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## DEVELOPMENT OF SINUS MAXILLARIS IN CHILDREN WITH COMPLETE UNILATERAL CLEFTS

(Age class 4—7 years)

Ž. HAVLOVÁ, V. BREJCHA, K. HAJNIŠ, J. RŮŽIČKOVÁ

We considered the problems of growth and development of sinus maxillaris in children with complete unilateral cleft, in connection with broader studies on the development of splanchnocranium in thus afflicted individuals.

Sinus maxillaris is formed in prenatal life by the invagination of the mucosa of the anterior part of the ethmoidal labyrinth into the "Anlage" of

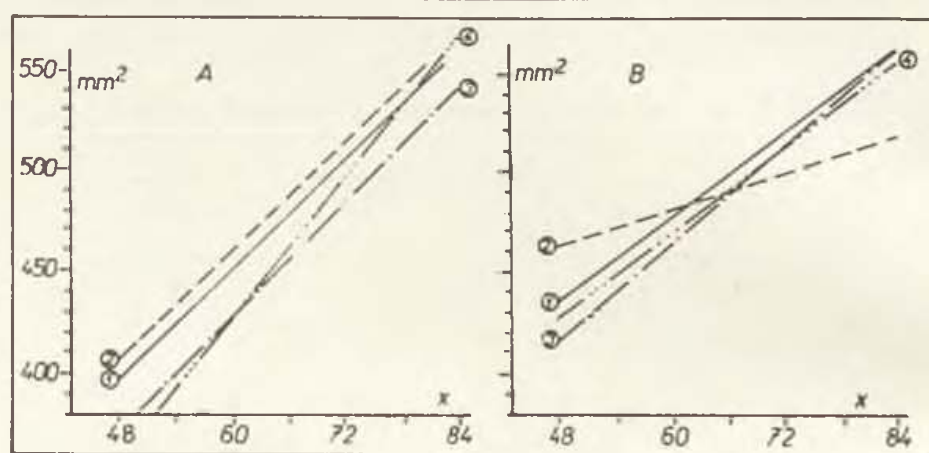
Tab. 1. Sex, number and mean age of examined children

Group	Sex	Number	Mean age (months)
Clefts	boys	56	62,32
	girls	27	64,56
	total	83	
Controls	boys	29	63,83
	girls	23	63,39
	total	52	

the upper jaw (postmaxilla). The sinus is clearly noticable in newborns. During postnatal life its further development proceeds in normal children in several phases, with an alternation of periods of a more rapid a slower growth rate. E. g. Libersa et al. (1) on the basis of x-ray examinations in a large series of children of both sexes varying in age from newborns up to 16 years, distinguished the following developmental phases: period of more rapid growth, which may be followed up in boys and girls since birth appro-

Tab. 2a: Sagital position. — Area, maximum height, width and height-width index antrum Highmori. — Boys

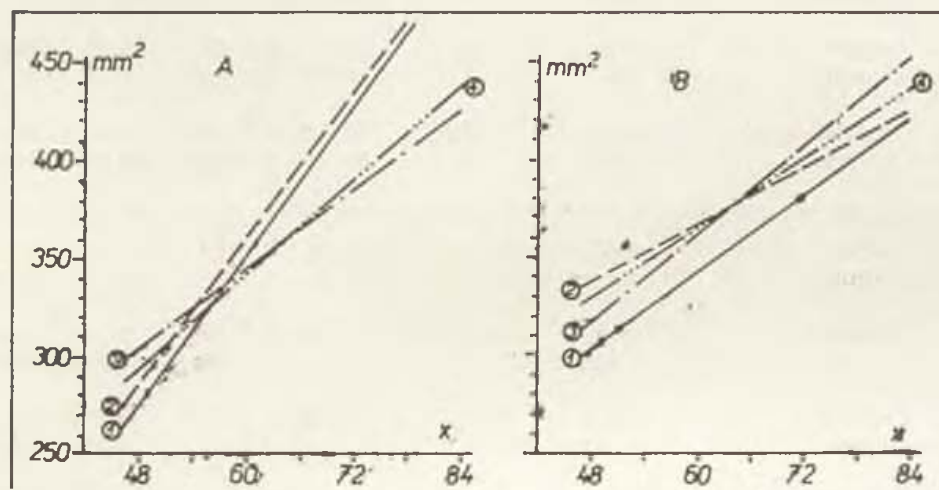
		Side	n	$\bar{x} \pm 3.S\bar{x}$	s	min — max
Control	area (mm <sup>2</sup> )	right	25	475,70 $\pm$ 3.2,31	11,57	296,0 — 720,0
		left		484,40 $\pm$ 3.2,34	11,70	317,3 — 730,6
	height (mm)	right	25	28,52 $\pm$ 3.0,90	4,50	20,0 — 38,0
		left		28,36 $\pm$ 3.0,91	4,56	21,0 — 40,0
	width (mm)	right	25	21,28 $\pm$ 3.0,69	3,47	16,0 — 28,0
		left		21,56 $\pm$ 3.0,74	3,71	16,0 — 30,0
	height-width index	right	25	75,39 $\pm$ 3.2,38	11,90	54,5 — 96,6
		left		76,95 $\pm$ 3.2,58	12,88	51,6 — 96,6
Clefts	area (mm <sup>2</sup> )	cleft	55	441,70 $\pm$ 3.1,36	10,12	250,6 — 669,3
		normal		445,80 $\pm$ 3.1,55	11,40	242,6 — 744,0
	height (mm)	cleft	55	26,98 $\pm$ 3.0,61	4,53	20,0 — 43,0
		normal		27,05 $\pm$ 3.0,58	4,24	19,0 — 38,0
	width (mm)	cleft	55	20,56 $\pm$ 3.0,41	3,03	14,0 — 27,0
		normal		20,78 $\pm$ 3.0,43	3,16	14,0 — 28,0
	height-width index	cleft	55	78,09 $\pm$ 3.1,84	13,63	40,0 — 104,2
		normal		77,80 $\pm$ 3.1,60	11,74	37,8 — 100,0



	Boys		Group	Side	Girls	
	$y = Bx + A$	R			$y = Bx + A$	R
1	0,44x + 19,01	0,42	control	right	0,36x + 26,06	0,32
2	0,44x + 19,80	0,42		left	0,16x + 38,59	0,23
3	0,48x + 13,91	0,58	cleft	cleft	0,41x + 22,04	0,43
4	0,57x + 8,66	0,62		normal	0,36x + 25,51	0,39

Diagram 1 — Sagital position. — Regression lines for antrum Highmori area  
A — boys, B — girls, x — months

ximately up to the age of two and a half years. Then the period from the age of 7 and a half, till 9 and a half, in which maximum growth increase (vertically and horizontally) manifests and last there is still the comparatively rapid growth in puberty, when the center already grows predominantly only into height. In the period from 2 and a half to 7 and a half and also from 9 and a half to the age of 12, i.e. in the period of prepubertal growth minimum, development of antrum is already slower. Scott (2) reports that sinus development occurs in connection with the entire trend of growth of the face



	Boys		Group	Side	Girls	
	$y = Bx + A$	R			$y = Bx + A$	R
1	$0,64x + 3,50$	0,56	control	right	$0,33x + 14,29$	0,44
2	$0,65x - 4,16$	0,54		left	$0,25x + 21,60$	0,31
3	$0,34x + 13,95$	0,46	cleft	cleft	$0,39x + 12,67$	0,47
4	$0,41x + 9,28$	0,54		normal	$0,31x + 17,89$	0,39

Diagram 2 — Water's position. — Regression lines for antrum Highmori area  
A — boys, B — girls, x — months

and that it develops just as the splanchnocranium, namely in forward direction, downwards and laterally. For the time being, the factors influencing the development of cavities are not clear; it may be assumed however that there apply effects resulting from the main functions of orofacial organs (chewing, swallowing, breathing, phonism, articulation etc.).

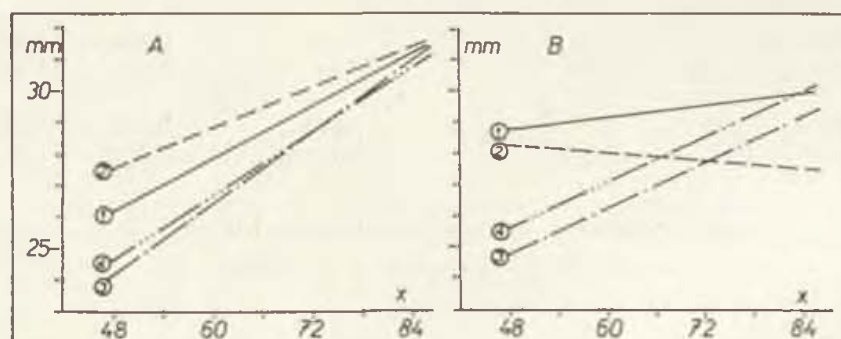
It should be therefore assumed in cleft individuals that such serious disturbance of splanchnocranium morphology not only caused by own defect but often also by postoperative deformations and also change of the function resulting from the mentioned deformations, may respond in the development of sinus maxillaris.

It is evident from literary data that reports dealing so far with research of this problem, differ in their conclusions. Schweckendiek and Tamba (3)



Tab. 2b: Sagital position. — Area, maximum height, width and height-width index antrum Highmori — Girls

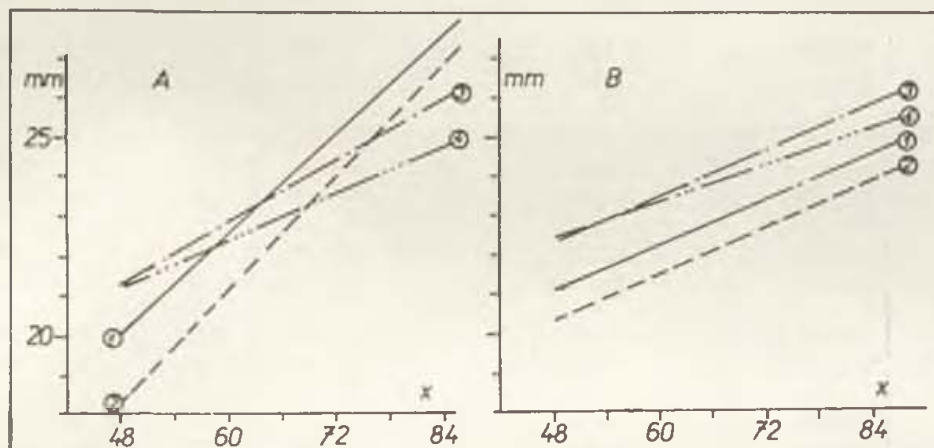
		Side	n	$\bar{x} \pm 3.S\bar{x}$	s	min — max
Control	area (mm <sup>2</sup> )	right	19	476,60 $\pm$ 3.2,66	11,61	368,0 — 885,0
		left		482,80 $\pm$ 3.2,68	11,37	426,6 — 682,6
	height (mm)	right	19	29,10 $\pm$ 3.0,51	2,21	25,0 — 33,0
		left		27,89 $\pm$ 3.0,58	2,51	21,0 — 33,0
	width (mm)	right	19	21,00 $\pm$ 3.0,59	2,56	17,0 — 28,0
		left		21,89 $\pm$ 3.0,48	2,10	19,0 — 26,0
	height-width index	right	19	72,52 $\pm$ 3.1,59	6,95	63,6 — 85,2
		left		80,09 $\pm$ 3.2,30	10,02	64,5 — 109,5
Clefts	area (mm <sup>2</sup> )	cleft	25	477,40 $\pm$ 3.2,14	10,71	280,0 — 696,0
		normal		484,50 $\pm$ 3.2,10	10,51	253,6 — 680,0
	height (mm)	cleft	25	27,16 $\pm$ 3.0,76	3,79	21,0 — 36,0
		normal		27,72 $\pm$ 3.0,75	3,77	19,0 — 35,0
	width (mm)	cleft	25	22,12 $\pm$ 3.0,68	3,39	15,0 — 27,0
		normal		21,76 $\pm$ 3.0,67	3,37	13,0 — 28,0
	height-width index	cleft	25	82,04 $\pm$ 3.2,45	12,26	60,7 — 109,5
		normal		78,96 $\pm$ 3.2,10	10,51	53,6 — 100,0



	Boys		Group	Side	Girls	
	$y = Bx + A$	R			$y = Bx + A$	R
1	0,15x + 18,95	0,36	control	right	0,03x + 27,34	0,14
2	0,11x + 22,33	0,26		left	-0,02x + 29,21	-0,09
3	0,19x + 15,12	0,51	cleft	cleft	0,12x + 19,04	0,40
4	0,17x + 16,57	0,48		normal	0,12x + 19,90	0,37

Diagram 3 — Sagital position. — Regression lines for maximum height of antrum Highmori. — A — boys, B — girls, x — months

and also Harvold (4) arrived on basis of x-ray examination at the opinion that in comparison with the normal population there is no difference in size, shape and rapidity of growth of antrum on the cleft side and the normal side. Eckel and Beisser (5) mention on one hand hypoplasia of the jaw cavities (probably due to the inclination to hypoplasia in these patients in general) and on the other hand they find that hypoplasia affects rather width than height of antrum and — paradoxically enough — more the side without cleft than the side with cleft. Pfeifer (6) believes that in cleft individuals hypoplasia occurs only in the ventral region of antrum, namely in the region of alveolar recesus. This escapes however attention in normal roentgenology. This



