

CHARACTERISTICS OF CLINICAL- MORPHOMETRIC PARAMETERS AND EVALUATION OF RESULTS OF SURGICAL TREATMENT OF PATIENTS WITH GNATHIC FORMS OF OCCLUSION ANOMALIES

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Abstract---Some authors' analyses indicated that the search for the best treatment option for patients with congenital and acquired facial skeleton deformations has been going on for more than 40 years and it does not disappear significance even today. The aim was to study the clinical and morphometric parameters of patients with gnathic forms of occlusion anomalies and to evaluate results of surgical treatment. Archival materials of 38 patients who were under medical observation at the Department of Pediatric Maxillofacial Surgery at the Tashkent State Dental Institute Clinic were analyzed for evaluating morphometric parameters of maxillofacial part of patients with congenital and acquired facial skeleton deformations. Classification of malocclusion which proposed by E. Angle were used in order to identify deformity of the facial skeleton, depending on the severity in one plane or another, type of affiliation. Based on the analysis of the research results, the treatment and rehabilitation of patients with common deformities of the jaw, and patients with congenital and acquired facial skeleton deformations in particular, cause great difficulties and require additional procedures to organize their psychological rehabilitation.

Keywords---congenital and acquired facial skeleton deformations, gnathic forms of occlusion anomalies, deformities of the jaw, orthognathic surgery.

I. INTRODUCTION

Domestic and foreign authors' analysis of clinical research data indicates that the search for the best treatment algorithm for patients with congenital and acquired facial skeleton deformations has been going on for more than 40 years and does not lose its relevance to this day. Primarily, the high frequency of this pathology determines the importance of the problem.

Today, the issues of diagnosis and treatment of patients with various deformations of the facial skeleton are widely covered. A special place in the medical rehabilitation of patients with gnathic forms of occlusion anomalies (GFOA) is

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given to orthognathic surgery, which allows eliminating anatomical, functional and aesthetic disorders. Studies carried out over several decades have allowed determining the most effective methods of surgical treatment of patients with GFOA, modernizing treatment methods and achieving fairly good functional and aesthetic indicators.

At the same time, there domestic and foreign publications have reported on complications occurring in different stages of medical rehabilitation of patients with dentoalveolar anomalies. It should be noted that these studies, for the most part, were episodic in nature, based on a small amount of clinical material and reduced only to a statement of the most common complications without identifying ways and methods of preventing them.

Factors of symmetry, proportionality and compliance with the averaged standard of external attractiveness (ASEA) are in the basis of fundamental concepts which structuring the main tasks of complex treatment. Supervised patients' the ethno – cultural features are an important factor influencing the objectification of the strategic goals of orthognathic surgery. The degree of inconsistency of the treatment plan for patients of different ethnic groups with similar deformities varies from 28 to 50%.

It is known that the deformation of the maxillofacial area causes serious emotional experiences of a person. For a person, a face is his connecting node in social relationship. People convey their emotions, their inner and outer worldview through their face. Consequently, a person experiences disfigurement of his face as a deep shock of the personality basis. One of the important aspects of evaluating the outcome of complex treatment of patients with GFOA is the patient's satisfaction with the result of the treatment. Anomalies of the bite and the resulting differences in the shape and proportions of the face, functional disorders are closely intertwined.

The purpose of the study: to study the clinical and morphometric parameters of patients with GFOA and to evaluate results of surgical treatment.

II. MATERIALS AND RESEARCH METHODS

Archival materials of thirty – eight ethnic Uzbeks patients who were under medical observation at the Department of Pediatric Maxillofacial Surgery of the TSDI Clinic were analyzed in order to evaluate morphometric parameters of maxillofacial part of patients with GFOA. We have used the classification of malocclusion proposed by E. Angle in order to identify deformity of the facial skeleton, depending on the severity in one plane or another, type of affiliation.

Patients after diagnosis, depending on the type of occlusion anomaly, were divided into the following 2 groups: 1 - the group consisted of class II patients (E. Engel, 1898) - distal occlusion (upper macrognathism, lower microretrognathia); 2 - group - III class - mesial occlusion (lower macrognathism, upper microretrognathia). All patients underwent a clinical and radiological examination: clinical examination, identification of complaints, assessment of the condition of the dentoalveolar system and tissues of the maxillofacial region, anthropometry of face proportions, teleroentgenography in direct and lateral projections.

