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ALGORITHM OF PREOPERATIVE PREPARATION OF PATIENTS FOR UPPER JAW DEFECT REPAIR IN CONGENITAL CLEFT LIP AND PALATE

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Abstract:
Congenital cleft lip and palate (CHL) being one of the most frequent malformations of the maxillofacial region since the birth of the child is accompanied not only by the cosmetic defect but also by severe functional disturbances. The high frequency of congenital cleft lip and palate, severe anatomical and functional disorders, the difficulty of social adaptation of such children indicate the particular relevance of this problem. According to the World Health Organization (2009), among all congenital malformations congenital cleft lip and palate takes 2-3rd place, and by the severity of anatomical and functional disorders - the leading place.

Keywords: Upper jaw defect, individual implants, improved treatment methods.

Introduction:

In the Republic of Uzbekistan, the improvement of the healthcare system has allowed not only to improve public health, but also to achieve certain success in preventing the formation of malformations, including congenital cleft lip and palate. Certain successes have been achieved in diagnostics, treatment methods have been improved, and rehabilitation and recuperation programs for these children have been developed. According to G. Swennan (2001), of 387 patients with congenital cleft lip and palate, 50% had a midface deformity. According to the observations of P.D. Waite (1996), 75% of patients with congenital cleft lip and palate have a cleft alveolar process (CAO). B.N. Davydov (1999) established delayed jaw growth due to postoperative scarring. Studies by M.B. Ubaidullaev (2001) established the degree of deformation of the nose and nasal septum after cheilo- and uranoplasty. M.Z. Dusmukhamedov (2006) on the basis of correlation analysis of clinical and biochemical findings and complications developed a mathematical model for prediction of local complications and surgical planning taking into account the shape of the palatine pharyngeal ring. A.M. Azimov

(2007) found that after uranoplasty the level of nonspecific factors of oral cavity protection decreases. S.S. Murtazaev (2008) identified reduced calcium levels in the saliva of children with GERD and due to this, a high incidence of dental caries. Amanullaev R.A. (2005) studied the frequency of birth of children with cleft lip and palate in the republic. According to his data, in Karakalpakstan the frequency of birth of children with this anomaly was 1:540, in Tashkent 1:745. Murtazaev S.M. (2010) found intestinal dysbacteriosis, immune system discoordination, increased somatic pathology and physical underdevelopment in children with GERD who were artificially fed. Sh.T. Shokirov (2011) in his expediency of alveolar defect plasty with bone block with its fixation by miniplates. A.A. Yuldashev (2016) in his works substantiated the effectiveness of using the umbilical cord as a membrane in the experiment on animals and in children with BPH in plasty of jaw defect with autograft and development of an improved method of alveoloplasty. To date, despite the existence of numerous scientific studies on the improvement of treatment and rehabilitation methods for children with BPH, alveolar defect plasty does not lose its relevance. In particular, many issues remain unresolved including prevention of graft resorption, stimulation of osteoreparation, the problem of ingrowth of soft tissue structures into the graft and its prevention using biological membranes is not solved.

The aim of the study: is to substantiate the effectiveness of preoperative preparation for surgical repair of upper jaw defect in TMJD by using stereolithographic model, to improve the accuracy of the operation and reduce the time of surgical intervention.

Materials and Methods of Research

The work is based on the results of the examination of 44 patients with maxillofacial defects in TMJD, who were hospitalized at the department of children's maxillofacial surgery of TGSI clinic in the period from 2019 to 2023, in order to compare the results of surgical treatment and determine the optimal method of surgical treatment. There is a predominance of patients with right-sided defects and deformities of the upper jaw - 21 patients, which is 47.7% of the total number of patients studied. Some patients underwent surgical intervention in several stages.

The upper jaw defects ranged in size from 1 to 2 cm. In 5 (11,3%) patients the maxillary defects were 1 to 1,5 cm in length; in 8 (18,2%) - from 0,8 to 2,0 cm, in 18 (40,9%) - from 0,5 to 1,5 cm, in 12 (27,3%) - from 0,6 to 1,8 cm and in 1 (2,3%) - from 1,5 to 2,5 cm. Thus, significant upper jaw defects were observed in a larger number of patients from 1.0 to 2.0 cm. The predominant number of upper jaw defects in GERD by

localization was on the left side (39%), less frequently on the right side (48%), and least frequently on the bilateral side (13%). При дефекте верхней челюсти наблюдается деформация лица за счет западения мягких тканей в края носа.