	Boys		Group	Side	Girls	
	$y = Bx + A$	R			$y = Bx + A$	R
1	$0,21x + 9,95$	0,49	control	right	$0,10x + 16,30$	0,42
2	$0,24x + 6,82$	0,60		left	$0,10x + 15,53$	0,34
3	$0,13x + 15,06$	0,48	cleft	cleft	$0,10x + 17,52$	0,47
4	$0,10x + 16,44$	0,42		normal	$0,08x + 18,60$	0,34

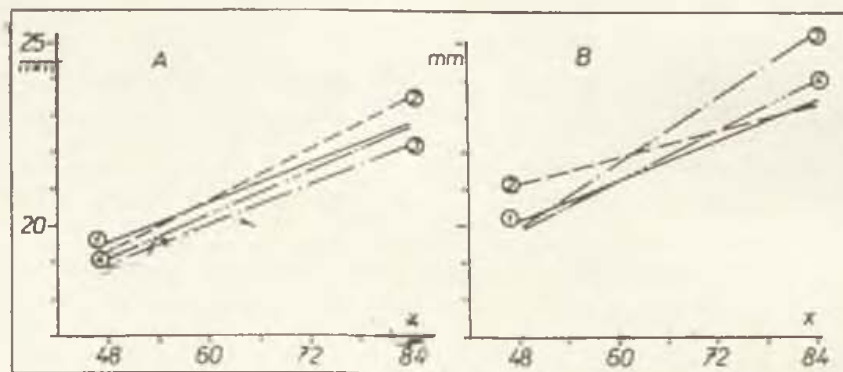
Diagram 4 — Water's position. — Regression lines for maximum height antrum Highmori. — A — boys, B — girls, x — months

is undoubtedly a very interesting statement. It is however necessary to be aware that development of the recesus is by no means constant. Thus studies by Hajniš et al. (7) reveal for ex. that alveolar recesus is only present in not quite half of the individuals of the normal population. Furthermore it must be stressed that deviations in shape and size of the jaw cavity determined in cleft patients, resulted according to the reports by Eckel and Beisser (5) and Pfeifer (6) from examinations of comparatively very small and also — in respect of age — not homogenic groups, when sex was also not differentiated.

The above mentioned diversity of opinion by the individual authors regarding growth, development, shape and also size of sinus maxillaris in in-

Tab. 3a: Waters' position. — Area, maximum height, width and height-width index antrum Highmori. — Boys

		Side	n	$\bar{x} \pm 3.S\bar{x}$	s	min — max
Control	area (mm <sup>2</sup> )	right	29	$371,60 \pm 3.2,05$	11,04	197,5 — 642,5
		left		$378,90 \pm 3.2,21$	11,91	226,5 — 728,0
	height (mm)	right	29	$23,24 \pm 3.0,77$	4,15	16,0 — 32,0
		left		$22,69 \pm 3.0,75$	4,04	16,0 — 30,0
	width (mm)	right	29	$21,03 \pm 3.0,64$	3,44	15,0 — 32,0
		left		$21,62 \pm 3.0,60$	3,24	16,0 — 31,0
	height-width index	right	29	$91,96 \pm 3.2,47$	13,33	66,7 — 123,1
		left		$96,71 \pm 3.2,53$	13,62	75,9 — 133,3
Clefts	area (mm <sup>2</sup> )	cleft	56	$350,50 \pm 3.1,18$	8,84	144,0 — 546,6
		normal		$349,60 \pm 3.1,22$	9,10	130,0 — 568,0
	height (mm)	cleft	56	$23,11 \pm 3.0,43$	3,22	14,0 — 29,0
		normal		$23,09 \pm 3.0,40$	3,02	15,0 — 29,0
	width (mm)	cleft	56	$21,48 \pm 3.0,49$	3,68	11,0 — 29,0
		normal		$20,91 \pm 3.0,46$	3,47	15,0 — 28,0
	height-width index	cleft	56	$91,86 \pm 3.1,94$	14,49	57,9 — 121,4
		normal		$91,05 \pm 3.1,80$	13,49	58,8 — 116,7



	Boys		Group	Side	Girls	
	$y = Bx + A$	R			$y = Bx + A$	R
1	$0,09x + 15,25$	0,29	control	right	$0,09x + 15,82$	0,34
2	$0,12x + 13,56$	0,36		left	$0,06x + 18,23$	0,30
3	$0,09x + 14,60$	0,38	cleft	cleft	$0,15x + 12,74$	0,50
4	$0,10x + 14,29$	0,40		normal	$0,12x + 13,96$	0,42

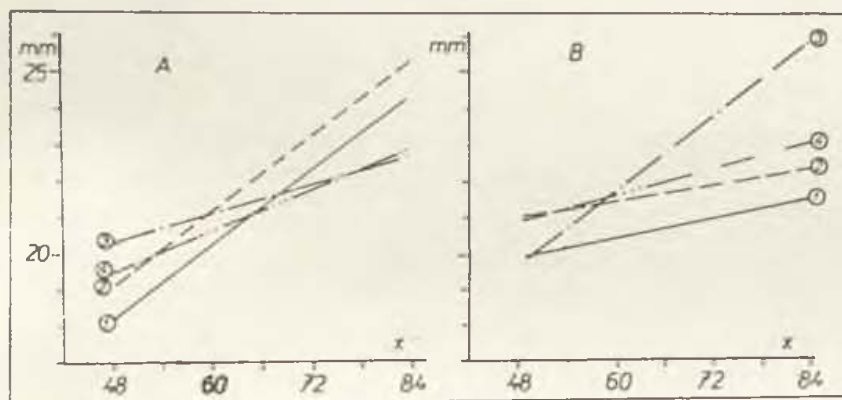
Diagram 5 — Sagittal position. — Regression lines for maximum width antrum Highmori. — A — boys, B — girls, x — months



dividuals with cleft, led us naturally to the possibility to form our own opinion on the above mentioned questions in a relatively numerous group of children with this defect.

#### MATERIAL AND METHODS

The examined group of individuals was formed by 83 children age 4—7 years, with complete unilateral cleft (cheilo-gnatho-palatoschisis unilateralis). We placed in this cleft group children in which no other associated defect of external and internal organs was determined. The control group of the same age category consisted of 52 individuals.



	Boys					Girls	R
	$y = Bx + A$	R	Group	Side	$y = Bx + A$		
1	$0,17x + 10,12$	0,48	control	right	$0,05x + 17,64$	0,22	
2	$0,17x + 11,02$	0,50		left	$0,04x + 19,07$	0,22	
3	$0,07x + 16,83$	0,24	cleft	cleft	$0,17x + 11,68$	0,56	
4	$0,09x + 15,34$	0,31		normal	$0,06x + 18,02$	0,23	

Diagram 6 — Water's position. — Regression lines for maximum width antrum Highmori  
A — boys, B — girls, x — months

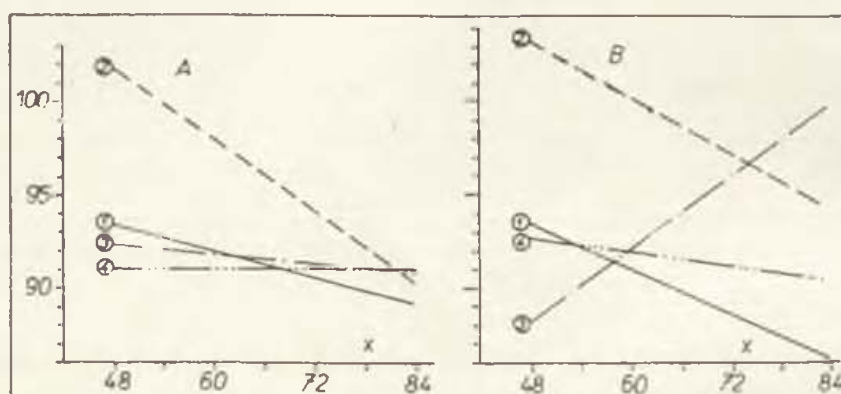
The number of examined children of both sexes and their mean age in the individual groups, is demonstrated on tab. 1.

Measurement and evaluation of cavities was carried out by means of tele-roentgenograms, taken at a distance of 4 meters by specially focused distance tube at 90—120 kV and 110 mAs. The head of the examined child was fixed in a cephalostat, this guaranteeing not only precise reproducibility and symmetry of projection, but also a stabile distance of the median level from the focal point of the Roentgen bulb (3,80 m) as well as from the film level (0,20 m). Under these conditions the enlargement is 7,5% and is always constant.

In each individual there was carried out a/p position, the head was bent 15° caudally from the Frankfurt horizontal (fig. 1), and the Waters' position applied as a rule for featuring adjoining cavities for clinical purposes (fig. 2).

Tab. 3b: Waters' position. — Area, maximum height, width and height-width index antrum Highmori. — Girls

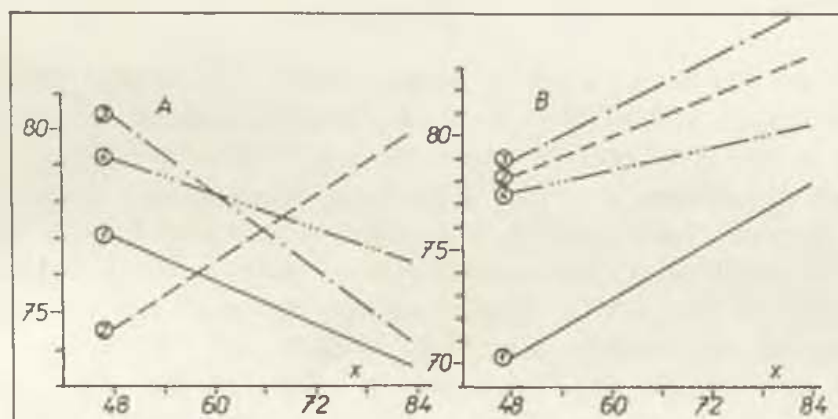
		Side	n	$\bar{x} \pm 3.S\bar{x}$	s	min — max
Control	area (mm <sup>2</sup> )	right	23	$350,00 \pm 3.1,88$	9,04	213,3 — 658,6
		left		$373,60 \pm 3.2,03$	9,74	237,3 — 733,3
	height (mm)	right	23	$22,83 \pm 3.0,61$	2,92	18,0 — 32,0
		left		$22,09 \pm 3.0,76$	3,67	15,0 — 28,0
	width (mm)	right	23	$20,56 \pm 3.0,53$	2,55	17,0 — 28,0
		left		$21,48 \pm 3.0,43$	2,06	19,0 — 28,0
	height-width index	right	23	$90,63 \pm 3.2,02$	9,67	75,0 — 110,5
		left		$99,14 \pm 3.3,38$	16,23	81,5 — 160,0
Clefts	area (mm <sup>2</sup> )	cleft	27	$378,10 \pm 3.1,95$	10,11	192,0 — 570,6
		normal		$378,70 \pm 3.1,84$	9,57	210,6 — 578,6
	height (mm)	cleft	27	$24,07 \pm 3.0,51$	2,63	19,0 — 30,0
		normal		$24,11 \pm 3.0,59$	3,05	19,0 — 31,0
	width (mm)	cleft	27	$22,48 \pm 3.0,69$	3,60	14,0 — 27,0
		normal		$22,00 \pm 3.0,64$	3,30	16,0 — 28,0
	height-width index	cleft	27	$93,36 \pm 3.2,23$	11,58	73,7 — 118,2
		normal		$91,48 \pm 3.2,01$	10,47	77,3 — 122,7



	Boys		Group	Side	Girls	
	$y = Bx + A$	R			$y = Bx + A$	R
1	$-0,10x + 81,88$	-0,09	control	right	$0,22x + 59,50$	0,32
2	$0,15x + 67,45$	0,12		left	$0,15x + 70,90$	0,16
3	$-0,18x + 89,20$	-0,16	cleft	cleft	$0,19x + 69,75$	0,18
4	$-0,08x + 83,10$	-0,09		normal	$0,08x + 73,71$	0,09

Diagram 7 — Sagital position — Regression lines for height-width index antrum Highmori. — A — boys, B — girls, x — months

In order to follow up all data, both positions were applied. We attempted to make up at least partly for the impossibility of carrying out studies of the cavity — because in each position the cavities are projected in a somewhat different way. The first of the mentioned positions is of course much more difficult to evaluate, because the antrum is obscured by the neighbouring structures; in several cases there was no possibility of safe evaluation and this caused a decrease of the number of evaluated cases, as evident from tables 2a and 2b.



	Boys		Group	Side	Girls	
	$y = Bx + A$	R			$y = Bx + A$	R
1	$-0,12x + 99,39$	$-0,08$	control	right	$-0,20x + 103,07$	$-0,24$
2	$-0,32x + 117,24$	$-0,23$		left	$-0,26x + 115,94$	$-0,20$
3	$-0,04x + 94,27$	$-0,03$	cleft	cleft	$-0,33x + 72,22$	$0,34$
4	$0,00x + 91,02$	$0,00$		normal	$-0,07x + 96,17$	$-0,08$

Diagram 8 — Water's position. — Regression lines for height-width index antrum Highmori. — A — boys, B — girls, x — months

By means of planimeter we evaluated in each roentgenogram the area into which the three-dimensional antrum Highmori (further only "area") is being projected. We measured maximum height and maximum width of antrum each time previously designing the median level passing through point "n" and "gn". From the mentioned values (height and width), the height-width index antrum Highmori ( $I = \frac{W \cdot 100}{H}$ ) is calculated. The measurements determined on skiagrams were not corrected and the measured values were directly used in further processing.