Table 1.Classification of the patients by age and gender

Group	Gender	Age group			Total	
		14-19	20-24	25-35		
Group #1	Male	4	2	1	7	16
	Female	5	4	-	9	

Group #2	Male	3	6	-	9	22
	Female	7	4	2	13	
Total		19	16	3	38	

We have used the cephalometric parameters of the Dolphin computer program in order to assess the skeletal signs of the development of the jaws, the symmetry of the bones of the facial skull, and the main cephalometric parameters. And we have studied the following parameters: absolute length of the upper jaw (PNS-ANS), absolute length of the lower jaw (Go-Pg), and height of the middle third faces (N-ANS), the height of the lower third of the face (ANS-Gn) (Fig. 1)

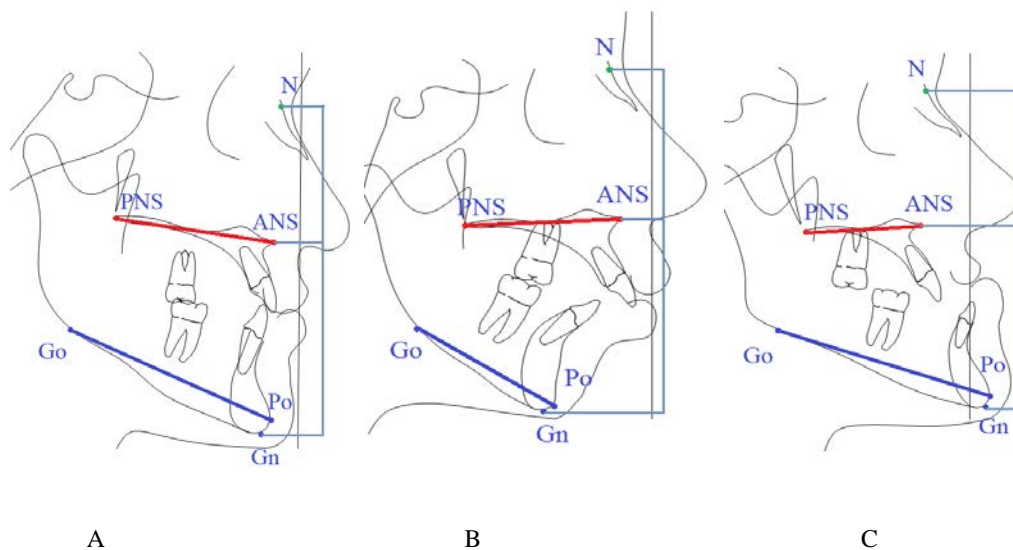


Fig.1 Schematic picture of the length of the facial skeleton:

PNS-ANS - the absolute length of the upper jaw,

Go-Pg - the absolute length of the lower jaw,

N-ANS — height of the average third of the face,

ANS-Gn - the height of the lower third of the face.

A –sizes of the facial skeleton in patients with orthognathic bite,

B –sizes of the facial skeleton in patients with a distal bite,

C –sizes of the facial skeleton in patients with a mesial bite,

Position of the upper and lower jaw and intermaxillary differential (SNA, SNB, ANB) (Fig. 2). Cephalometric indicators of the norm of individuals of the Uzbek population were taken as control.

In our opinion, these examinations allow a comparative assessment of the skeletal signs of jaw development, assessing the symmetry of the bones of the facial skull, and evaluating the main cephalometric parameters of a patient with GFOA.

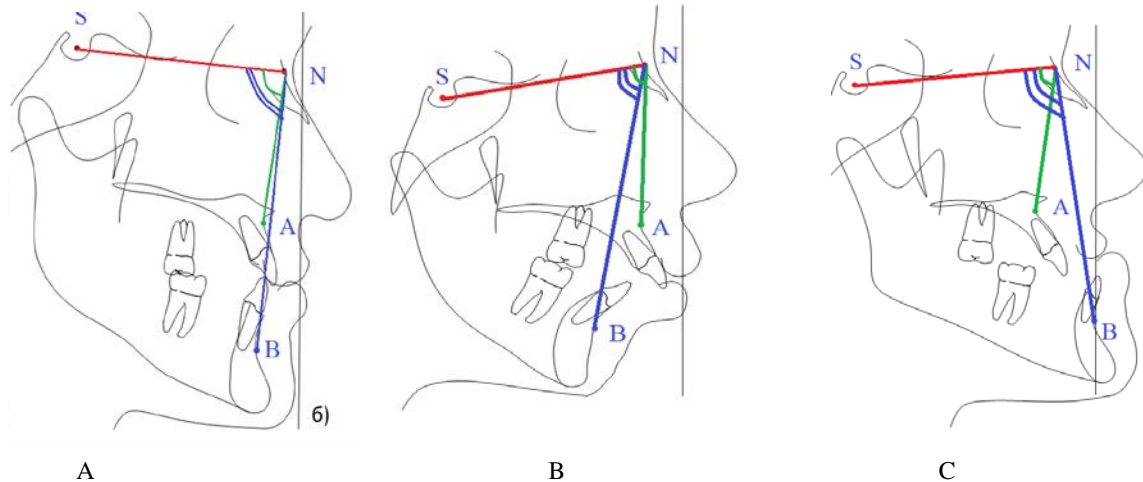


Fig. 2. Schematic picture of angles: SNA, SNB, ANB:

A - with an orthognathic bite, B - with a distal bite, C - with a mesial bite.

There has been conducted a survey of 67 patients with defects and deformities of the jaw (DDJ) who were registered at the clinic of the surgical dentists TSDI from 2009 to 2017, to assess the psycho-emotional state. The distribution of patients depending on gender and age is presented in table2.