Functional disorders included biting and speech disorders, all of which were accompanied by profuse salivation. As a result of soft tissue changes, soft tissue retraction into the nasal margins and facial asymmetry were evident. These factors had a negative impact on the patient's psyche.

All patients underwent the surgical intervention for the upper jaw defect - bone grafting.

The most difficult and important moments of the bone plasty were: preparation of the graft bed, fixation of the upper jaw fragments, selection of the graft and its fixation in the bone wound.

Peculiarities of the bone bed preparation: with strict aseptic observance we removed foreign bodies, carefully stopped bleeding, and in case of rupture of the oral mucosa we applied vicryl and polypropylene sutures to the wound, sometimes double-row sutures. Scar tissue between the ends and around the upper jaw fragments was dissected out, the scarred fragments were repaired. Often the changed mucosa of the oral cavity was dissected and then a defect was formed. The method proposed by Professor M.V. Kostylev (1963) was used to close such defects.

Comparative assessment of treatment results was based on clinical and radiological examination data and analysis of bed-days. Analysis of the distribution of patients by age showed that the age group of 18 and older accounted for the largest number of patients, which was 52.27%. There is a slight predominance of women - 47.7% of the total number of patients.

Results of the study: Preoperative preparation of the patient for surgery to restore defects of the upper jaw with individual implants in patients with congenital cleft lip and palate, as well as for secondary surgical intervention for a defect or deformation of the upper jaw, has undergone significant changes in recent years.

Patient preparation for surgical intervention includes:

1.Gathering the anamnesis, determining the age of the disease.

2.Identification of comorbidities.

3. general clinical examination: general blood test with gemsindrome, blood group and Rh factor, biochemical blood test, general urinalysis, ECG.

4. Complete radiological examination: X-ray of the upper jaw in three projections, orthopantomography, computer tomography. Orthopantomography was conducted on the apparatus: Panoramik PM 2002 SS orthopantomographer, as well as X-ray Siemens Somatrom CR tomography was used for the work. Depending on the

complexity of the object, the scanning was performed in high resolution mode with a slice thickness of 2 or 4 mm. 3-D scanning of facial skeleton bones was performed.

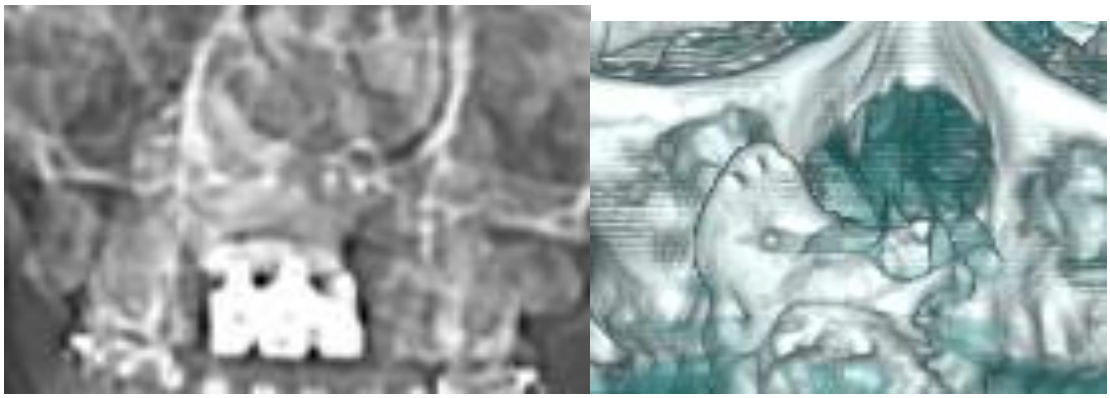

Fig.1 MSCT: titanium implant with dental implants and crowns placed on the right side.

5. Planning of the upcoming surgical intervention, with determination of the exact volume of the planned alveolar process, or the size of the defect. The mandible was placed in the optimal position, taking into account the bite and cosmetic indicators. Next, the defect was eliminated with a model of an endoprosthesis made of wax by sculpting. The endoprosthesis model was fitted to the place of its future attachment on the upper jaw. A titanium endoprosthesis was fabricated on the basis of the wax template. In this way, the defect was repaired with the wax model, which then served as a template for fabricating the endoprosthesis.