From the obtained data, the basic statistical characteristics were calculated, i.e. the arithmetical mean ( $\bar{x}$ ), the standard deviation (s), medium error of means ( $s_{\bar{x}}$ ) and the minimum and maximum (min-max) were determined in all indices. In order to test the differences between the means, Duncan's test was used at 1% and 5% significance level. When estimating

all studied indices we furthermore determined their relation to age. For this purpose we applied calculation of the correlation coefficients (R). The differences in the obtained regression lines of the individual indices between the cleft group and the control group, we evaluated by means of Student's t-test.

## RESULTS

The obtained results are demonstrated on tables 2a, 2b, 3a and 3b and furthermore on diagrams 1—8.

## DISCUSSION

The determined values of area, height, width and height-width index were tested by Duncan's test in both studied groups (i.e. cleft group and control group) and in both positions (a/p position and Waters' position). Tested were: symmetry of upper jaw cavities, difference between sexes and finally the difference between both examined groups. It is evident from the obtained results that in children of the control group there is no significant difference between right and left cavity. District asymmetry appeared only once in girls of the control group, where a significant difference (5% level) was determined in both positions in the height-width index between the right and left side. In the cleft group the difference between the cavity of the cleft side and the normal side was tested; the results being again negative in all studied indices. In both groups we were unsuccessful in proving also differences in relation to sex. The differences described in adult age [Martin-Saller (8)] do not appear in the studied period and this corresponds to the findings by Libersa et al. (1). Not even a difference in size and shape of the cavity was found between the control group and the cleft group.

It is evident from diagrams 1 to 8, demonstrating in both positions the relation of cavity growth to age that not even growth of all studied indices of sinus maxillaris differs in both groups to any extent. In order to verify this fact we evaluated by means of Student's t-test the growth of the individual indices firstly between both cavities in the same group (i.e. in the control group between right and left antrum, in clefts between antrum of the cleft side and the normal side), furthermore between both groups mutually. Not in a single case did we prove a difference in growth rate.

The disturbance of morphology and function — given by the cleft — obviously does not interfere with development of the antrum in such a manner as to be apparent in the statistical processing of values obtained in a larger group. Yet it is possible of course to determine even quite distinct asymmetries in some cases in normal as well as cleft individual (fig. 3 and 4). If by coincidence these happen to accumulate this may tempt to draw incorrect general conclusions.

## CONCLUSIONS

1. Asymmetry of sinus maxillaris which may be found in normal children and in children with cleft, aged 4—7 years, is not statistically significant. Neither inside each group nor if comparing the individual groups mutually.



2. In relation to sex there is no significant difference in area, maximum height, width and height-width index in antrum Highmori.

3. No difference was proved in intensity of growth of sinus maxillaris in children with cheilo-gnatho-palatoschisis unilateralis and healthy children.

#### SUMMARY

In a group of 83 children with complete unilateral cleft (56 boys and 27 girls) aged 4—7 years and 52 children of the control group (29 boys and 23 girl) of the same age category, there was carried out statistical evaluation of the area into which by means of teleroentgenograms there are projected: three-dimensional antrum Highmori, maximum height, maximum width and height-width index of antrum Highmori. Simultaneously also intensity of growth of sinus maxillaris is estimated in this age period. The evaluated data were obtained in each individual by measuring the teleroentgenogram in two positions (a/p and Waters'). No difference was proved in the development of cavities in healthy children as well as in children with cleft, of both sexes in each group and also in comparison of the individual groups mutually.

#### RÉSUMÉ

##### **Le développement du sinus maxillaris chez les enfants atteints du bec-de-lièvre complet unilatéral. (L'âge de 4—7 ans)**

Ž. Havlová, M. Brejcha, K. Hajniš, J. Růžicková

Chez la groupe de 83 des enfants atteints du bec-de-lièvre complet unilatéral (dont 56 des garçons et 27 des filles) à l'âge de 4—7 ans et chez 52 des enfants en contrôle (dont 29 des garçons et 23 des filles) de la même groupe d'âge les auteurs ont entrepris une évaluation statistique de l'étendue dans laquelle se prosternent sur des prises téléroentgénologiques de la cavité maxillaire en trois dimensions, de la hauteur la plus grande, de la largeur la plus grande même que l'index hauteur/largeur de la cavité maxillaire respective. En même temps on a fait évalué dans cette période de vie l'intensité de la croissance de la cavité maxillaire. Les données respectives ont été tirées chez chacun des malades des prises sur téléroentgenogrammes dans deux projections (antéropostérieure et celle de Waters). Aucune différence dans le développement des cavités et des personnes en bonne santé et des enfants souffrant de bec-de-lièvre des deux sexes dans chacune des groupes de même que dans la comparaison entre les groupes respectives n'a pas été trouvée.

#### ZUSAMMENFASSUNG

##### **Entwicklung des Sinus maxillaris bei Kindern mit einseitiger Lippen-Kiefer-Gaumenspalte. (Altersklasse 4—7 Jahre)**

Ž. Havlová, M. Brejcha, K. Hajniš, J. Růžicková

Bei einer Gruppe von 83 Kindern mit einseitiger Lippen-Kiefer-Gaumenspalte (56 Knaben und 27 Mädchen) und bei 52 Kindern einer Kontrollgruppe (29 Knaben und 23 Mädchen) derselben Alterskategorie wurde einerseits die, auf den Röntgenaufnahmen dargestellte Fläche des drei-dimensionalen Antrum Highmori und andererseits die maximale Höhe, Breite und das Höhe-Breiten-Index statistisch ausgewertet. Zugleich



wurde auch in dieser Altersgruppe die Wachstumsintensität des Sinus maxillaris beurteilt. Die gewerteten Daten wurden bei allen sämtlichen Kindern durchmessungen an Fernröntgenaufnahmen in zwei Projectionen (fronto-okzipitalen und Waters'sche Projection) gewonnen. In der Entwicklung der Kieferhöhlen sowohl bei gesunden als auch bei Kindern mit Spaltenmissbildungen wurden sowohl innerhalb einzelner Gruppen wie auch beim gegenseitigen Vergleich verschiedener Gruppen keine Unterschiede nachgewiesen.

#### RESUMEN

#### **Desarrollo del sinus maxillaris en los niños afectados con la grieta de un solo lado general. (La categoría de edad desde 4 hasta 7 años)**

Ž. Havlová, M. Brejcha, K. Hajniš, J. Růžicková

En un grupo de 83 niños con la grieta general de un solo lado (56 muchachos y 27 muchachas) en la edad desde 4 hasta 7 años y en 52 niños del grupo de control (29 muchachos y 23 muchachas) de la misma categoría de edad se realizó la valoración estadística del área, en la cual se proyectaba en las teleradiografías antrum Highmori de tres dimensiones, de la máxima altura, de la máxima anchura y del índice de altura-anchura de antrum Highmori. Al mismo tiempo se juzgaba en esta categoría de edad también la intensidad del crecimiento del sinus maxillaris. Las indicaciones avaloradas en cada individuo se ganaron por la medición de las teleradiografías en dos proyecciones (anterior-posterior y la de Waters). No se comprobó ninguna diferencia en el desarrollo de las cavidades ni en los sanos ni en los niños de grieta de ambos sexos dentro de cada grupo y precisamente así tampoco en la comparación recíproca entre los grupos particulares.

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## APPLICATION OF PRESERVED HETEROOPERITONEUM FOR PLASTIC OPERATION OF POSTOPERATIONAL VENTRAL HERNIA

N. T. YELISEYEV

Till the present time, the question of radical surgical therapy of ventral hernia has not been solved to satisfaction. According to data by M. P. Ruchlyadeva (1952) there exist more than 80 different types of hernia which are classified according to the method of plastic operation of ventral hernia. When we studied these methods in our work, we arrived at the conclusion that many of them have various shortcomings.

Normal closing of ventral hernia appears to be an insufficiently reliable method of surgical therapy. Methods of plastic muscle operation (S. F. Chidsh 1903; J. K. Spidsharnyi, 1909 a. o.) are traumatizing unnecessarily and wound the peritoneal nerves, this resulting in later muscle atrophy. For these reasons not even the method of muscle-aponeurotic plastic operation has found wide application. Neither did aponeuroplastic graft fulfill expectations, partly in a number of cases necrosis of transplanted aponeurosis sets in, partly diastase of direct muscles is not removed in plastic operation and does not prevent recurrence, besides this, excision of graft causes further traumatization in patient.

Methods of covering up the defect of peritoneum by means of skin graft by immersing postoperational scars into depth (N. M. Sokolov, 1929; S. P. Shilovcev 1964; A. N. Machabeli, 1961, a. o.) also do not solve all questions. In these operations, connected with essential treatment of skin or scar by flash burn of electrocoagulation, there may occur subcutaneous damage, cysts may form.

Synthetic alloplastic material used at present (capron, dacron, nylon, tephlon, phthoroplast - 4 a.o.) are alien substances and are unable to substitute fully auto- homo- and heterotissues, because they are not inert.

The unsatisfactory results of therapy in postoperational ventral hernia, led us to apply a method according to the suggestion of P. P. Khokhlov, based upon application of heteroperitoneum preserved in 2% aqueous chloramine solution. Heterogenic tissues, especially heterogenic peritoneum, have been

initially applied in surgery since the end of the XIX<sup>th</sup> century (Morris, 1902; A. X. Smirnov, 1913; Kleinberg, 1929; L. G. Shkolnikov, 1938; N. I. Krauze, 1940; V. P. Filatov, 1948; S. I. Koshkin, 1953; N. N. Kuznetsov, 1953; a. o.).

Treatment, preservation and final storing of heteroperitoneum, we carried out according to the method worked out by P. P. Khokhlov (1957).

The process of treating and preserving heteroperitoneum is not complicated. In the local slaughter-house we collected from fresh slaughtered animal (bull, cow) large sheets of parietal peritoneum and placed it into a clean container. Further processing of sheets was carried out at the clinic. Peritoneum was carefully washed in warm tap water with soap, fat was removed, washed again and immersed in 2% aqueous chloramine solution for two days. 48 hours later the sheets were again washed in tap water and immersed again into 2% chloramine solution. Finally the 2% chloramine solution was changed daily for a period of 12 days and after this process, peritoneum was ready for application. It was kept in glass flasks with ground stopper in 2% chloramine solution in refrigerator at temperature of +4 to +5 °C. Period of storing at maximum 8—10 months. The technique of processing pressed peritoneum is simple and can be easily carried out. In sterile conditions (in the operating theatre) on prepared and possibly ironed 4 layers of sterile veil, we place alternately three soft sheets of preserved heteroperitoneum, which we dried previously, in size corresponding to dimensions of press area. Sheets of heteroperitoneum are opened up so that their external surface corresponds to the shiny area of peritoneum. This is why we cover the sheets with the other half of the same veil and place them between two well cleaned smooth boards, disinfected beforehand in 2% chloramine solution. All this is placed into a portable press for 12 hours, then the veil with heteroperitoneum is removed and left to dry for 6 hours. The specimen of heteroperitoneum is sent to the laboratory for determination of sterility and the sheet is rolled into tube and placed in a high measuring cylinder for 500—1000 ml, which was boiled beforehand and filled up with 96% alcohol. The cylinder is covered with several layers of sterile veils and finally the surface with a rubber glove. After 5 days, peritoneum thus placed in alcohol, is ready for use.

The pressed sheets of peritoneum are suitably soft for stitches, do not shrink, do not stretch and form a layer of 0.5—0.8 mm thickness, the colour is yellow, consistency firm, they do not break and can be easily cut with scissors.

In order to specify the possibilities of application of heteroperitoneum in clinics, an experimental study was carried out in 83 dogs, with the following aim:

1. to find out the physical chemical properties of unpressed peritoneum and peritoneum pressed into three layers,
2. to study the course of postoperational period,
3. to determine patho-morphologic changes occurring in heterogenic peritoneum and in tissue of the recipient surrounding the graft, during different periods (from 2 to 645 days).

The physico-mechanical properties of heteroperitoneum in respect of strength and elasticity were verified on a special tension testing machine. Results are demonstrated on the table.