Table #2. Classification of the patients by pathology form and age

PATHOLOGY FORM	GEND ER	AGE GROUP			TOTAL	
		14-19	20-24	25-35		
CongenitalDDJ	Male	7	5	1	13	30
	Female	6	9	2	17	
AcquiredDDJ	Male	5	8	2	15	37
	Female	8	10	4	22	
TOTAL		26	32	9	67	

The survey was carried out using two types of questionnaires:

1) Clinical Questionnaire - to identify and evaluate neurotic states. It is used to identify and evaluate neurotic states. K.K. Yakhin and D.M. Mendelevich have developed the test. The test is intended for a qualitative analysis of neurotic manifestations and allows identifying the main syndromes of neurotic states on the following six scales: anxiety, neurotic depression, asthenia, hysterical type of reactions, depressive-phobic disturbances (obsessions), and vegetative disorders. The questionnaire contains 68 questions. The respondent is asked to evaluate his current state using five-point system: 5 points - never, 4 points - rarely, 3 points - sometimes, 2 points - often, 1 point - constantly or always. The diagnostic coefficients on six scales are summarized and are built a graph. The indicator more than +1.28 indicates the level of health, less - 1.28- the painful nature of the detected disorders.

2) The technique of self-assessment of emotional states is used for self-assessment of emotional states and the degree of wakefulness. Measurement in this technique is carried out in a ten-point (wall) system. If the total score is from 26 to 40, then the respondent highly assesses his emotional state, if from 15 to 25 points, then the emotional state is average assessment and low assessment is from 4 to 14 points.

The results of the study. The study results analysis of aesthetic parameters before surgery in patients of group #1 shows that the ratio of the average height of the face is more than 1 relative to the lower height (normal 1: 1), which indicates an increase in the size of the upper jaw or a decrease in the size of the lower jaw.

In this study group, 14 patients has presented aesthetic complaints (87.5%), which were expressed in a decrease in the lower third of the face and crowding of the dentition in 11 patients (68.8%), insufficient visualization of the maxillary incisors while smiling in 5 patients (31, 3%). Patients of this group are characterized by complaints of clicking in the area of the temporal-mandibular joints - 3 patients (18.7%), fatigue of the masticatory muscles in 4 patients (25%) and difficulty in nasal breathing in six patients (37.5%).

Patients of this group showed characteristic features of the face: there was noted a violation of the proportions of the face due to shortening of its lower part. The labiomental fold was high and deep. All patients had a distal position of the chin in relation to the middle part of the face. With a pronounced retroposition of the lower jaw in the resting position, the closing of the lips was broken: the mouth is half-open, the incisors of the upper jaw are visible from under the upper lip. When examining the oral cavity in a patient (6.25%), a small vestibule of the oral cavity in the anterior lower jaw and a high attachment of the frenum of the lower lip and cords of the oral mucosa were revealed. In two patients (12.5%), protrusion of the incisors of both jaws, in three patients (18.8%) - retrusion of the upper incisors were noted, while all patients had a close position of the front teeth. In addition, deformity of the occlusal plane, distal occlusion of the posterior teeth, and incisal disocclusion (sagittal fissure reached an average of 7-13 mm) were noted in all patients. Most patients had deep incisive disocclusion, and two patients (12.5%) had vertical incisive disocclusion. We also observed deformation of the dentoalveolar arches of the jaws: shortening of the lower dental arch, narrowing of the dental arches in the lateral parts.

The results of the study of aesthetic parameters before surgery in patients of the second group show the presence of a variety of skeletal disorders. In patients of this group, the ratio of the average height of the face is less than one relative to the lower height, which indicates an increase in the size of the lower jaw or a decrease in the size of the upper jaw.

In this group, all 22 patients complained of cosmetic defects (100%), which were expressed in the excessive severity of the chin area - 21 cases (94.5%), and lengthening of the lower third of the face - 18 cases (81%). In addition, four patients (18%) complained of insufficient severity of gonial angles, 12 patients (54%) were worried about crowding teeth; tension in closing lips and the presence of a “gingival” smile were observed in 13 patients (58.5%). Moreover, seven (31.5%) patients complained of a “hump” in the back of the nose and difficulty in nasal breathing in 14 (63%), 9 patients (40.5%) noted difficulties in biting off food.

In patients of this study group, an increase in body length prevailed, which was combined with an increase in gonial angle indices over 123-124 °. The height of the chin of the lower jaw has been increased. The height of the branches was within normal limits. In such patients, a decrease in the volume of the oral cavity and an incorrect position of the tongue were noted. The imbalance of the front and rear facial height was revealed. It should be noted that in patients with a

pronounced increase in gonial angle, lower jaw height and anterior facial height indices, “long face syndrome” was revealed and an increase in the inclination of the front teeth and vertical disocclusion of the dentition with back overlap were observed.