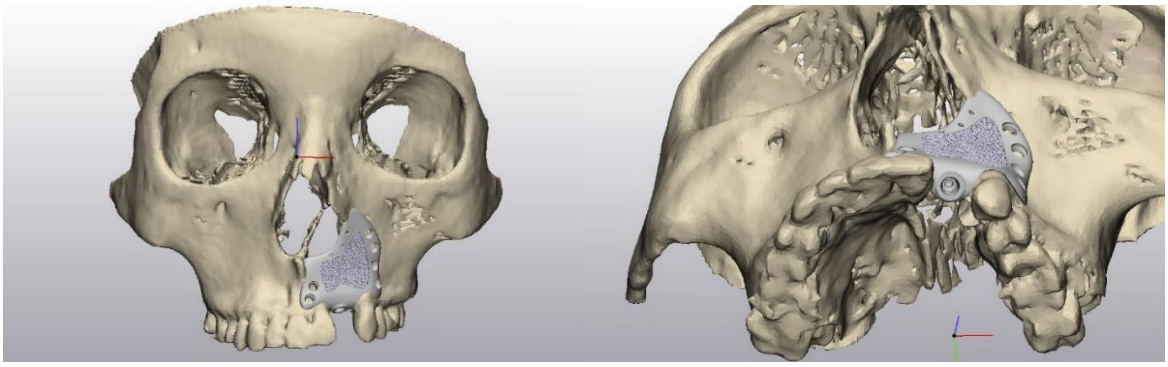

Fig.2 A wax template of an endoprosthesis that accurately corrects the defect is simulated.

If an upper jaw defect was planned to be corrected with a titanium endoprosthesis, a simulation of the upper jaw resection was performed on the model. The resulting defect was repaired with an aluminum template. The height of the branch was also calculated on the model in order to select a titanium joint of the appropriate size.

An individual titanium endoprosthesis was fabricated using the available template, which was a titanium plate that had individual curves to adapt it to the specific patient. Titanium plates and TMJ prostheses made in the conditions of the specialized production with the observance of the corresponding technology from titanium grade BT-1-0 (OST-1 90173-75) were used in the work, also there was used a set of titanium plates for reconstructive operations on the upper jaw of the firm "Martin" (Germany).

8. If it was planned to eliminate the defect with a vascularized autograft of fibula, the linear dimensions of the resected area of the upper jaw were calculated on the X-ray and the angles of osteotomy of the graft were planned taking into account the anatomical curves.

9. Orthodontic examination and treatment included making plaster models of the jaws, making a bimaxillary splint to fix the bite in the postoperative period and to place the jaws in the correct orthognathic position during resection, fitting and fixation of the endoprosthesis, or graft.

10. Before surgery, children were photographed in the following positions: front, profile right, left, open mouth, bite, and front with head tilted back. In the preoperative period, the method of fixation of the endoprosthesis or graft in the bone wound was determined. Fixation was performed using titanium plates, titanium self-tapping screws, and bone suture method. Individual fixation titanium plates were made to exactly follow all the curves and irregularities of the jaw fragment.

Analysis of the diagnostic value of MSCT examination confirmed its undoubted value in the examination and treatment of patients with upper jaw defects and deformities in comparison with standard methods of radiological diagnosis (orthopantomography, radiography in standard projections), as well as with objective and additional methods of examination (examination, palpation, jaw models). We recommend mandatory MSCT-diagnostics in this category of patients before surgical intervention. Based on the data obtained during the MSCT examination of the patient, we have developed a computer program for calculating the exact shape and size of the implants, taking into account the percentage of shrinkage given by the material used for its manufacture ("Calculation program for individually made implants, compensating defects and deformations of the maxillofacial area"). The above-mentioned object is registered in the Register of Intellectual Property Agency of the Republic of Uzbekistan № 3128.

The computer program is based on the data obtained during MSCT examination of the patients: thickness, height, length, depth, the defect, which can be determined on the MSCT - slices using a special function available in the MSCT program (Fig. 3). This

function allows to connect any given points with a line with the definition of dimensions.

Fig. 3 Determination of implant size on MSCT slices.

The MSCT slices were used to determine the size and shape of the defect according to three parameters: width, height, depth, which should be taken from several places of the defect. Thus, there are nine parameters, which are entered into the corresponding cells on the data input sheet. The following data are entered into the program: the patient's last name, first name, patronymic, medical history number, age, sex, diagnosis, the area of the defect or deformation, the estimated percentage of implant shrinkage, the name of the planned surgery and the defect dimensions obtained on MSCT slices (height, depth, width), which allows you to calculate the dimensions of the future implant in three dimensions. After entering the necessary data, press the "Calculate" button. The program starts calculating the true dimensions of the implant, taking into account the percentage of material shrinkage in the three projections. These data appear in the windows next to the entered defect size parameters.

