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EFFECTIVENESS OF THERAPEUTIC POSITIONING WITH CONSIDERATION OF REMODELLING FACTORS IN CONSERVATIVE TREATMENT OF MANDIBULAR HYPOPLASIA IN CHILDREN

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Abstract
The article presents a brief review of the literature, analysis of the results of health assessment in 28 children with hemifacial microsomia with the involvement of paediatric specialists. The results of 3-year follow-up of the patient with HFM at the 1st and 2nd stages of somatic and orthodontic method with therapeutic positioning with creation of conditions for self-regulation and restorative processes are presented.

Keywords Hypoplasia of the lower jaw hemifacial microsomia (HFM), connective tissue dysplasia, pathology of gastrointestinal tract organs, nervous, excretory systems, musculoskeletal apparatus, interdisciplinary approach to diagnosis, orthodontic treatment, therapeutic positioning of the lower jaw.

INTRODUCTION

Taking into account the age and condition of the teeth, known removable plate appliances were used. They indicate the effectiveness of conservative treatment with a multidisciplinary approach. The overall effect of this treatment approach was firstly manifested in the improvement of neurological and respiratory status, cessation or significant reduction of cephalgia intensity, improvement of sleep, digestion and other parameters. The results also confirm the improvement of the remodelling of the mandible, maxilla and other facial bones with a tendency to equalisation of linear and angular parameters, and the possibility of improving (reforming) the shape of the mandible by gentle conservative treatment of children during the growth period. They point to the effectiveness of conservative complex treatment with a multidisciplinary approach.

Early diagnosis and adequate treatment of patients with congenital facial malformations is one of the most difficult tasks of modern paediatric maxillofacial surgery, orthodontics and all areas of paediatrics. Hemifacial microsomia (HFM) is the most complex among them, with pronounced hypoplasia of the upper jaw and lower jaw and

functional disorders, which requires long-term orthodontic and surgical treatment for many years.

Unilateral HFM of varying degrees: condyle, branch, body is due to growth centre abnormalities. It may be associated with head and neck syndromes, including mandibular-facial dysostosis, oculo-auriculo-vertebral syndrome (Goldenhar syndrome) and hemifacial microsomia. In the most severe cases, agenesis of the entire condyle or a branch (condylar aplasia) may be observed. The most common cause is due to trauma to the condyle in the first period after birth, other causes include infection, radiation therapy and rheumatoid or degenerative arthritis [6,30,29].

Reports of early conservative orthodontic treatment alone in young children show that satisfactory results were not always achieved. The treatment was only aimed at achieving a normal shape of the dental rows and their relationship, and did not always improve the symmetry of the lower and upper jaws [16].

The use of an improved algorithm for distraction osteogenesis, including computer planning, the use of curvilinear compression-distraction appliances (CDA), gentle operative techniques, and ultrasound control at the distraction stage, allows us to obtain predictable results and a full-fledged bone regenerate. Early onset of orthodontic treatment helps to achieve constructive occlusion at the postdistraction stage, which in some cases makes it possible to avoid additional surgical interventions. In the presence of residual signs of deformity, reconstructive surgery may be necessary at the stage of appliance removal. [5]

The optimal age for surgical correction is considered to be 15 years in boys and 13-15 years in girls, i.e. it is recommended to postpone surgery until the completion of tooth and bone growth. to avoid recurrence of asymmetry and the need for additional surgery, as well as to reduce blood loss and improve patient compliance.

The main way of monitoring the effectiveness of treatment is nowadays always radiological with cone-beam, 3-D and computed tomography, while conventional radiographic methods are considered ineffective. [9]. However, the frequent use of radial diagnosis in children is strictly limited due to the high radiation exposure to the growing body, so the focus of clinicians' attention is shifting from mechanical assessment to the evaluation of facial aesthetics as well as the assessment of functional impairment . [7,8]

Unfortunately recurrences and complications are not uncommon . A systematic review by Verlinden et al found a complication rate of 43.9%, with 13.9% requiring reoperation, hospitalisation or resulting in irreversible consequences . Dislocation of the mandible occurred in 0.6% of cases. Fracture of the mandible occurred in 2.8%. Other postoperative complications include bone nonunion, inadequate bone formation, metalwork exposure, facial scarring, wound infection and mandibular necrosis indicate the need to limit the . [31] Therefore, a differential approach to planning hardware-surgical correction of jaw asymmetries is recommended[1].