Analysis of the results of cephalometric parameters study in patients of group #1 shows (Tab. 3) that the average value of the length of the upper jaw (PNS-ANS) in patients of this group was 50.5 ± 0.31 mm. The average value of the absolute length of the lower jaw (Go-Gn) was 74.5 ± 1.21 mm, which indicates a small size of the lower jaw, the anterior height of the middle third of the face (N-ANS) was 52.45 ± 1.83 mm. The average value of the height of the lower third of the face (ANS-Gn) was 61.1 ± 1.88 mm, which indicates the underdevelopment of the lower third of the face.

Table #3. Jaw size cephalometry in patients with GFOA

Study group	Gender	ANS-PNS (mm)	Go-me (mm)	Go-Gn(mm)	N-ANS (mm)	ANS-Gn (mm)	Ar-Go (mm)
Group #1	M	52,0±0,5 1	71,6±0,6 4	75,9±0,83	53,1±0,72	63,3±0,47	54,7±1,27
	F	49,1±0,3	68,7±0,1 7	73,1±0,53	51,8±0,97	58,9±0,81	48,9±0,94
	Ave.	50,5±0,3 1	70,1±0,3 9	74,5±1,21	52,45±1,8 3	61,1±1,88	51,8±0,78
Group #2	M	50,1±0,7 2	75,8±1,1 4	82,6±0,92	52,2±0,24	72,5±0,19	59,3±0,61
	F	46,9±0,5 1	71,3±0,6 2	76,7±0,88	50,1±0,78	65,7±0,37	52,1±0,48
	Ave.	48,5±0,5 9	73,5±0,5 8	79,6±0,63	51,1±1,36	69,1±1,09	55,7±0,14
Contro 1	M	51,9±0,5 2	73,9±0,8 2	79,7±0,82	54,93±0,5 8	68±0,84	54,9±0,74
	F	47,8±0,4 4	68,5±0,6 5	74,0±0,69	50,02±0,8 1	61,5±1,12	48,5±0,56
	Ave.	49,8±0,4	71,2±0,5 9	76,8±0,61	52,62±0,5	64,98±0,7 7	51,7±0,57

Note: control - results of S.S. Murtazayev 's study (2018)

In patients of the second group, the results of the study of cephalometric parameters show that the average value of the length of the upper jaw (PNS-ANS) was 48.5 ± 0.59 mm, which indicates a small size of the upper jaw (Table 2). The average length of the lower jaw (Go-Gn) was 79.6 ± 0.63 mm, which indicates an increase in the size of the lower jaw. The average height of the middle third of the face (N-ANS) was 51.1 ± 1.36 mm, which indicates a small size of the middle third of the face. The average height of the lower third of the face (ANS-Gn) was 69.1 ± 1.09 mm, which indicates an increase in the size of the lower third of the face. The scatter of indicators in the study group was very significant (the

maximum size of the lower third varies from the maximum – 76.3 mm. To the minimum – 57 mm). This indicates a large variability of the source data.

The results of studies of the jaw angles in patients of group #1 show that the average SNA was $83.5 \pm 2.49^\circ$ (Table 4), which indicates a tendency to the anterior position of the upper jaw. The average value of the SNB angle indicator was $77.3 \pm 2.38^\circ$, which indicates a decrease in the angle due to the small size of the lower jaw. The average ANB angle in patients with distal occlusion was $7.15 \pm 0.66^\circ$, which indicates an increase in the angle.

Table #4. Cephalometry jaw angles in patients with GFOA

Study group	Gender	Angle SNA (°)	Angle SNB (°)	Angle ANB (°)
Group #1	M	84,1±0,83	77,8±1,19	8,1±0,33
	F	82,9±0,79	76,9±0,85	6,2±0,73
	Average	83,5±2,49	77,3±2,38	7,15±0,66
Group #2	M	81,4±0,27	87,9±0,54	-6,2±0,42
	F	80,2±0,65	85,1±0,81	-5,4±0,78
	Average	80,8±0,71	86,5±1,01	-5,8±0,64
Control	M	82,9±0,53	80,3±0,53	2,7±0,28
	F	82,1±0,44	79,6±0,44	2,6±0,23
	Average	82,5±0,35	79,9±0,34	2,7±0,18

Note: control - results of S.S. Murtazayev 's study (2018)

In patients of group #2, the SNA angle had an average value of $81.47^\circ \pm 0.71^\circ$ (Table 3), which indicates the normal position of the upper jaw, the average value of the SNB angle was $86.5 \pm 1.01^\circ$, which indicates an increase the magnitude of the angle and the increase in the size of the lower jaw. The average ANB angle, representing the difference between the SNA and SNB angles, was $-5.8 \pm 0.64^\circ$.