The maximum tension load of unpressed heterogenic peritoneum 1 cm wide, equals 20,2 kg and elongation — 20% of original length. Maximum

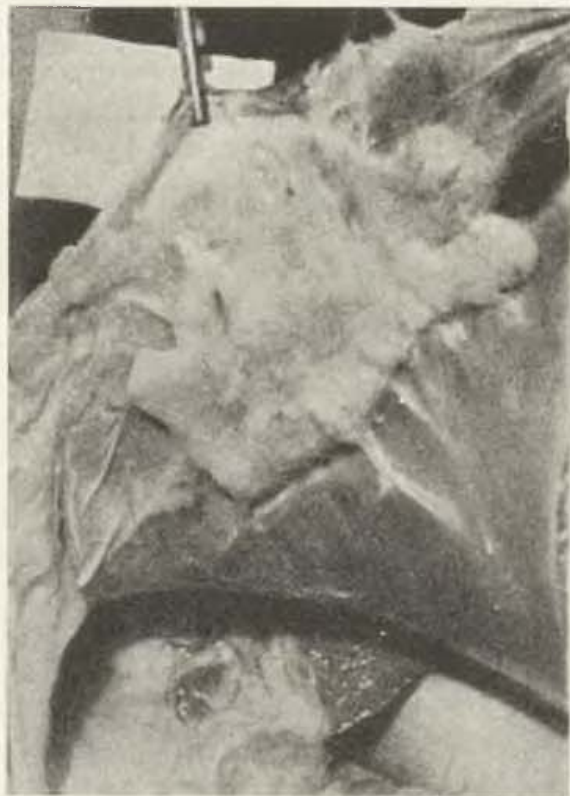


Fig. 1. Experiment 29. Period of observation 274 days. Macropreparate. Heteroperitoneum stitched intraperitoneally and substituted by connective tissue scar.

tension load of three layers pressed heterogenic peritoneum 1 cm wide — 28,8 kg and elongation 10%.

In animals the intraabdominal method was applied, whereby heteroperitoneum was placed into abdominal cavity and stitched to parietal peritoneum, in the place of artificially formed defect of abdomen.

All animals recovered well from the operation. In most cases the wounds healed per primam. In the postoperational period there were no complications of local or total character which could be brought into connection with the graft. Macroscopic studies disclosed that heteroperitoneum survives well in suture, vessels penetrate well, it thickens and covers the defect firmly. If pressed heteroperitoneum was stitched, the connecting plate which formed in the process was thicker (up to 1 cm) and stronger than the plate formed in place of unpressed sheets of heteroperitoneum (0,5—0,7 cm). At intraabdominal stitching of heteroperitoneum, graft did not adhere to internal organs (fig. 1).



For the purpose of microscopic observation we cut specimen of peritoneum size 1X1X1 cm from various parts of graft, fixated it in neutral formalin and processed it in alcohol solutions of increasing concentration.

Specimen of 8 —10 cm thickness we stained with hematoxylineosin according to van Gieson and distinguished collagen fibres according to Mallory.

I. Changes in tissues of recipient, surrounding heterograft, were characterized by development of exudative and prolipherative inflammatory process: in the period of up to 20 days the exudative inflammation developed, later predominated prolipherative processes with development of young granulation tissue, which finally became more and more regular and covered the solid fibrose tissue.

II. In the heterograft during early periods of observation (10—30 days) dystrophic and necrobiotic processes developed. Heteroperitoneum swelled, homogenized and fragmentated (fig. 2). After 30—50 days of observation, connective tissue cells and newly formed vessels appeared in the heterograft, penetrating from surrounding tissues (fig. 3). After 70—100 days of observation, granulation tissue transformed into irregular connective tissue (fig. 4).

Finally, during process of maturing, irregular connective tissue formed.

Research of physical-mechanical properties of tissue plates formed in the process of substituting the heterograft, disclosed that they depend upon the period of graft (3 to 480 days) and that they are firm and elastic.

Maximum tension load of cut-out tissue plate after substituting graft of 1 cm width equalled 38,8 kg, elongation was 20% (see Table). This means that the tissue plate formed in place of peritoneal heterograft is firmer than the graft itself by 1,5X to 2X. It was determined to be stronger than normal abdomen in dog also by 1,5—2X.

The obtained positive results of experimental research permitted us to apply preserved heteroperitoneum under clinical conditions for plastic operation of defective abdominal wall in post-operational ventral hernia. Best proved to be the method of intraabdominal plastic operation of defects by

Table 1. Physical - mechanical properties of preserved heteroperitoneum before and after grafting

Material	One-layer preserved heteroperitoneum before grafting		Same substituted by connective tissue		Preserved pressed three-layer heteroperitoneum before grafting		Same substituted by connective tissue	
	tension load (in kg)	elongation (in %)	tension load (in kg)	elongation (in %)	tension load (in kg)	elongation (in %)	tension load (in kg)	elongation (in %)
Minimal	5	15—20	—	—	11,8	5	22	10
Maximal	6,5	20—30	23,4	15—20	28,8	10	38,6	20



means of three-layer pressed heteroperitoneum. 100 patients underwent operation with application of heteroperitoneum, of which 91 were with post-operational hernia, 9 with primary hernia and diastase of direct stomach muscles, patients were 21 men and 79 women.

#### TECHNIQUE OF INTRAABDOMINAL PLASTIC OPERATION IN PATIENTS

1. Under local anaesthetic according to A. V. Vishnevskiy, we cut out the post-operational scar: we separated and reduced the hernial sac. We loosened connection between parietal peritoneum and internal organs and removed rest of hernial sac.

2. To cover defect of peritoneal wall, we cut a plate from pressed heteroperitoneum larger than dimensions of defect by 3--4 cm. We washed the plate in saline solution and stitched it to the internal area of parietal peritoneum in region of defect by means of knotted silk stitches at maximum contraction of the edges of defect, with distances of 1--1,5 cm between the individual stitches. Above the graft we stitched the edges of defect, in some cases--remnants of hernial sac.

3. We closed the operational wound by direct suture. In order to forgo the cutting of stitches, we bound abdomen with strong linen bandage.

In 97 patients the operational wound healed per primam. We removed the stitches on the 9th--11th day. We permitted patients to walk on the 11 th--15th day. Mean period of hospitalisation was 20 days.

In 10 patients healed when released from clinic per primam, the skin wound opened partially up to a size 1X0,5 cm. Only in one woman with very much decreased ability of compensating and regeneration mechanisms due to previously carried out roentgen therapy for malignant uterus ulcer, the wound opened up and healing took place per secundam.

In two patients healed when released from the clinic per primam, 2--3 months later stitch fistules appeared. One woman was soon operated for stitch fistule and released home in good condition.

It is known from literary data that recurrence of hernia is rather frequent. Thus Masson (1923) states that in application of different operational methods recurrence takes place in 38,98%. According to data by V. R. Chesin (1927) recurrence took place in 42%, Branch (1934) states 21,42%, N. Z. Monakova (1956) states 33%. In comparison to these data, our results are very favourable: 1 recurrence to 100 operations.

According to our observations, application of heteroperitoneum did not induce anaphylactic reaction, in covering large defects of peritoneum we applied large heteroperitoneum up to 1800--2000 cm<sup>2</sup> in size. We did not observe anaphylactic reaction even in cases of repeated application of heteroperitoneum in the same patient.

Absence of protein incompatibility may be explained by the processing of heteroperitoneum in chloramine solution, as this causes denaturation of proteins.

Of 100 operated patients, two patients died 3 to 7 days after operation. Pathologic-anatomic examination disclosed that death was in no way connected with the application of heteroperitoneum.

During post-operational period the patients underwent in average 2—3× follow-up examinations at the clinic. Observations were carried out for up to 8 years after operation. No recurrence was determined.

Of 98 patients, 70 returned to work (30 employees, 40 workers). Besides this, 13 operated patients, who had not been working previously due to large hernia, became fit for work.

#### Excerpts from case history:

Woman X.: aged 33, admitted to clinic on 20. II. 1962, complains of continuous pain in entire abdomen, the pain increasing after food consumption and after slight physical strain. Was operated in April 1949 for gangrenous cholecystitis and apendicitis. The wound was drained. Healed after 3 month per secundam, but a septic fistule remained in the wound and healed only 10 months after operation. In January 1955 she underwent surgical operation due to post-operational ventral hernia. Later the wound became septic and the edges opened up. Wound healed per secundam and there was recurrence of hernia.

*Status praesens:* Organs of breathing and circulation are without pathological changes. Abdomen soft, palpating pain throughout. In front area of abdominal wall to the right of central line is a large wide post-operational scar 20×20 cm. In places the scar is very thin and intestinal peristaltic is visible with naked eye. Defect of abdominal wall is of the same dimensions.

*Diagnosis:* Extensive recurrence of post-operational ventral lateral hernia. Pains due to adhesion (fig. 7). Blood picture, urine, x-ray of chest organs, EKG without pathological changes.

*Operation 3. III. 1962:* under endotracheal ether-oxygen anaesthesia according to the above method. Size of applied pressed heterogenic graft 33×22 cm. Wound closed by direct suture. Post-operational period smooth. Stitches removed on 12th day. Wound healed per primam. Examined after 5 years. Healthy. In region of operation elastic tissue (fig. 8) firm.

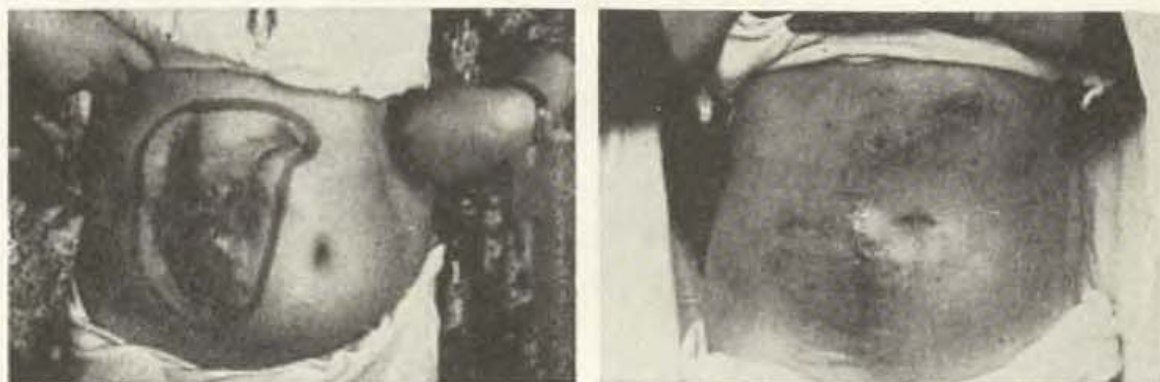


Fig. 7. Woman X. before operation. In right half of abdomen large defect of wall, covered by skin scar. — Fig. 8. The same patient after operation.

## CONCLUSION

1. Operational therapy of postoperational ventral hernia remains one of the difficult problems of surgery.

2. Experimental research in 83 animals and clinical observations in 100 patients disclosed that heteroperitoneum grafted into tissues in live organism, undergoes complicated biochemical changes. Within 2 to 645 days it is substituted by connective tissue of recipient, changing in region of ventral hernia into solid fibrotic plate.

3. Our recommended method of strengthening abdominal wall by intra-abdominal plastic operation with pressed preserved heteroperitoneum is a radical, biologically justified and effective method in therapy of postoperational ventral hernia.

## SUMMARY

Favourable experimental results carried out in 83 dogs, allowed us application of preserved heteroperitoneum for clinical purposes in plastic operation of abdominal wall defects in ventral hernia, in 100 patients. We covered defect of front abdominal wall by intraabdominal method. Early and late and late results were studied during 8 years. Two patients died after operation. In one woman there was recurrence as the sequel of technical errors, when methods were worked out in the first period.

The submitted method of strengthening abdominal wall is radical, biologically justified and effective, because in the graft defect is substituted — due to active processes — by new-formation of tissue elements, especially by formed connective tissue.

## RÉSUMÉ

### **L'emploi du péritonéum pariétal hétérogène conservé dans la plastic des hernies ventrales post-opératoires**

N. T. Yeliseev

Les données expérimentales favorables réalisées sur 83 des chiens respectifs nous ont permis d'employer l'hétéropéritonéum conservé pour l'usage clinique en tant que plastie des défauts de la paroi ventrale chez les hernies ventrales de 100 des malades. La fermeture du défaut de la paroi ventrale a été réalisée par voie intraabdominale. Les résultats précoces et ceux tardifs dans la période de 8 années ont été étudiés. En suites de l'intervention, deux des malades sont mortes. Une malade subit la récurrence en suite des fautes techniques au cours d'examination d'une des méthodes d'intervention dans la première période des examens.

La méthode recommandée de la fortification de la paroi ventrale est radicale, effective et de même biologique, car elle ne fait pas remplacer le défaut du transplant directement, mais ce remplacement est réalisé à l'aide des procès actifs par la formation nouvelle des éléments spécifiques des tissus, surtout du tissu ligamenteux de forme.

## ZUSAMMENFASSUNG

### **Anwendung des konservierten heterogenen parietalen Bauchfells zur Plastik der postoperativen ventralen Hernien**

N. T. Jeliseev

Die günstigen, an 83 Hunden gewonnenen Versuchsergebnisse machten es möglich das zu klinischen Zwecken konservierte heterogene Bauchfell zur Plastik von Bauchwanddefekten bei ventralen Hernien bei 100 Kranken anzuwenden. Die Deckung des



Defektes der vorderen Bauchwand wurde mittels des Intraabdominalverfahrens vorgenommen. Es wurden sowohl die Früh- als auch die Spätergebnisse im Verlauf von 8 Jahren studiert. Nach Operation sind zwei Kranke gestorben. Bei einer Kranken ist Rezidive vorgekommen, die als Folge der technischen Fehler der ersten Zeit bei der Ausarbeitung der Methodik anzusehen ist.