Studies on postoperative cephalograms and radiographs have shown that mandibular distraction osteogenesis with internal devices is effective in lengthening the mandible and improving facial symmetry, appearance, and dentition [22] However, there are few studies on long-term outcomes. Hollier et al, Meazzini MC, - followed patients from 12 to 92 months and found a recurrence rate of 51% to 100% between 42 and 92 months. The recurrence rate, requiring reoperations with wound revision. [24,23, 26,14] This emphasises the importance of monitoring patients before skeletal and dental formation. In a 2012 study by Meazzini MC et al showed that the asymmetric facial proportions and growth patterns of HFM patients are genetically determined and revert to baseline asymmetry even after HF distraction Patients and their families should be informed of the high likelihood of revision surgery during childhood and adolescence.

In a review of 17 patients operated on for unilateral hemifacial microsomia and followed for 18 years, several treatment principles are clarified:. Treatment is facilitated by dysplasia-dominated

grouping, with the underlying functional deformity dictating the sequence of repair.

In the etiology of HFM, the authors mainly emphasise the genetic factor as it is a complex congenital disease. Therefore, special attention is paid to comprehensive planning and team approach to diagnosis and treatment. Currently, connective tissue dysplasia (CTD) is considered as a constitutional basis for multi-organ disorders in children and adolescents. The severity of dysplasia predetermines the frequency and time of irreversible disabling consequences of connective tissue restructuring, necessitates the development of timely and modern therapeutic and preventive measures for this category of children and adolescents.[2] The frequency of DST syndrome detection is quite high - from 26 to 80% depending on the study group. Thus, according to G.I.Nechaeva et al. (2010), from 74 to 85% of school-age children have various signs of DST. [2]

Purpose of the study : To evaluate the results of an interdisciplinary approach to conservative treatment of DST in children using an orthodontic method with therapeutic positioning of the mandible.

Material and methods of examination : We examined 40 children with HND caused by GFM in the clinic of children's maxillofacial surgery of the Tashkent State Dental Institute and the City Children's Medical Consultative and Diagnostic Centre. In diagnosing GFM we used the classification of Kaban L. B, et al.[25] We determined type I in 23 patients. Components of mandibular and temporomandibular joints were present and had normal shape, but were hypoplastic to varying degrees; type IIa, when mandibular branch, condyle and temporomandibular joint were present, but were hypoplastic and had abnormal shape - in 5 patients. Examination and treatment were carried out in 28 patients (Table 1). Patients aged 4-12 years-24 patients were treated more often. (Table 1) All patients presented local and general complaints characteristic for this pathology and similar in content but different in severity (Table 2).

Table 1

Distribution of patients by age and sex

Gender/age.	**4-7 years**	**8-12 years**	**13-19 years**	Total
Boy	5	6	3	14
Girl	3	10	1	14
Total	8	16	4	28

Frequent complications and recurrences in short-term and long-term follow-up indicated to us the need for a more rational approach to the method and timing of surgical stages and a careful study of risk factors for their development in the growing organism of the child. [3,4] The processes of progressive and regressive remodelling according to W.Moffet, occurring in the bone tissue of the jaws and bones of the facial skeleton [28], as well as the surrounding soft tissues, were also taken into account. Types of orthodontic appliances, forces and directions of functional loading, and morphofunctional disorders in the joint area were determined.