Thus, our data confirm the idea that cephalometric analyzes are often based on a comparison of the data obtained from the examination of a particular patient (group of patients) with the average values in this population. The obtained data will serve as the basis for a judgment on deviations of the norm in the facial skeleton and, in particular, in its gnathicarea among ethnic Uzbeks. These parameters will be the normal criteria for cephalometric studies in the treatment of patients with dentoalveolar anomalies, in particular patients with GFOA, which ultimately facilitates the clinical diagnosis, a rational plan of orthodontic, surgical treatment and assessment of their immediate and long-term results.

The studied group of patients was comprehensively examined and comprehensive preparation was carried out before the operation. For clarity, we present several cases from clinical practice.

Clinical case No. 1.

Patient Anvarov I., 18 years old, complained of changes in the shape and aesthetics of his face, incorrect closing of teeth, and difficulty in chewing food (Fig. 3). At the age of 10-11 years, parents began to notice mixing of the lower jaw and after this, asymmetry of the face and deformation of the lower jaw gradually developed. He has been receiving orthodontic treatment within three months.



Fig 3. Photos (front and profile) of patient Anvarov I. before the operation.

We conducted clinical studies of the face and bite, face photographs, teleroentgenography, orthopantomogram, MSCT of the maxillofacial region and gypsum model. (Fig. 4).

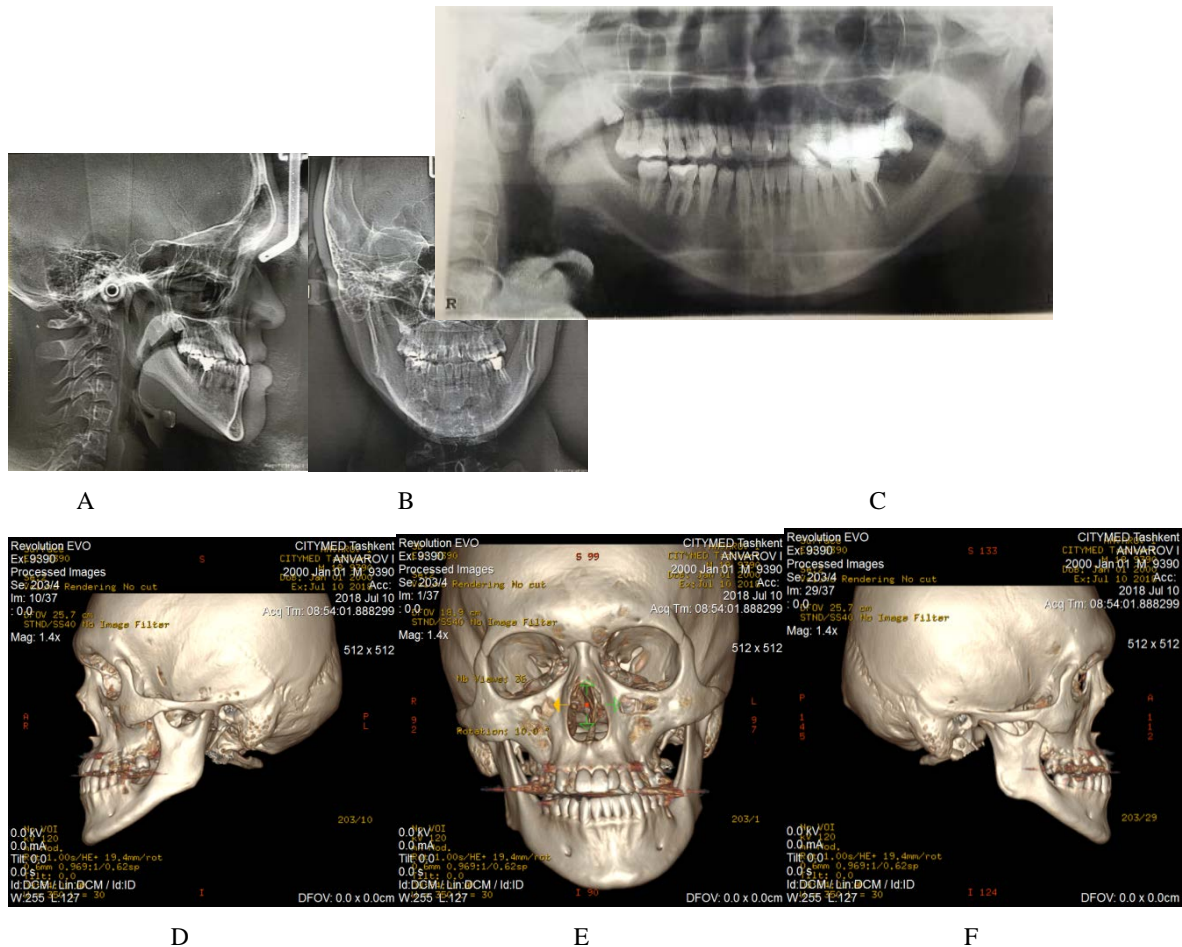


Fig. 4. Additional studies of the patient: A) Telerontgenography of the head of the lateral projection; B) Telerontgenography of the head of a direct projection; C) Orthopantomogram; D) MSCT maxillofacial area on the left; E) MSCT maxillofacial area direct; F) MSCT maxillofacial area on the right.