Die vorgelegte Methode zur Festigung der Bauchwand ist radikal, biologisch begründet und effektiv, da mit ihr kein direkter Ersatz des Transplantatdefektes erfolgt, sondern Ersatz infolge von aktiven Prozessen durch Neubildung von spezifischen Gewebeelementen und speziell von geformten Bindegewebe.

#### RESUMEN

### **Aplicación del peritóneo parietal heterogéneo conservado para la plástica de las hernias postoperatorias ventrales**

N. T. Yeliseyev

Los resultados favorables experimentales realizados en 83 perros nos permitieron aplicar el heteroperitóneo conservado a las finalidades clínicas para la plástica de los defectos de la pared ventral en las hernias ventrales en 100 enfermos. La cobertura de los defectos de la pared anterior ventral realizamos por el método intraabdominal. Se estudiaban los resultados tempranos y tardíos en el transcurso de ocho años. Después de la operación murieron dos enfermas. En una enferma ocurrió la recidiva, la que fue consecuencia de las faltas técnicas en la elaboración del método en el primer período.

El método presentado de la consolidación de la pared ventral es radical, biológicamente fundado y efectivo, porque en él no llega al reemplazo directo del defecto del trasplante, pero al reemplazo en consecuencia de los procesos activos por la creación nueva de los elementos específicos del tejido, del tejido ligamentoso después especialmente formado.

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## NEW METHOD OF RECONSTRUCTION OF AURICLE WITH FIGURE GRAFT FROM HEALTHY EAR

G. V. KRUCHINSKY

Up to the present days, reconstruction of the auricle represents one of the most complicated and still unsolved problems of plastic surgery. During several centuries, surgeons have attempted to solve it. A great number of surgical methods have been recommended and hundreds of papers written about them, but the essential difficulties have not yet been overcome. This becomes understandable, if one imagines the complexity of the auricle relief with its thin cartilage skeleton and likewise thin skin cover which can hardly be replaced by any equivalent tissues.

The history of otoplasty is quite extensive. It can be divided into three main periods. In the first period which lasted till the XVIIth century, a few scattered attempts were made at reconstructing small defects in the auricle [Tagliacozzi]. Total reconstruction was not carried out at all, because it was considered impracticable [Zeis].

The following period which began at the end of the XVIIIth century, was characterized by the improvement of the methods of partial otoplasty and the first attempts at reconstruction of the whole auricle [Shimanovsky, Diefenbach]. However, because of the employment of soft tissue only, without any supporting material, these methods proved ineffective.

Development of otoplasty was greatly promoted by the experience collected during the First World War 1914—1917, when the Filatov tube flap was first used for this purpose. As supporting material, rib cartilage (autogenous by Schmieden, Pierce, Peer, Converse, Tanzer and Steffenson; homogenous by Mikhelson, Gnilorybov, Limberg, Solntsev, Yarchuk, Khitrov, Pierce, Peer, Berson, Bardach and Bařinka) and also some alloplastic material, were used.

Attempts were made at forming the auricle on the neck or thorax and transposing it to the site of the defect [Lexer, Joseph, Kartashov, Gisylnina]. In spite of the great number of methods developed at that period, the results remained far from perfect. This was so because materials unsuitable for the purpose were used and thus the shape of the reconstructed auricle was coarse and altogether relative. Attempts were also made at employing cartilage taken



from the patient's mother (Gillies, Greeley) and from cadavers (Kirkham, Lemont, Lapchinsky).

The present period of the development of otoplasty is characterized by the preference given to tissues from the neighbourhood of the defect used together with free skin grafts. The methods of modelling the auricle skeleton from rib cartilage and other material were greatly improved upon and the sequence of the individual stages of reconstruction exactly determined.

Of all authors who have had an influence on the development of otoplasty in this period, Converse and Tanzer should be mentioned first. By cleverly exploiting the experience of their predecessors and improving upon it, they succeeded in achieving famous results which instilled the belief that total otoplasty is practicable after all.

A new trend in otoplasty developed with the widespread introduction of alloplastic material into surgery (Aufricht using acrylate, Rubin polyethylene, Gruzdkova EGMAS-12, Bardach polysterol nets, Chmyrev polyamide thread, Cronin silocon, etc.).

At the Surgical Department of the Central Institute of Stomatology where, for a number of years, attention was also paid to the problems of auricle reconstruction, some experience was collected which justifies us to express our opinion about the main trends of development in otoplasty.

Good results of auricle reconstruction can only be achieved by the improvement of surgical procedures in three main directions: 1. facilitating the mode in which material is obtained for covering skin defects, 2. perfecting the methods of preparation and conservation of homogenous tissue grafts and discovering new alloplastic materials whose qualities would come as near to auricle cartilage as possible, to be used for constructing the auricle skeleton, 3. developing methods of more exact modelling of the auricle.

Research in the first direction should be aimed at maximum exploitation of intact tissues in the neighbourhood of the defect, if possible from the temporal and periauricular regions, used together with free skin grafts, and also of tissues from the other, healthy ear.

The second direction should, according to our opinion, go along three ways: a) conserved auricle cartilage obtained from cadavers should be used more often for the construction of the auricle skeleton, b) construction of the auricle skeleton from cadaver auricle or autogenous rib cartilage should be perfected, c) new alloplastic materials for implantation into the auricle should be introduced and their modelling into the proper shape improved upon.

The third direction is, in many ways, linked up with the first two. It consists in the further improvement in planning of the surgical procedures, mainly the sequence of stages, the surgical technique and the postoperative (corrective) modelling of the taken graft.

The limited space of this communication does not permit a comprehensive and detailed appraisal of all important aspects of otoplasty. The author intends to publish further papers dealing with his experience in the employ-

ment of skin from the temporo-parietal region in special cases, of conserved homogenous auricle cartilage in total otoplasty, etc.

The present paper will only be confined to the first direction. As was mentioned above, this can be done in several ways. Particularly the possibility of employing the tissues from the other, healthy ear as a free skin-cartilage graft in its natural complex form, have not by far been exhausted. This problem will, therefore, be dealt with in detail below.

Since Suslov (1898) and König (1902) who first used free grafts of parts of the auricle, their methods have widely been employed in rhinoplasty by present-day surgeons in the Soviet Union and elsewhere. In this respect, Kyansky (1958) should be mentioned who, in cases in which he used part of an auricle for rhinoplasty, recommended filling the defect created in the one ear with a graft taken from the other, up to half its dimensions. Somewhat earlier, Pegram and Peterson (1956) practised an analogous method in filling auricle defects resulting from the resection of small tumours.

In 1905, the German surgeon Körte was the first to take parts of the auricle as free grafts for the repair of a large traumatic defect immediately after the accident. However, his method was only used occasionally (Lexer, Omrédanne, Meier). On the whole, the method is still little known and not sufficiently elaborated.

At present, the tissues of the auricle are considered the best plastic material for otoplasty with regard to both their composition and their shape. By no other method can the helix be reconstructed to an appearance as near to normal as possible. For the purpose of rhinoplasty and otoplasty, an oval or wedged shaped graft with its apex pointing towards the middle of the auricle, is usually excised. In order to give the donor ear a configuration as near to normal as possible, two more triangular sections through the full thickness of tissues must be excised, one on either side of the defect resulting from the removal of the transplant.

If this is not done and the defect is closed by simple suture, the donor ear usually becomes deformed due to the elastic pull of the cartilage; the upper pole flattens visibly, the auricle tends to get rolled up and a disfiguring skin-cartilage cone develops. The degree to which the donor ear is deformed, depends on the length of circumference of the helix excised in taking the graft. In the method recommended above, the triangular sections additionally excised from the donor auricle are not used to any purpose. In order to make full and rational use of all tissues taken from the donor site, the following method of excision of a specially shaped full-thickness graft is recommended. Apart from the basic triangular section, such a graft has two more triangular parts, each projecting at right angles from either of its sides. This graft is usually excised in the upper-outer quadrant of the helix. The apex of the main triangle reaches as far as the centre of the concha. The width of the graft, as measured by the length of helix circumference, depends on the size of the donor ear and, of course, on the amount of material required for the plasty. From an auricle of medium size, a graft of 10 to 15 mm, and from

a large auricle even one of 15 to 25 mm width, may be taken without running a risk of causing gross alteration in its shape. The width of the lateral triangular flaps should, in their sumtotal, equal that of the main triangle, i.e. the length excised from the helix circumference. The lateral triangles are excised at different levels; the anterior higher, i. e. in the groove between the helix and antihelix, and the posterior lower, i. e. in the region of the antihelix and concha. In this way the graft includes parts of the helix, antihelix and concha. Fig. 1 shows a diagram of this graft. On the medial side in the region of its central projection, the transplant has no skin cover.

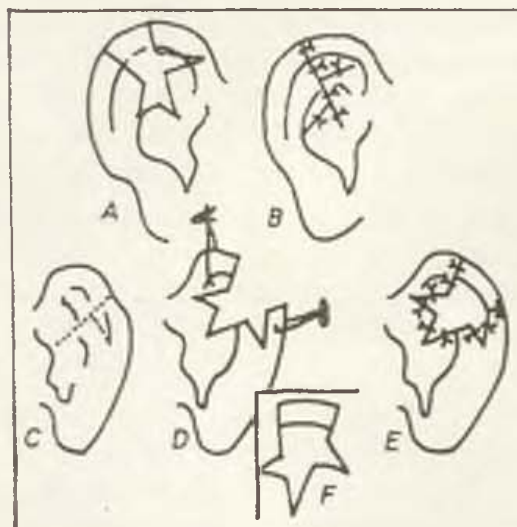


Fig. 1. Diagram of stages of auricle enlargement using figure graft from healthy ear: a) outlines of figure graft drawn on donor ear, b) view of donor ear after excision of graft and suture of wound, c) dotted line marks incisions to be made in microtic auricle, d) recipient bed in microtic auricle, e) figure graft, f) figure graft sutured into defect and auricle thus enlarged both by length of helix and into width

With this "figure" graft, in contradistinction to the earlier methods, it is not only possible to lengthen the helix, but also to widen the whole auricle including the concha.

The ledge-like shape of the transplant enables it to lie close to the surrounding tissues; it is — so to speak — embedded between them.

Apart from that and under otherwise equal conditions, the "figure" graft has a much longer circumference than grafts currently used which has the advantage of enlarging the contact-surface with its bed thus creating much more favorable conditions for its take. As a matter of fact, by this feature the take of relatively large figure grafts has been complete in all cases.

The first transplantation of such a graft aimed at enlarging an under-developed auricle, was carried out in the Institute in April, 1966. Similar operations were performed in another 15 patients without any complications, even in the presence of posttraumatic scars.

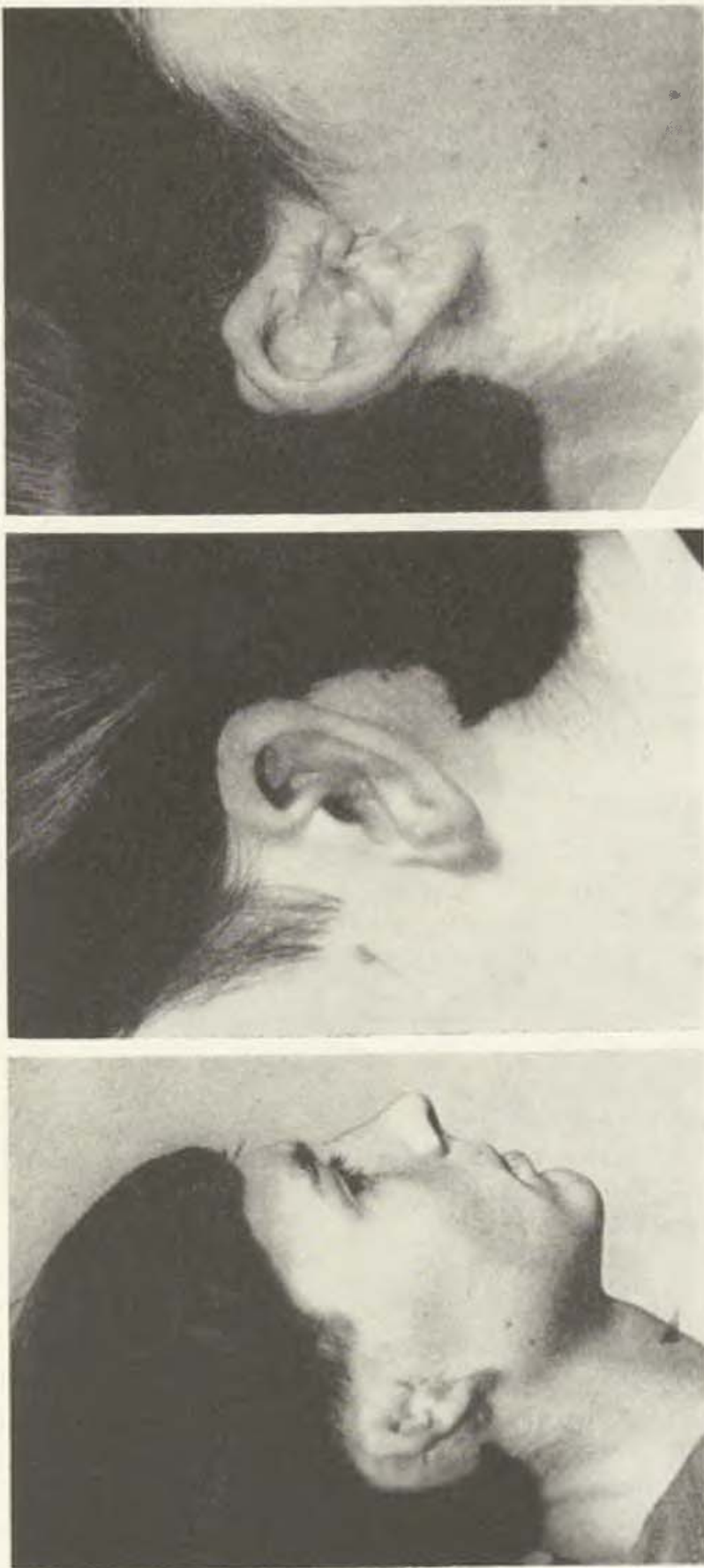


Fig. 2a) Patient A with 2nd degree microtia of right auricle. For improvement of shape, figure graft transplanted from left ear. — b) Same patient one year after operation. — c) Same patient: view of donor ear



Thus the figure graft taken from an auricle and used for the repair of defects of various provenance in the other auricle, has the advantage over the hitherto known methods (even if their shortcomings should be overcome in the future) that it permits the most expedient utilization of tissues obtained from the donor ear and with them the enlargement of an underdeveloped auricle not only by the length of its helix, but also by its width and by deepening of its concha, all carried out in one session.