Then you need to press the "Print" button. After that, the final result is printed and displayed on a separate sheet with the necessary information about the patient, localization and area of the defect, type of surgery, the material from which the implant will be made, percentage of its shrinkage. The table then shows the true dimensions of the implant (9 parameters) and the figure shows its expected appearance with the defect area highlighted (Fig. 4).

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Data entry sheet for MSCT slices

Shrinkage Calculation

No. of Case Histories	21:26	FULL NAME	Norkulova Sh.	Age	13	Gender	Woman

Diagnosis: Upper jaw defect in congenital cleft lip and palate

Location of the defect: Alveolar process

Area: AB

Material:: Titanium percentage 2% Result

Width 1	29	
Width 2	22	
Width 3	24	
Height 1	29	
Height 2	25	
Height 3	23	
Depths 1	33	
Depths 2	5	
Depths 3	3	

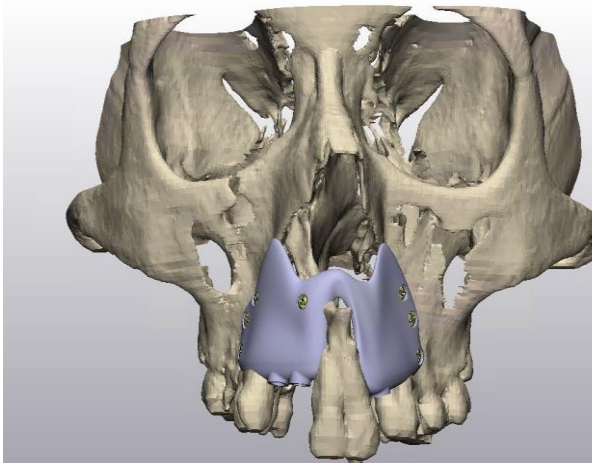

Fig. 4. Input sheet of the obtained data on MSCT slices

The sheet with the final design can be transferred to the technical laboratory for implant fabrication. This program will significantly reduce the number of technical errors and, consequently, reduce the number of complications associated with the manufacturing of the implant (the size of the defect is not taken into account, improper manufacturing of the implant, in which there is a change in the physical and chemical properties of the material).

A sheet with the exact parameters of the implant and its appearance for the upper jaw.

MINISTRY OF HEALTH OF THE REPUBLIC OF UZBEKISTAN TASHKENT STATE DENTISTRY INSTITUTE, DEPARTMENT OF PEDIATRIC SURGICAL DENTISTRY

Case History No.	21/26
NAME	Norkulova Sh.
Diagnosis	Upper jaw defect of the alveolar process area in GERD
Age	13
Sex	Female
Location of the defect	H/C of the articular and coronal process
Area	AB
Operation	Upper jaw and alveolar region plastic surgery
Result	
Material	Titanium
Installations	2

IMPLANT DIMENSIONS	
Width 1	20,02
Width 2	22,68
Width 3	24,18
Height 1	30,12
Height 2	25,14
Height 3	21,12
Depths 1	10,3
Depths 2	4,7
Depths 3	2,8

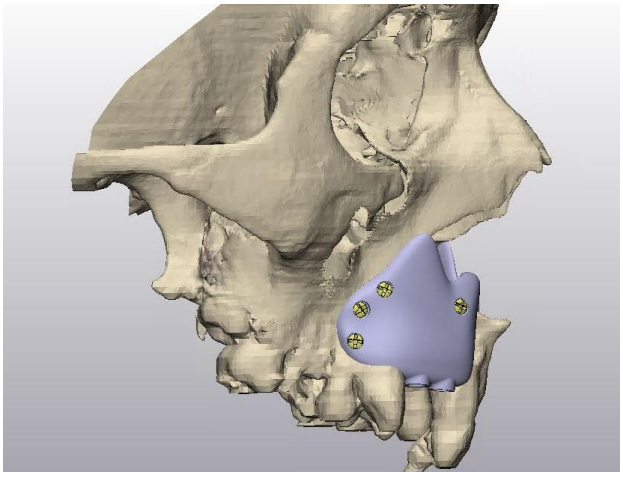

Fig. 5. Sheet with the exact parameters of the implant and its appearance for the upper jaw.

Conclusions:

Multispiral computed tomography is a universal diagnostic apparatus of the new generation with the potential of use in maxillofacial surgery. In the scheme of preoperative examination of patients with upper jaw defects in TMJD it is necessary to include multispiral tomography for a more accurate assessment of bone tissue pathology. MSCT data allow to model three-dimensional implants with true size and shape, which allows for error-free and accurate manufacturing of its model.

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