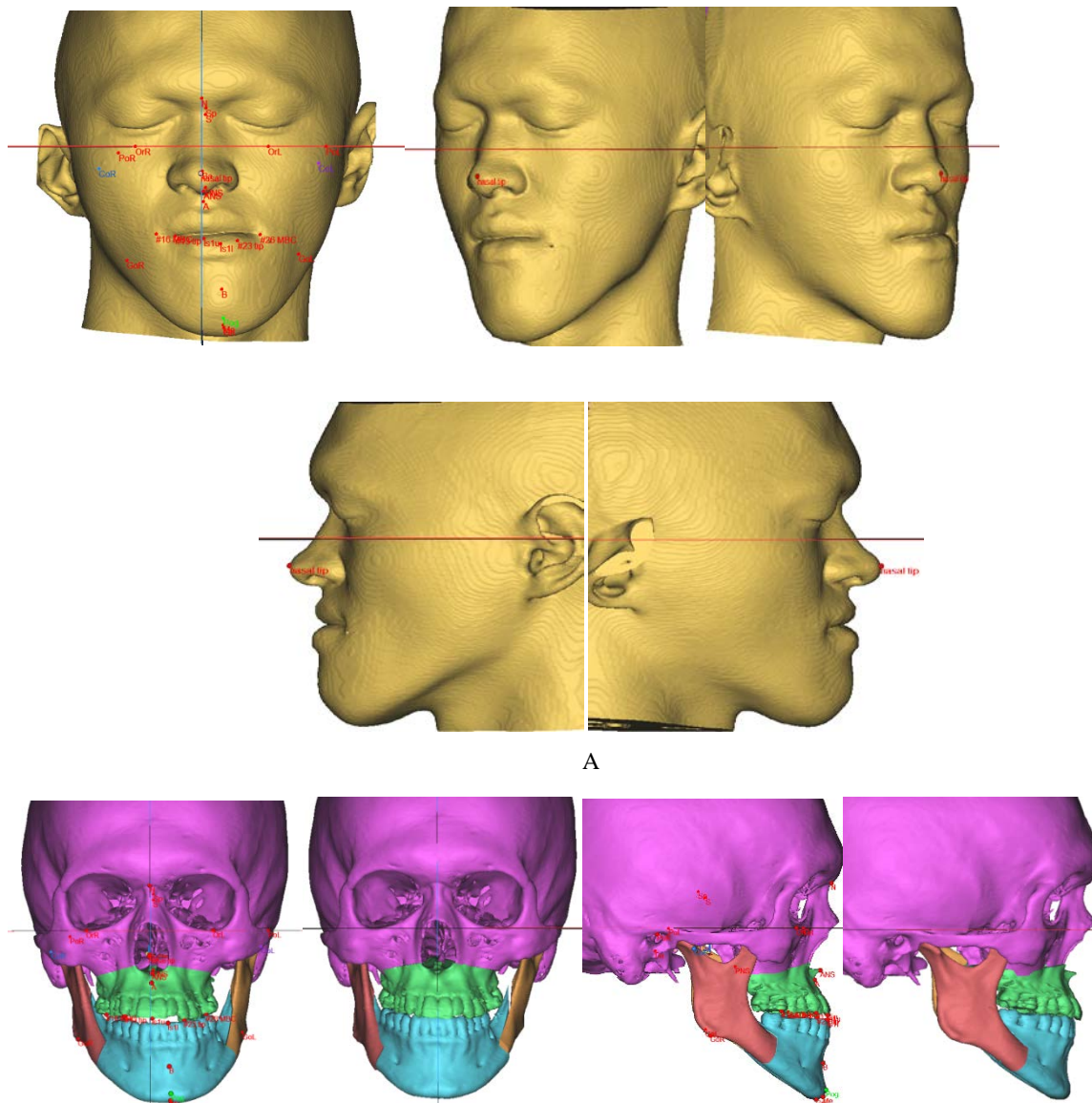
After the examination, the following diagnosis was made: “Asymmetry of the face due to displacement to the left. Lower prognathia. Hypoplasia of the upper jaw. The necessary condition has been created in the period of orthodontic preparation - when fixing the upper and lower jaws; their ratio has guaranteed the correct bite.

An orthodontic treatment plan and a preliminary surgical treatment plan have been drawn up, which was agreed between the orthodontist and the surgeon. The plan and drawings of face changes in details were discussed with the patient and his parents.

At the surgical stage, the treatment plan was that the operation would be performed on two jaws: on the lower jaw, split the branch of the lower jaw on both sides, move the medial fragment to the back. On the upper jaw, carry out an osteotomy according to Le Fort type 1, with a puncture of the back and correction of the asymmetry of the arch of the upper jaw (Fig. 5).

