Current Views on the Morphological Parameters of the Maxillary Jaw in Children with Congenital One-Sided Cleft of The Maxillary Lip and Palate in Growth and Developmental Dynamics Before Cheiloplasty

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ABSTRACT

According to modern ideas, the growth of the facial skeleton and skull in norm is caused by many factors. It is genetically determined. The implementation of the genetic programme of harmonious growth of facial bones and jaws depends on the correct structure of the hereditary genome, the normal course of prenatal and postnatal ontogenesis. In congenital clefts many links of this mechanism of facial skeleton growth are disturbed.

Keywords: congenital clefts, bite disorder, cleft lip and palate.

Introduction: 46-100% of patients with congenital cleft lip and palate have sharply pronounced jaw deformities, abnormal positioning of teeth, and bite disorders[1,3]. Typical maxillary deformities have been described in fetuses and foetuses of various ages with congenital cleft lip and palate[6,10]. They appear early, at 8 weeks of age, and progress quite rapidly. The maxillary bone of a 24-week-old foetus is 8% smaller on the cleft side than on the healthy side and is displaced posteriorly. The effect of muscle dysfunction is negligible at this time, as facial muscle development and differentiation is underway at 7-8 weeks of age[4,5]. In the foetus, all structures of the midface, the forming nose, upper lip, and upper jaw are deformed. However, there is no consensus on the underlying cause and mechanism of deformities during perinatal ontogenesis [7,8,9].

Purpose of the study: To determine the morphological parameters of the maxilla in children with congenital unilateral cleft lip and palate in the dynamics of growth and development before cheiloplasty

Materials and methods of research: 38 children with congenital unilateral through cleft upper lip and palate and 24 children with congenital unilateral cleft lip aged from 10 days to 5 years were under our observation in paediatric maxillofacial surgery of Tashkent Dental Institute in 2020-2023 for examination and treatment. In order to systematise the

clinical material we used the classification of congenital cleft lip and palate by L.E. Frolova (1974) and the classification of deformities of the middle zone of the face after repair of congenital cleft lip and palate by B.N. Davydov (2007).

Of the total number of children, 26 children were operated on using the Obukhova-Tennison method, 38 children were operated on using the Millard D.R. method, and 19 children were operated on using the Millard Azimov meodification. The period of operative treatment on the upper lip averaged 6-8 months.

The dynamics of growth and development of the maxillary bone prior to cheiloplasty was studied in children with VORVGN depending on the task. Immediately before the operation of cheiloplasty we studied morphological parameters of the maxilla before cheiloplasty in 31 children with SORVGN. Morphological parameters of the upper jaw were studied in 12 children in the dynamics of age in newborns, in 3-4 months after birth and in 6-8 months before cheiloplasty. The data of anthropometric measurements of maxillary models of healthy children of the same age served as a control. The Sillman J.H. landmarks were taken as a basis for the measurements. The data of anthropometric measurements of the sagital upper jaw models of children with SARVGN are shown in Table 1. According to the results obtained, the relative length of the maxilla on the large-healthy fragment at the projection I (Ax) of the deciduous teeth does not differ significantly from its value in healthy children and is 26.0+1.0 and 25.6+1.0 mm, respectively, although there is some protrusive position of the mesial edge of the large fragment of the maxilla (P>0.05). The length of the maxillary small fragment at the projection of the III tooth is shortened and is 17.6+1.0 mm (normal 22.0+1.0 mm, P<0.001). In 3-4 months of age of children with SARS, the sagital length of the maxillary major fragment increases relative to the initial one at the projection of I, II, and III teeth.

Table1

Morphological parameters of sagital models of the maxilla in young children with penetrating unilateral cleft lip and palate before cheiloplasty (M±m), mm

Age months.	Examined groups of children	Ax	Bx	CxR	DxR	CxL	DxL
Newborn.	healthy (n=25)	25,6±1,0	22,0±1,0	17,0±1,0	8,0±0,5	22,0±1,0	8,0±0,5
	with SARS (n=12)	26,0±1,0	23,8±0,95	16,5±0,85	8,0±0,8	17,6±1,0 *	8,2±0,4
3-4	with SARS (n=12)	28,0±1,0 *	25,0±1,0*	18,0±0,95	8,0±0,8	18,2±1,0	7,9±0,7
6-8	healthy (n=25	33,5±1,6	31,0±1,0	21,5±1,0	11,0±1,0	21,5±1,0	11,6±1,0
	with SARS (n=31)	36,9±0,8 *	35,1±0,9*	20,3±0,9	10,2±0,7	18,7±0,8 *	9,0±0,5*

B by 7.7, 5, and 9%, respectively. On the cleft side, the length of the small fragment at the projection of the III tooth does not change significantly in relation to the initial one and makes 17.6+1.0 and 18.2+1.0 mm.