At the same time, the shape of the donor ear has, after the removal of the figure graft, not at all been altered from a cosmetic point of view; it has only become somewhat smaller. For illustration of the above, fig. 2 shows the photograph of patient A suffering from an underdeveloped right auricle (2nd degree microtia) prior to and after operation. In order to repair the shape of the right ear, a figure graft from the left auricle was transplanted by the method described above.

As can be shown from the experience collected by the Institute, this method has great perspectives, and if properly indicated and carried out by adequate technique, it gives much better results than any other surgical procedures. Such transplantations are most effective in plastic operations for microtia or in the repair of relatively small acquired defects.

Free grafts taken from an auricle, in this case a figure graft, should find wider employment and become the method of choice both in oto- and rhinoplasty.

#### SUMMARY

A method of reconstruction of the auricle using a free skin-cartilage graft of a complicated shape from the healthy ear, is described.

The "figure" graft is a wedge of full thickness with wedged shaped ledges projecting on either side of it. The transplant includes parts of the helix, antihelix and concha.

The figure graft has the advantage over other, hitherto employed methods in that it permits the most rational utilization of tissues excised from the donor ear, and with them to enlarge the auricle not only along the circumference of the helix, but also into width, and all in one session.

The figure graft was used in patients with congenital anomalies and post-traumatic defects of the auricle. A total of 15 patients were operated on by this method and all with the same good result.

#### RÉSUMÉ

#### **Une nouvelle méthode de reconstruction du pavillon de l'oreille par une greffe composée de l'oreille de l'autre côté, saine**

G. V. Krutchinskiy

Une nouvelle méthode de reconstruction du pavillon de l'oreille à l'aide d'une greffe composé enlevée du pavillon de l'oreille du côté sain vient d'être décrite.

Cette greffe composé est un coin en pleine épaisseur douée des deux côtés des triangles de la peau. La greffe se compose d'hélix, d'antihélix et de la conque.



La méthode de la greffe composée — sans annuler les autres méthodes a pourtant beaucoup d'avantages. Elle permet surtout d'utiliser plus rationnellement les tissus provenant de l'oreille saine et d'élargir le pavillon de l'oreille et de l'allonger autour d'hélix.

La greffe composée fut employée dans des cas du défaut inné de même que dans les cas du défaut traumatique du pavillon de l'oreille chez 15 des malades toujours en plein succès.

## ZUSAMMENFASSUNG

### **Ein neues Verfahren für die Wiederherstellung der Ohrmuschel mit einem Figurpfropf vom gesunden Ohr**

G. V. Krutschinski

Es wurde ein Verfahren für die Wiederherstellung der Ohrmuschel mit einem Haut-Knorpelpfropf komplizierter Form vom gesunden Ohr beschrieben.

Der Figurpfropf stellt einen Keil in voller Schichtdicke dar, aus welchem an jeder von den beiden Seiten je ein Keillappen hervortritt. Das Transplantat umfasst einen Teil der Helix, der Antihelix und der Concha.

Die Methode des Figurpfropfes besitzt — ohne Ausnahme der früheren Methoden — eine Reihe von Vorteilen, namentlich ermöglicht sie die von dem gesunden Ohr gewonnenen Gewebe höchst rationell auszunützen und mittels derselben die Ohrmuschel parallel der Helix in einer Operation nicht nur zu vergrößern, sondern auch auszu dehnen.

Der Figurpfropf wurde bei der Behandlung der angeborenen Anomalie oder des Nachunfalldefektes der Ohrmuschel insgesamt bei 15 Kranken benützt, in allen Fällen mit Erfolg.

## RESUMEN

### **Nuevo modo de la reconstrucción del pabellón por el injerto de figuras de la oreja sana**

G. V. Krutchinsky

Se describió el modo de la reconstrucción del pabellón de la oreja con la aplicación del injerto de piel-cartílago de la forma compleja de la oreja sana.

El injerto de figuras representa la cuña de pleno espesor de la cual en cada de dos partes sobresale un lóbulo de cuña. El trasplante comprende una parte del helix, del antihelix y de la concha.

El método del injerto de figuras, sin excepción de los modos anteriores, tiene muchas ventajas, por ejemplo permite el más racional aprovechamiento de los tejidos ganados de la oreja sana y con ellos no solamente en una operación agrandar el pabellón a lo largo del helix sino también extenderle.

El injerto de figuras se aplicó en el tratamiento de la anomalía congénita o del defecto del pabellón de la oreja después del accidente en 15 enfermos en total y siempre con éxito.

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## THE CALORIC COST OF WEIGHT GAIN AFTER BURNS- THE IMPORTANCE OF M2 MIXTURE IN TREATMENT

R. DOLEČEK

There exists a number of experimental and clinical possibilities how to follow up the effectiveness of treatment in burned patients. Besides following up survival, rapidity of healing and several biochemical and histological indicators (1, 2, 3), regular observation of the weight curve is also a very important indicator of successful therapy. This is especially important if simultaneously the caloric consumption of the burned patient is being followed up. Thus the caloric cost of a certain weight increase may be determined. It is an excellent indicator of the immense energy losses by burned organism, which is certainly in part due to losses of water by evaporation on burned area. After previous very good experimental and clinical experience with modified neuroplegic mixture M2 (1, 2, 3), we repeatedly followed up for quite some time — weight curve in experimentally burned rats, treated in the first 5 days either only with saline solution or neuroplegic M2 mixture. As control we simultaneously followed up weight curve and caloric consumption in unburned rats of similar weight.

### METHODS

Female white Wistar rats were used in the experiment initial weight on the day of burning amounting to 185—225 grams. Several days prior to burning, the rats were placed in individual metabolic cages, where water consumption could be measured as well as diuresis and daily consumption of calories. Rats were weighed daily between 8,00—9,00 a.m. At that time also their rectal temperature was measured. The rats were fed on standard diet Wayne Lab-Blox, which contains in 1 kg 2 731 kcal metabolisable energy.

Burns of III. degree were carried out by flame, in light halothane narcosis, burned area equalled roughly 20% of body surface (according to Lee's formula (4)). For the first 5 days, the rats were intraperitoneally administered 1 ml of either saline solution or modified neuroplegic M2 mixture. The unburned group was only weighed each day and its consumption of calories was followed up.

The modified neuroplegic mixture M2 contains Hydergine<sup>2</sup> [alpha-receptor blocker] + Panthesine<sup>R</sup> [preparation similar to procain] + Sandosten-Calcium<sup>R</sup> [antihistaminic]. We administered it in the following composition:

Hydergine (= DH-Ergotoxin)	2 ml
Pantesine	20 ml
Sandosten-Calcium	20 ml
Physiologic Saline solution	58 ml

In order to remove the occasional daily variation of weight, consumption of calories, diuresis etc., the figures express the mean of 3 days of observation.

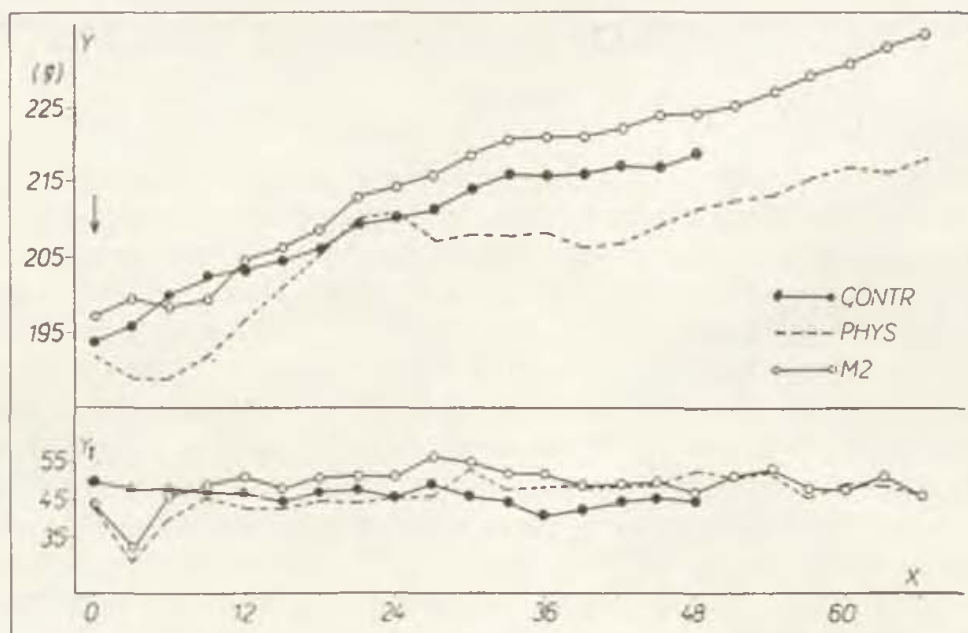


Fig. 1. Weight curve and caloric intake per 24 hrs in rats. CONTR. — mean values from 4 unburned rats (controls). PHYS. — burned rats (5) treated in the first 5 postburn days with the physiologic saline. — M2 — burned rats (6) treated in the first 5 postburn days with the neuroplegic M2 mixture.

## RESULTS

Fig. 1 demonstrates weight curve and caloric consumption in 4 unburned rats (CONTR.), 5 burned rats treated with saline solution (PHYS.) and 6 burned rats treated with neuroplegic mixture M2 (M 2). The burned rats were followed up for a longer period than stated in the figure, altogether for 172 days. Mean weight in rats treated with saline solution amounted at the end of experiment to 238,2 g if treated by neuroplegic mixture M2 weight amounted to 254,6 g, so that the mean weight increase during period of observation amounted to  $46,2 \pm 4,3$  (SD) and  $57,1 \pm 6,7$  (SD)g. The difference between both values is significant ( $p < 0,02$ ).

Table 1 demonstrates the mean daily consumption of calories by rats described on fig. 1, treated with saline solution and neuroplegic mixture M2, in



three 18-day intervals [these intervals were chosen in connection with the elimination of necrosis]. For comparison we give the mean normal consumption of calories in unburned rats. Further the table gives weight increase in the same 18 day intervals. Most important are data on caloric cost of 1 g weight increase. In the period of elimination of necrosis, there is an immense increase of caloric cost of 1 g weight increase in rats treated with saline solution (277 kcal), in comparison to normal values in rats treated with neuroplegic mixture M2 (75,9 kcal). Edema formation in the first 18 days in rats

Table 1. Some indicators on weight increase, consumption of calories and caloric cost of weight increase, in burned rats

18 day intervals*)	I.	II.	III.	Treat- ment
Consumption Kcal/24 hrs. (norm. 46,5 Kcal)	40,6 45,7	47,7 52,7	50,9 49,7	PHYS. M2
Weight increase in g/18 days (norm. 11,2 g)	13,2 11,3	3,1 12,5	5,1 6,2	PHYS. M2
Caloric value 1 g of weight increase (norm. 75,1 Kcal)	55,4 72,8	277,0 75,9	179,6 144,4	PHYS. M2

\*) after burns

SAL — burned rats treated with saline solution (5 rats)

M2 — burned rats treated with neuroplegic mixture M2 (6 rats)

treated with saline solution is clearly demonstrated in the decrease of caloric cost of 1 g weight increase (55,4 kcal in comparison to normal values in unburned rats 75,1 kcal). Rats in fig. 1 and 2 were followed up simultaneously at constant environmental temperature (22—24 °C).

Fig. 2. follows up — besides weight curve — also temperature curve, [diuresis] and change in the ratio PERORALLY CONSUMED WATER INTAKE/WATER OUTPUT (I/O), in 4 burned rats treated with saline solution (PHYS), and 5 rats treated with neuroplegic mixture M2 (M2). Burned rats were followed up for a longer period than stated in fig. 2, altogether for 68 days. Mean weight in rats treated with saline solution amounted at the end of experiment to 233,3 g, with neuroplegic mixture M2 to 246,6 g. Weight increase during period of observation amounted therefore to  $21,5 \pm 4,9$  (SD) and  $33,0 \pm 8,1$  (SD) g. The differences are statistically significant ( $p < 0,05$ ).