In the department, the patient under premedication and general endonasal anesthesia, an osteotomy of the upper jaw was made inside the mouth, an incision was made in the mucous membrane of the oral cavity and periosteum, an incision was made slightly above the transitional fold of the upper jaw from seven to seven teeth. The edges of the wound were moved apart, thereby, accessing the front wall of the upper jaw. On the front and side walls of the upper jaw left and right markings of cut lines were made. Special fretsaw produced osteotomy according to the markings. Then the sawn fragment was separated and moved to a pre-selected position. Fixation of the displaced fragment in the new position was carried out by titanium mini-plates.

On the lower jaw, the incision was made on both sides along the mucous membrane and periosteum along the external oblique line and the transient fold, preserving the neurovascular bundle and periosteum from the inner surface of the lower jaw branch (Fig. 6). In this case, the chewing muscle remains on a small fragment, the position of the medial pterygoid muscle and its fascia changed somewhat.



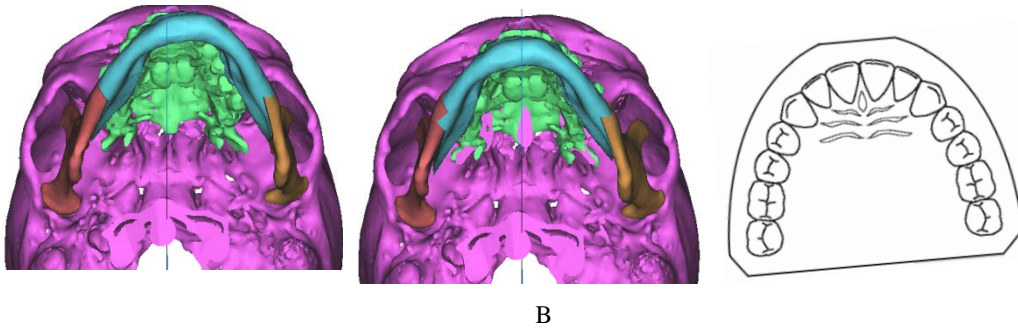
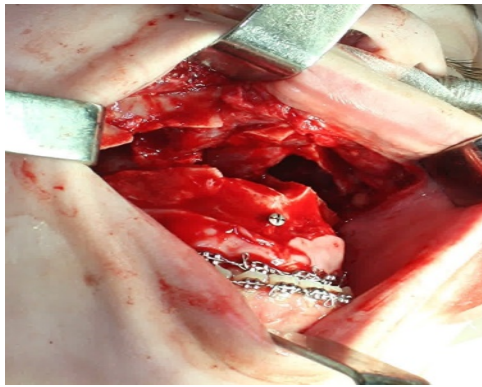
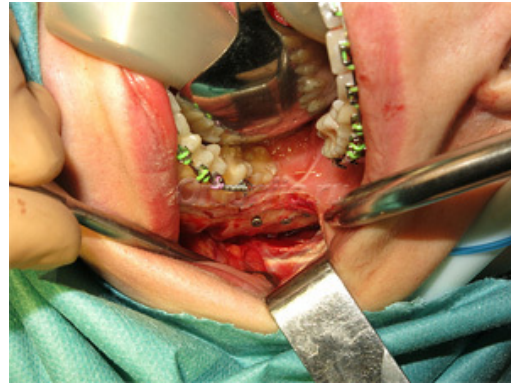


Fig. 5 Composed treatment plan:

A) Data on the study of soft tissues of the face; B) 3D simulation of planning the operation



A

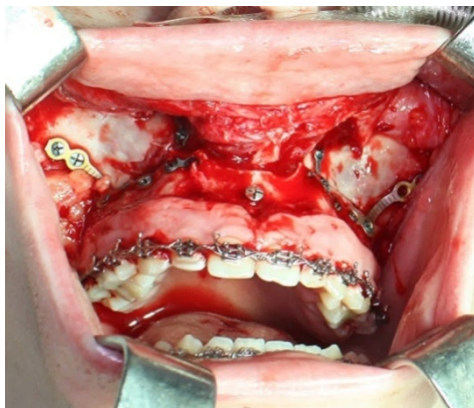


B

Fig. 6. Access to the upper (A) and lower (B) jaws

Further, along the inner surface of the branch in the horizontal direction to its posterior edge, an osteotomy of the compact layer of bone was performed by a boron above the tongue at the entrance of the neurovascular bundle. An osteotomy was performed on the vestibular layer of the compact substance of the jaw at the level of the second molar up to the lower edge of the jaw.

The dissection of compact plates was carried out using a chisel. After the cleavage of the jaw was completed, a large fragment was placed in the state of an orthognathic bite, and the excess part was removed. Bone fragments were fixed with mini-plates in the region of the curved line of the lower jaw. (Fig. 7).



