correction of disorders of synthesis of glycosaminoglycan.

For normalization of connective tissue exchange, some authors recommend the use of collagen stabilizing complex with vitamins E, B2, B6 and C for DCT. Thus vitamin E increases antioxidant protection, improves tissue respiration, proliferation of cells, and B6 vitamin improves synthesis of collagen and stabilizes collagenic structures, vitamin C improves synthesis of collagen and pro-collagen. The collagen stabilizing complex is used in pre-and the post-natal periods [32].

It is known that decrease of regenerator potential of connective tissue and hemorrhagic syndrome is one of the brightest manifestations of DCT. In this regard, when carrying out early surgical correction concerning a frenektomy of upper lip (after eruption of the first permanent incisors) and lower lip, tongue (from 2-year age) and difficult removal of teeth, a number of authors recommend the three-day courses "ASCORUTIN", potassium orotat, "CALCIUM-D3 NYCOMED" in combination with "DICYNONE" and SUMAMED" (250 mg) for the purpose of increase of extent of regeneration of connective tissue, and also prevention intra-and post-operational bleedings and inflammatory complications [54].

It should be noted that organized system of medical care has important value in improvement of specialized dental help for children and teenagers with DCT. In this regard a certain algorithm (stage-by-stage solution) which includes definition of the accompanying pathology, symptoms of illness, hidden manifestations, including small and big signs, search of diagnostic reference point, preliminary scheme of examination, preliminary diagnosis, additional researches, specified diagnosis, individual plan of dental treatment and dispensary supervision was developed. Thus E.E. Statovskaya and T.I. Kadurin (2013) recommend considering advanced diagnostics which is connected with the dental functional analysis and examination by experts (cardiologist, orthopedist-vertebrologist, oculist, endocrinologist, neurologist, psychotherapist, gastroenterologist, therapeutist, pediatrician, etc.) that will allow early identification and treatment of the diseases associated with DCT.

CONCLUSION

Thus, prevention of diseases of pathological processes of organs and tissues of the oral cavity and also maxillofacial area among children with DCT has certain features. Thus similar researches in the conditions of the Republic of Sakha (Yakutia) haven't been studied yet earlier that dictates need of complex researches taking into account specific regional biological and environmental risk factors of formation and development of dental diseases in children with DCT.

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