Elimination of necrosis observed by means of a special point system occurred in both groups rather similarly.

## DISCUSSION

By following up weight curve of burned rats repeatedly, we determined their absolutely similar trend (fig. 1, 2): in burned rats treated after burns with saline solution alone during period of elimination of necrosis (second 18 day period) weight increase was stopped, possibly weight even decreased. In burned

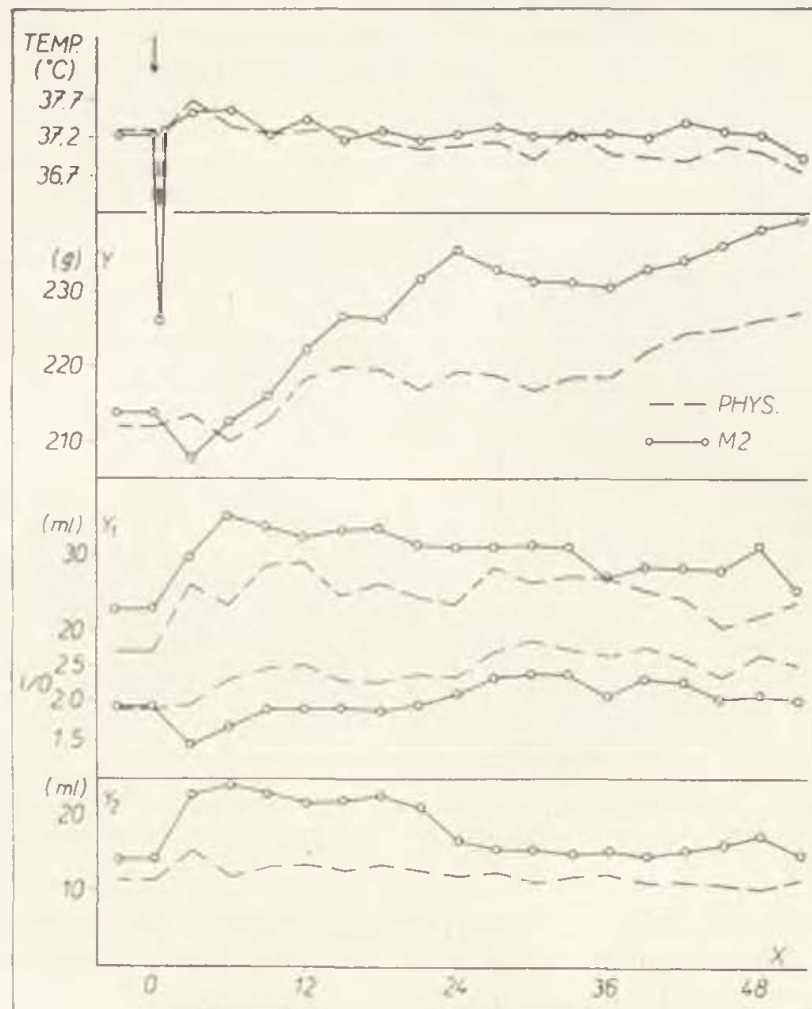


Fig. 2. Rectal temperature, weight curves, water intake and water output (diuresis) in burned rats. Four were treated with the physiologic saline (PHYS.) in the first 5 postburn days, five were treated with the neuroplegic M2 mixture (M2) — see Fig. 1. I/O — water intake/water output ratio.

rats treated with modified mixture M2 (Hydergine + Panthesine + Sandosten-Calcium) stopping of weight increase either did not occur at all or it was considerably smaller, possibly it started later. In longterm observation of weight (172 and 68 days) in two groups of burned rats (in each group rats were treated with saline solution and neuroplegic mixture M2), weight increase in both groups if treated with neuroplegic mixture M2 was significantly higher than weight increase in burned rats treated with saline solution.

In the phase of elimination of necrosis (the second 18 days in tab. 1) caloric cost of weight increase in burned rats treated only with saline

solution was several times (3,6X) higher than in rats treated with mixture M2. In further 18 days this difference was already considerably smaller. Probably the only possible explanation is that burned rats treated with mixture M2 lost during release of necrosis much less water by evaporation and thus invested also much less of their own energy — heat — into evaporation (0,58 kcal for 1 ml water). An indirect indicator of this is also demonstrated in fig 2, where diuresis in burned rats treated with M2 mixture increased significantly whereas it did not increase in rats treated with saline solution. Yet in both groups the peroral water consumption during 24 hours was after burns significantly higher. This reflects clearly also in the behaviour of I/O ratio, i.e. quantity of water consumed to quantity of urine (fig. 2 states each time the mean of 3 days), water intake/water output.

Rats, treated after burns with saline solution alone, had in the second half of experiment (fig. 2) a lower temperature than rats treated with neuroplegic mixture M2, the latter had a lower caloric cost of weight increase. This may be explained by the incapability of rats treated after burns with saline solution, to mobilize further sources of energy for maintaining body temperature, when organism is losing so much heat due to evaporation.

To the great number of indicators proving usefulness of modified neuroplegic mixture M2 in treatment of burns in experiment and in clinic (1, 2, 3), there must be now also added objective data on favorable influence upon the caloric cost of weight increase (probably due to decreased evaporation in neuroplegics treated burned rats) and upon diuresis. This means that the applied neuroplegic mixture M2 protects significantly, in time, some basic processes after burns and this bears effect upon the entire period of the burns disease. Besides the favourable effect of mixture M2 upon microcirculation (5), it is also necessary to consider the possibility of effect upon lysosomes of some cells (in the digestive tract?) in stabilising their membranes (Sandosten-Calcium?) as described repeatedly after some anti-histaminics (6, 7), not however after chlorpromazine. Disturbance of lysosome membranes in the digestive tract may be an important factor in the pathogenesis of shock [for ex. haemorrhagic shock (8)].

#### SUMMARY

When following up the weight curve in rats treated after burns by flame with saline solution and modified neuroplegic mixture M2 (Hydergine+Sandosten — Calcium+Panthesine), significant differences were repeatedly determined. After treatment with neuroplegic mixture M2 a significantly higher weight increase occurred. In the period of elimination of necrosis, rats treated with saline solution had to invest 277 kcal for 1 g of weight increase, whereas rats treated with M2 mixture invested in the same period only 75,9 kcal. Diuresis in neuroplegics treated rats was significantly higher than in rats treated with saline solution.

The modified neuroplegic mixture M2 protects a number of basic processes (improvement of microcirculation, decrease of energy losses by evaporation, perhaps also stabilisation of lysosomes), after burns.

## RÉSUMÉ

### **La valeur calorique de la prise en poids chez les brûlés. L'évaluation de la mixture M 2 dans la thérapie des brûlés**

R. Doleček

En évaluant la courbe du poids des rats traités en suite des brûlures par la flamme soit par la solution physiologique soit par la mixture neuroplégique modifiée M2 (Hydergine plus Sandostène-calcium plus Panthésine) on a constaté couramment des différences importantes. Au cours de la thérapie à l'aide de la mixture neuroplégique M2 la prise en poids était bien plus élevée en relation avec celle par la solution physiologique. Dans la période de la libération des nécroses les rats traités par la solution physiologique étaient obligés d'utiliser 277 des Calories pour un seul gramme de poids total, tandis que les rats traités par M2 mixture dans la même période n'avaient besoin que de 75,9 Calories. La diurèse chez les rats dans la neuroplégie était significamment élevée contre ceux traités par la solution physiologique.

La mixture neuroplégique M2 en suite des brûlures joue un rôle protectif dans tout un tas des procès basals (l'ammélioration de la microcirculation, l'abaissement des pertes d'énergie par l'évaporation, peut-être même dans la stabilisation des lysosomes).

## ZUSAMMENFASSUNG

### **Kalorischer Wert der Gewichtszunahme bei Verbrannten. Bedeutung des M 2 Gemisches in der Therapie**

R. Doleček

Bei der Verfolgung der Gewichtszunahme von Ratten, die nach Verbrennung mit physiologischer Kochsalzlösung und modifiziertem neuroplegischem Gemisch M2 (Hydergin + Sandosten — Calcium + Panthesin) behandelt wurden, sind wiederholt signifikante Unterschiede festgestellt worden. Unter Behandlung mit dem neuroplegischem Gemisch M2 trat eine signifikant höhere Gewichtszunahme vor. In der Zeitperiode der Nekrosenlösung mussten die mit physiologischer Lösung behandelten Ratten 277 Kcal auf 1 Gram Gewichtszunahme investieren, wogegen die mit dem M2 Gemisch behandelten Ratten in derselben Zeitperiode lediglich 75,9 Kcal verbraucht haben. Bei den neuroplegierten Ratten war die Diurese signifikant höher als bei den mit physiologischer Lösung behandelten Ratten.

Nach Verbrennung greift das modifizierte neuroplegische Gemisch M2 in eine Reihe von elementaren Prozessen (Verbesserung der Mikrozirkulation, Verminderung der Verdampfungsenergieverluste, möglich auch die Stabilisierung von Lysosomen) protektiv ein.

## RESUMEN

### **Valor calórico del aumento de peso en los quemados. Importancia de la mixtura M 2 en el tratamiento**

R. Doleček

Al seguir la gráfica del peso de las rats tratadas después de la quemadura de llama con la solución fisiológica y con la neuroplégica mixtura M2 modificada (Hydergin + Sandosten — Calcium + Panthesin) se comprobaron repetidamente diferencias significantes. Después del tratamiento con la neuroplégica mixtura M2 llegaba al aumento de peso significamente superior. En el tiempo de la liberación de las necrosis las ratas tratadas con la solución fisiológica tenían que invertir 277 Kcal para 1 gramo del aumento de peso, en tanto que las ratas tratadas con la mixtura M2 en el mismo



tiempo solamente 75,9 Kcal. La diuresis en las ratas tratadas con la mixtura neuroplégica era significativamente mayor que la en las ratas tratadas con la solución fisiológica.

La neuroplégica mixtura M 2 modificada interviene protectoramente después de la quemadura en la serie de los procedimientos fundamentales (mejoría de la microcirculación, disminución de las pérdidas de la energía por evaporación, quizás también la estabilización de los lisosomas).

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## SKIN PLASTY IN THE SURGICAL TREATMENT OF CONGENITAL ELEPHANTIASIS IN CHILDREN COMBINED WITH CONGENITAL CONSTRICTION IN THE EXTREMITIES

N. I. BUTIKOVA, V. S. PROKOPOVICH

Congenital constriction in limbs is usually combined with other malformations, such as syndactyly, equinovarus, lack or insufficient development of the distal segments of arms and legs, varus deformities of the upper limbs, and sometimes also with malformations in other parts of the body. Apart from this, constrictions in extremities usually occur multiple and are combined with a more or less gross thickening of soft tissues in the distal parts of the limb.

In the more conspicuous types of congenital elephantiasis, surgical treatment is indicated, but its methods are as yet little elaborated. The surgical procedures used show considerable variety, and the recommendations of authors are based on but single observations (treatment of foot elephantiasis combined with constriction in the leg). The authors of this report did not find any communication about the surgical treatment of upper-extremity elephantiasis combined with congenital constriction.

As far as surgical procedures are concerned, Dykhno, Wallace, Patterson, Stoytscheff and Barsky et al. are satisfied with resecting the constriction in the leg counting upon elephantiasis of the foot to disappear by itself after removal of the strangulating obstacle in the limb. The above authors remove the constriction in two stages, because resection of it in one session seems risky to them. Tshaklin recommends excision of the fibrotic tissue in the foot, but he does not point to the necessity of any surgical intervention on the constriction. A number of authors remove both elephantiasis of the foot and constriction in the leg. Thus Haberer first excises a wedge of soft tissue from the foot and, three months later, he carries out a circular excision of the constriction in the leg. Pasenko removes the constriction in the leg and, at the same operation, excises a wedge of soft tissue from the dorsum of the foot. Ulitsky, on the other hand, first removes the constriction in the leg and after eight to ten days carries out the same operation on the foot as Pasenko.

Since 1954, the authors of this report have observed 95 children between the age of one month and 16 years in which, among other malformations, there was a total of 312 congenital constrictions in the extremities. In 71 of these (49 children) the constriction was accompanied by a various degree of thickening in the skin and subcutaneous tissue of the distal parts of the affected limb. In 52 cases, the constriction was situated on the fingers, in seven cases on the toes, in eleven on the leg, and only in one case on the thigh.

Fourteen children were operated on for congenital elephantiasis combined with constriction; three of them were babies, another three aged one to three years, six children were three to seven years old and two were older than seven. In all these patients, a total of 19 different segments of extremities were affected by constriction combined with elephantiasis. In 13 cases, these were the fingers, in two cases the toes and in four cases constriction in the leg was combined with elephantiasis of the foot. In two of these children, constriction had been removed first at an early age. Long observation of these children showed that this did not cure elephantiasis of the foot. In both cases the thickening of soft tissues on the dorsum of the foot grew proportionately with the growth of the entire limb. Both children had to be operated on for a second time; resection of the thickened tissues in the foot followed by simple suture, was carried out. This was done eight years in the one and ten years in the other case after excision of the constriction.