All parents of patients were familiarised with surgical and orthodontic methods and possible complications. We planned the treatment taking

into account the revealed somatic pathology as well as the wishes of the patient. We have created schemes of causal relationship in the development of jaw deformities in children after primary bone diseases and TMJ lesions, after congenital hypo-aplasia of the articular head of the mandible on the background of connective tissue dysplasia . [10,11]

(Table 2). A comprehensive study of the health status of children with mandibular hypoplasia revealed the uniformity of pathological processes in internal organs with predominant lesions of the GI tract, CNS, ENS, kidneys, and respiratory organs, combined into manageable risk factors.

Table 2

Nosological forms of diseases of internal organs and systems in children with hemifacial microsomia (n=25 people).

№ п/п	Name of diseases	Number patients
1	Functional bowel disorders. Chronic constipation	18
2	Chronic enterocolitis	8
3	Dyskinesia of biliary tract DZVP	18
4	Chronic cholecystitis	10
5	Encephalocerebroasthenia gravis	12
6	Dysmetabolic nephropathy with oxaluria	20
7	Vegetovascular dystonia	18
	MMD (minimal brain dysfunction)	8
8	Central paresis .facialis	5
9	Neuropathy of n.facialis	18
10	Asthenoneurotic syndrome	8
11	Myasthenia gravis (unilateral)	3
12	Multiple caries	21
13	Posture disorder	23
14	Joint hypermobility	25
15	Skull deformity	8
16	Chest deformity	17
17	Spinal deformity	24
18	Flat feet	21
19	Thyroid hyperplasia II-III stages Euthyroidism	9
20	Restrictive bronchial patency disorder	17
21	Ehlers-Danlos syndrome	4

22	Marfanea syndrome0	

They cause the development of dysmetabolic dysplastic processes with disturbance of all types of metabolism, including mineral metabolism, delayed physical development (DFD) and deformation of the bone system and jaws [3,10].

Therapeutic positioning with functional unloading of the joint was preceded by complex somatic treatment.

Table. 3

Change in complaints of patients with hemifacial microsomia after treatment with the proposed method. n= 25 people.

	Name of complaint	Frequency of complaints .	
		Before treatment	After treatment
1	Rapid fatigue	23	2
2	Sweating	24	-
3	Headaches	23	-
4	Irritability, tearfulness	24	-
5	Disturbance of breathing, especially at night with heavy snoring	18	2
6	Nasal discharge	18	5
6	Abdominal pain	23	-
7	Pain and heaviness in the right subcostal region	18	-
8	Fat indigestibility	18	5
9	Intolerance to dairy products	19	5

10	Frequent constipation	25	-
11	Nausea	23	-
12	Low back pain	18	3

On this background it had an aesthetic and functional effect stress and accordingly local pathochemical changes with disturbance of bone modelling and remodelling with participation of pathogenic enzymes, increasing destruction of TMJ complex tissues were eliminated. Autotraining, massage of soft tissues of the neck, face and therapeutic gymnastics relieves persistent musculo-articular imbalance, the installation of a persistent myotatic reflex to this position is carried out. Bite separation with withdrawal and positioning removes traumatic occlusion with overload of paradontal tissues on the short стороне eliminates unilateral growth retardation and digging of teeth, delay of vertical and longitudinal growth of LF and HF., as a result normal breathing is restored has an antihypoxant effect with its consequences. We think that this explains the restoration of jaw shapes in hypoplasia with TMJ pathology. We have identified and eliminated, if possible, the factors negatively influencing the processes of modelling and remodelling of the bone tissue of the jaws and facial bones in children with hemifacial microsomia. Considering the findings of Moffett B Jr. , Johnson L, McCabe, et al. and our own research results, we drew up a scheme of conservative treatment, therapeutic gymnastics taking into account local complaints and factors regulating them. The scheme of complex treatment of children with temporomandibular joint pathology with the first orthodontic stage to achieve balanced facial animation; with acceptable self-esteem was taken as a basis.

[12].

If the orthodontic appliance is worn improperly or if the appliance is removed and discontinued independently after each stage or during the retention period, the reverse process may occur.