By 6-8 months of a child's life (before cheiloplasty), the sagital length of the maxilla on the large fragment increases relative to the initial one at the level of all teeth by 41.9; 47; 23 and 27.5%. The length of the small fragment at

the projection of teeth III and IV increases only by 6.2 and 9.7%, but nevertheless it is shorter than on the healthy side. In relation to the norm the sagital parameters of the large fragment of the maxilla at the projection of I, II teeth are also significantly longer and are 36,9±0,8 mm vs. 33,5±1,6 mm; 35,1+0,9 vs. 31,0+1,0 mm, respectively (P<0,01). The length of the maxillary small fragment at the projection of III, IV teeth was significantly less than the norm and was 18.7±0.8 versus 21.5±1.0mm and 9.0±0.5 versus 11.6±1.0mm, respectively (P<0.01).

The transverse dimensions of the upper jaw remained wide at the projection of all teeth in neonates with VORVGN compared with the norm (P<0.01) (Table 2.). By 3-4 months the initial width of the maxilla relative to the isometric line increases by 3.4%; at the projection of teeth III, IV - by 5.0% (P>0.05). Comparing the transverse dimensions of the maxilla of the same children before cheiloplasty, we should note an increase in its initial width at the level of all deciduous teeth by 22.6, 16.2, and 19.0%, respectively. Corresponding to the increase in the transverse dimensions of the maxilla, the width of the cleft within the alveolar process and hard palate also increased by 22.1% of its initial value.

By 6-8 months of age, the transverse dimensions of the maxilla remain significantly wider than normal at the projections of all teeth and are 39.6±1.2 versus 34.5±1.0 mm relative to the isometric line; at level IV│IV, 38.8±0.7 versus 36.5±1.0 mm; at level III│III, 33.1±1.1 versus 29.5±1.0 mm. (P<0,05).

Table 2

Morphological parameters of maxillary transversal models in children with VORVGN before cheiloplasty (M+m), mm

Age Months.	Examined groups of children	SL-SR	FR-FL	DR-RL	CR-CL
Newborn..	healthy (n=25)		26,0±1,0	30,0±1,0	25,0±1,0
	with SARS (n=12)	14,0+1,3	32,3±1,2*	33,4±0,98*	27,3±1,1*
3-4	with SARS (n=12)	16,2+0,75	33,4±1,0*	35,1±0,85*	29,2±1,3*
6-8	healthy (n=25		34,5±1,0	36,5±1,0	29,5±1,0
	with SARS (n=31)	17,1+1,0	39,6±1,0*	38,8±1,2*	33,1±1,1*

The increase in the initial sagital and transversal parameters of the maxilla and the width of the palate defect is explained by the dysfunction of the cleft muscles of the upper lip, soft palate and tongue pressure, i.e., by the disturbance of myodynamic balance. The slope of the slope of the palatal plates in newborn children with SARS is more vertical (P<0.001) in relation to the norm at the projection of all deciduous teeth, both on the large healthy one and on the side of the cleft.

By 3-4 months of the child's life, the steepness of the slope of the palatine plates does not change significantly in relation to the initial one as on the healthy side.

Conclusions: Thus, on the basis of the above stated, we can make the following conclusion

that dysfunction of the cleft muscles of the upper lip and soft palate combined with tongue pressure in the intrauterine period of development causes an anatomical disorder of the maxillary bone. It is characterised by a deformed position of the cleft fragments of the maxilla, underdevelopment of its palatine processes, changes in the slope steepness both on the healthy and on the cleft side, deviation of the nasal septum to the healthy side and displacement of the small fragment of the maxilla to the rear. These disorders are more severe the greater the degree of cleft. In the dynamics of age from the newborn period to cheiloplasty (6-8 months), morphologically the upper jaw of children with SARS lags behind in growth and development of the palatine plates, especially the small fragment, with an increase in the initial width of the defect of the alveolar process. In our opinion, the growth retardation of the maxilla is genetically determined and is associated with the child's physical development.

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