A

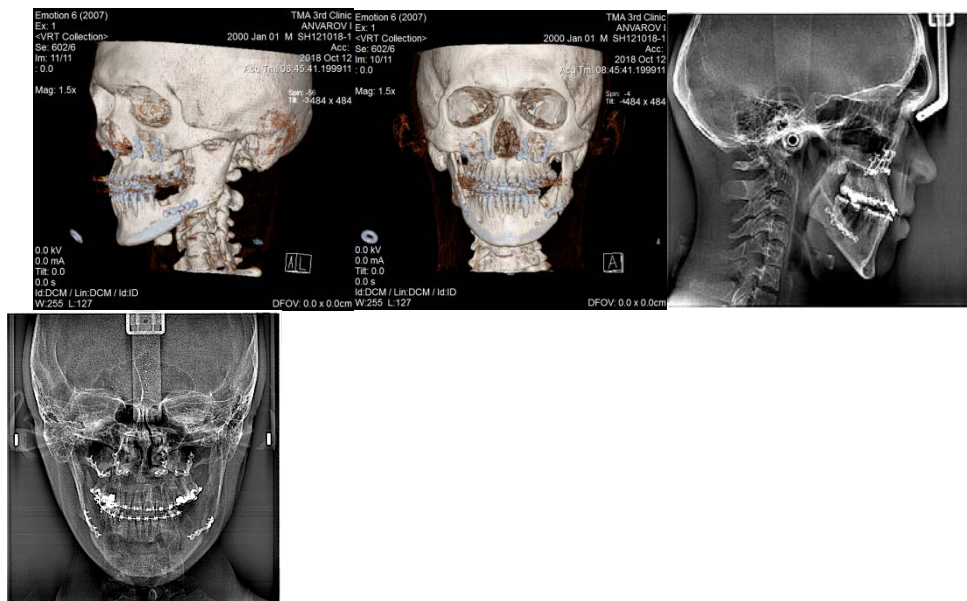
B

Fig. 7. Fixation of fragments by mini-plates: - A – upper jaw, B – lower jaw.

Wounds were drained with active drainage and shielded in layers. The jaw was immobilized with the help of elastics. On the 7th day, the stitches were removed and the patient was discharged from the hospital. 1-2 months after surgery, the patient used guiding elastics that help passively close his mouth into the correct bite.



A



B

Fig. 8. A) Photograph. B) MSCT and teleradiography of the patient after surgery

The last stage of treatment was the final orthodontic treatment. It has been started 6 months after the operation and it is going on. (Fig. 8.).

Orthodontic treatment ends when perfect occlusion is achieved, and the patient himself can align the jaws in the correct position.

Thus, the proposed approach to conducting orthognathic operations showed an improvement in all indicators and a significant approximation to regulatory standards. This indicates a rather high assessment by patients of the results of treatment. In addition, it should be noted that according to the results of the survey, men presented more requirements for

the functional state of their dentoalveolar systems, and women showed higher requirements for the aesthetic result of surgical treatment. Analyzing the results of the study, we can conclude that the key component of the complex therapy of patients with GFOA is the personal perception of aesthetic and functional criteria.

According to the results assessing the quality of life of patients, randomized trials in the long term after complex therapy 84% of respondents focused on improving external facial aesthetics, 71% of respondents on normalizing chewing function, 91.4% of them noted the appearance of internal psychological comfort and 32% of respondents noted restoration of previously disturbed articulation. According to the test results, it was found that only 93% of patients rated their emotional state low, the average score was only in 7% of patients and a high score was not observed. Analyzing the results of the survey according to the questionnaire, a high level of anxiety in 57% of patients should be noted. Along with anxiety in patients, psycho-emotional disorders were noted, manifested by neurotic conditions 68% of respondents, depressive reactions 41% of patients with a tendency to transition to pathological personality development, which affects the whole future life of a person. When comparing the symptoms of neuropsychiatric disorders with the dynamics of somatic disorders, a dependence of the severity of mental manifestations on the severity of maxillofacial deformation and its consequences was revealed. In 12% of patients without psychopathological manifestations, a normal reaction to the injury and deformation was revealed. Moreover, according to the test results, women with maxillofacial deformity were more psychological traumatized compared to men. Their neurotic disorders were significantly more pronounced. In the only patient with congenital pathology, the level of anxiety was minimal and neurotic disorders were practically not manifested. Regarding this, a number of scientists are of the opinion that the mental disorders accompanying congenital malformations of a person differ in their clinical features from mental disorders caused by a cosmetic defect resulting from mechanical trauma. In the case of congenital malformation, they appear in children of primary school age, usually with ridicule and comments about their appearance from peers. These painful conditions in the form of neurotic reactions are the result of traumatic situations and pass quickly. Mental disorders in older children and adults are more pronounced. Asthenic, depressive and phobic symptoms and their combinations characterize mental disorder. In mechanical injuries with an extensive cosmetic defect, psychogenic reactions are observed with an affective-shock component, alternating with depressive and asthenodepressive reactions, and sometimes, suicidal tendencies.

III. CONCLUSION

Thus, based on the analysis of the research results, the following conclusion can be made that the treatment and rehabilitation of patients with DDJ in general, and patients with GFOA in particular, cause great difficulties and require additional procedures to organize their psychological rehabilitation.

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