Diet during orthodontic treatment: the food is nutritious, the composition of ingredients depends on the identified pathology of internal organs.

In the course of treatment, prevention of harmful effects of orthodontic appliances, treatment of carious and non-carious lesions of teeth, rational prosthetics were carried out. Different degree of hypoplasia severity creates difficulties in carrying out comparative statistical analysis of treatment results in all examined patients. Therefore, we present a clinical example of complex treatment of a patient.

Clinical example. Patient D.T. 9 years old with hemifacial microsomia on the right side came to the clinic with parental complaints of facial and cranial deformities, posture disorders. Irregular bite with deformation of tooth rows. Headaches, sweating, breathing disorders, especially at night with snoring, nasal discharge, irritability, tearfulness, poor memory, withdrawn. Periodic twitching of the toes, abdominal pain, nausea, chronic constipation.

Initial vegetative tone-hypersympathicotonic, vegetative reactivity-hypersympathicotonia, adaptive and compensatory-adaptive processes are overstressed. At the first stage somatic disorders were treated. After the treatment there was a significant improvement of the general condition. then we started therapeutic positioning. The patient had no signs of Goldenhar syndrome, but during medical and genetic examination together with other specialists were diagnosed: Mobius syndrome, Functional bowel disorders, chronic constipation. Biliary dyskinesia. Asthenoneurotic syndrome. Facial neuropathy. Strabismus. Hypermobility of joints. Violation of posture, scoliosis, flat feet. Violation of bronchial

patency by restrictive type. Hemisinusitis. Hyperplasia of the thyroid gland, euthyroidism. Dysmetabolic nephropathy with oxalatouria Diagnoses were established based on the results of clinical, laboratory and functional studies.

The data on changes in mandibular parameters in the result of conservative therapy of somatic diseases orthodontic treatment are shown in Table 5.

Table 5.

Changes in the parameters of the mandible in patient T.D., 9 years old

as a result of orodontic treatment

Parameters and units	Before treatment		After treatment	
	on the right	on the left	on the right	on the left
Length of condyle(rx)	46,2	54,3	72,8	70,0
Branch length	140,4	167,0	219,8	197,9
Body length	220.2	192.9	304,5	316,9
Head height(mm)	12,0	11,6	13,8	15,1
Head width(mm)	8,87	7,5	9,97	9,99
Head length (mm)	6,05	4,3	15,7	16,5
Chin centre-midline angle (deg)	8,9		1,6	
Branch-to-body angle (sagitt)	141,8	118,1	136,1	133,6
Angle of occlusal plane inclination (deg)	4.1		1,3	
Width of the sagital cleft of the pharynx (mm)	4,93		12,3	
Width of the sagital gap between the incisors.	8,9		1,64	
Densitometry results (Hfd)	362,2	384,9	354.1	264,2

As a result of orthodontic treatment with therapeutic positioning of the lower jaw,positive aesthetic (photometric) and functional results were achieved - normalisation of the facial shape, which led to improvement of the child's psycho-emotional status and breathing. The analysis of MSCTomogam was carried out using the RadiAnt DICOM Viewer software. A tendency to alignment of linear and angular parameters with improvement (reformation) of the mandibular shape, as well as bone density was established.

Conclusion. The results of the study confirm the improvement of remodelling of the lower, upper jaws and other facial bones with a tendency to equalisation of linear and angular indices and improvement (reformation) of the shape of the

lower jaw during conservative treatment of children with hypoplasia of the lower jaw caused by GFM. In this article we present the results of short-term observations at the 1st and 2nd stages of treatment. They indicate the effectiveness of conservative complex treatment with interdisciplinary approach. The overall effect of this approach to orthodontic treatment was firstly manifested in the improvement of neurological status and breathing, which was expressed in the cessation or significant reduction of cephalgia intensity, improvement of sleep, digestion and other disorders) of the mandibular shape in a gentle conservative method of treatment of children during the growth period.

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