The cosmetic results of operations leave much to be desired. It is understandable that excision of the affected tissues cannot be radical enough, if the defect is to be closed by simple suture. Wide excision invariably leads to tension in the wound edges which is fraught with the threat of necrosis. In the surgical treatment of congenital constriction combined with elephantiasis, therefore, the authors resorted to skin plasty which was carried out in 12 patients with a total of 17 limbs affected by elephantiasis combined with congenital constriction. The technique and character of the surgical treatment were modified according to localization of the affection.

In two other patients with elephantiasis of the foot combined with constriction in the leg, the latter was removed by circular excision and the defect closed by a Z-plasty according to Limberg in the first stage. This improved conditions in the distal parts of the limb, particularly the thickening of soft tissues which became less infiltrated. However, elephantiasis did not disappear. Six months later, radical surgical treatment of elephantiasis was carried out; wide excision of skin and subcutaneous tissue down to the fascia on the dorsal aspect of the foot and re-implantation of the skin after removal of the hypertrophic subcutaneous layer. After that, the surplus skin became pendent around the circumference of the transplant and this cosmetic shortcoming had to be repaired by an additional Z-plasty.

As an illustration of the above surgical treatment of elephantiasis of the foot combined with constriction in the leg, a case history is given below:

Patient N. T. (case paper No 377), a girl aged three, was admitted to the Institute on 25 Oct., 1962. She was suffering from a deep circular constriction in the lower third of the left leg combined with elephantiasis of the foot which was particularly gross on the dorsum. The dorsum-sole circumference of the foot was 9 cm larger than that of the right foot. The skin on the dorsum was dry, rough and craked in many places. The toes were hidden under the overhanging surplus dorsal skin (fig. 1a).

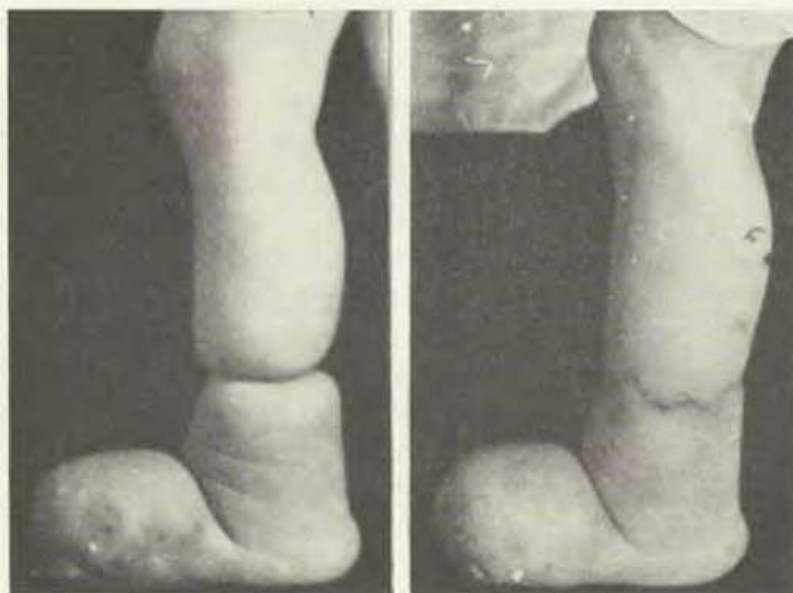


Fig. 1a) Deep congenital constriction in left leg combined with gross elephantiasis of foot in child N. T., aged 3. — b) Photograph of same patient's leg 7 months after circular excision of constriction and Z-plasty of skin. The constriction has been removed but elephantiasis of the foot persists

The patient was operated on under general anaesthesia on 3 Jan., 1964. The constriction in the left leg was excised by two parallel and circular incisions penetrating through the entire soft tissue right down to the bones. The resulting wound was sutured plastically employing five symmetrical opposing triangles formed by additional skin incisions at  $60^{\circ}$  angles, each 2 cm in length. Soon after removal of the congenital constriction, the existing thickening of soft tissues in the left foot decreased slightly and the tissues of the dorsum became soft and flabby. The circumference of the left foot grew smaller by 3.5 cm. However, elephantiasis later became stabilized (fig. 1b). On 12 Aug., 1963, radical excision of tissues on the dorsum of the foot and re-implantation of the excised skin, was carried out. The graft took completely.

Histological examination of the excised tissues showed that the skin on the dorsum of the foot was grossly thickened to the detriment of the cornified layer. The subcutaneous tissue consisted mainly of fibrous connective tissue with elements of smooth muscle fibres and innumerable blood vessels whose walls were grossly thickened (Yaroshevskaya).



After this radical operation of elephantiasis, the shape of the foot improved considerably; the toes became uncovered, but the deformation of the foot due to the overhanging of surplus skin around the edges of the transplant, remained unchanged (fig. 1c). On 13 Oct., 1963, the surplus skin was removed by a Z-plasty using asymmetrical opposing triangular flaps formed by incisions, each 1 cm in length, whereby the inner incisions were made along the scar and the side incisions at angles of 30 to 90° to it. The incisions



Fig. 1c) Photograph of same patient's leg after radical excision of elephantiasis on dorsum of foot and re-implantation of excised skin. — d) Photograph of same patient's leg 3 years after operation

in the graft were made at right angles, because this was the less mobile tissue. Those at sharp angles ran through the skin surrounding the graft.

On check-up of the patient three years after the last operation, it was found that the re-implanted skin did not differ in colour from that of the surrounding tissue, lay at the same level with the latter and could be shifted over the underlying tissue. The dorsum-sole circumference was the same in both feet. The patient wore normal foot-wear. This was a good result both from a functional and cosmetic point of view (fig. 1d).

Congenital elephantiasis of fingers or toes is repaired together with removal of the constriction in one session. Dividing the surgical procedure into excision of the constriction and removal of the thickened tissue in the digit, seems inexpedient because the constriction is usually excised only to half of the circumference of the digit and, as a rule, together with the dorsal skin, where the soft tissue always shows a greater surplus which, in addition, is more irregularly distributed than on the volar or plantar aspect. After excision of the constriction in the digit, a symmetrical figure of op-

posing triangular flaps (according to Limberg) is formed. Then the distal side incision is extended and two triangular pieces of skin at right angles to each other are excised, which permits removal of surplus tissue in the distal part of the digit at the same time. After this, the triangular flaps are exchanged and the wound edges approximated and sutured. A diagram of this operation (carried out in one session) is shown in fig. 2.

In some cases of congenital elephantiasis, the strangulating constriction and the thickening of soft tissues are evenly developed all round the finger. Then excision of the constriction and the surplus tissue carried out only on the dorsal aspect of the finger does not suffice. In such cases, the constriction and elephantiasis on the volar aspect are repaired in a second stage, one or two months after the first operation. If several constrictions are present in one finger, the proximal is removed first together with excision of the surplus tissue and, in a second stage, the distal constrictions are excised together with the remaining surplus tissue.

As illustration of the results achieved after repair of congenital elephantiasis combined with congenital constriction in fingers by the method described above, a case history is given below:

Patient P. I. (case paper No 163), a boy aged five months, was admitted to the Institute on 10 June, 1967, with ectrosyndactyly of both hands and congenital constriction in the ring and little fingers of the right hand combined with gross elephantiasis in their distal parts. The malformation was detected immediately after birth. On each the ring and little finger of the right hand, there were two deep circular constrictions situated on the proximal and distal phalanges. The dorsal aspect of the fingers between these two strangulating grooves showed gross thickening of soft tissues, particularly the ring finger. The thickening was so enormous that it covered both the ring and little fingers. The circumference of the ring finger at the level of the thickening was 6 cm, i.e. exceeded more than twice that of normal fingers. The skin of this part was thickened and infiltrated and showed several transverse folds (fig. 3a).

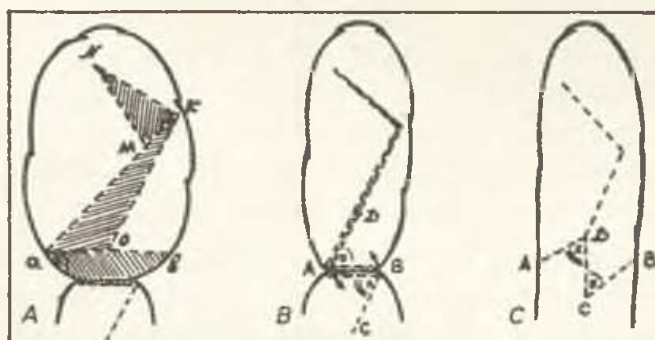


Fig. 2. Diagram of incisions in removal of constriction in finger and excision of surplus soft tissue. — A) Diagram of incisions: triangular areas, a-k-o and M-N-k, and sections in region of constriction to be excised (hatched areas). — B) Approximation of wound edges after excision of surplus tissue. — C) Final result after exchange of opposing triangular flaps in region of constriction



Fig. 3a) Congenital ectrosyndactyly of right hand and constrictions in ring and little fingers combined with gross elephantiasis in child P. I., aged 5 months. — b) Photograph of condition after surgical treatment

The patient was operated on under general anaesthesia on 14 June, 1967. The proximal constriction in the ring finger was excised by two half-circular incisions on the dorsal aspect of the finger, 7 mm apart from each other. Additional side incisions were then made, running at 60° angles from the ends of the half-circular incisions. The distal of those side incisions was lengthened, two triangular flaps formed and the surplus soft tissue excised. After exchange of the triangular flaps, suture of the wound was carried out. At the same operation, the proximal constriction in the little finger was also removed. On 7 Oct., 1967, the distal constrictions and the remaining surplus tissue on the dorsal aspect of both ring and little fingers of the right hand, were excised. The result achieved was satisfactory; the fingers showed their contours and became capable of gripping (fig. 3b).

After operations on fingers, no complications were ever observed. In one of the two patients operated on for elephantiasis of the foot, a minute and limited area of re-implanted skin became necrotic. In order to prevent scarring, the authors did not wait for closing of the thus created defect by spontaneous second-intention healing, but carried out an additional plasty using a split-skin graft 2 X 2 cm in size.

In all 12 patients operated on with the employment of a skin plasty, the immediate results achieved were satisfactory. The patients were checked up one to five years after operation. The condition of the operated on parts



remained stable, the reimplanted skin had grown larger parallel with the growth of the extremity and the mobile subcutaneous layer under the transplant did not show any thickening.

### CONCLUSIONS

1. Thickening of an extremity distal to a congenital constriction should be qualified as a type of congenital elephantiasis, because it is stable by nature and does not disappear after removal of the strangulating constriction.

2. In elephantiasis of fingers and toes combined with congenital constrictions, surgical treatment in one single session proved expedient. It consists in removal of the constriction on the dorsal aspect of the finger combined with a Z-plasty of skin and in excision of surplus skin and subcutaneous tissue on the dorsal aspect of the finger in the shape of two triangular pieces at right angles to each other. In circular elephantiasis which it met with rarely in fingers, the surgical procedure described above is first carried out on the dorsal aspect and, in a second stage, on the volar aspect of the finger.

3. In elephantiasis of the dorsum of the foot combined with congenital constriction in the leg, better results are achieved from radical surgery consisting in circular excision of the constriction combined with a Z-plasty and complete excision of the thickened skin and subcutaneous tissue on the dorsum of the foot and subsequent re-implantation of the excised skin. The constriction in the leg and elephantiasis of the foot may be surgically treated with success within a period of a few months.

### SUMMARY

The authors report on 95 children of an age between one month and 16 years, suffering, among other malformations, from a total of 312 congenital constrictions in the extremities. In 71 of these constrictions (49 children), the skin and subcutaneous tissue of the distal parts of the extremity were thickened, which the authors qualify as a sign of congenital elephantiasis.

Fourteen children were subjected to surgical treatment and in these a total of 19 constrictions combined with gross elephantiasis, were removed. In 13 cases, these malformations were found on the fingers of the hand, in two on the toes of the foot and in four, there was elephantiasis of the foot in the presence of a constriction in the leg.

The treatment consisted in removal of the constriction and the surplus of skin and subcutaneous tissue. On fingers, the surgical treatment was usually carried out in one session and combined with local skin plasty. In elephantiasis of the foot, removal of the constriction together with a Z-plasty was carried out first and, in a second stage, the skin and subcutaneous tissue was excised radically down to the fascia and the excised skin re-implanted. The method described above gave good results which were checked up and proved stable up to five years after operation.



## RÉSUMÉ

### **La plastie cutanée au cours du traitement chirurgical de l'éléphantiasis de l'origine d'une strangulation innée du membre en question**

N. I. Butikova, V. S. Prokopovitch

Les auteurs ont soumis à la contrôle 95 des enfants à l'âge d'un mois jusqu'à seize ans qui, à part d'autres défauts innée, souffraient en somme de 312 des strangulations innées des membres. Chez 71 de ces strangulations se trouvant chez 49 des enfants dans des parties variées des membres, la peau et le tissu conjonctif en question était plus épais distalement. Les auteurs supposent que c'est le signe de l'éléphantiasis inné.

14 de ces enfants ont été soumis à l'intervention chirurgicale, et 19 des strangulations combinées à la forme d'éléphantiasis inné. Dans 13 des cas il y avait en plus des défauts innés des doigts des mains, dans deux cas des doigts des pieds et dans quatre des cas il y avait de même un éléphantiasis plantair en suite de la strangulation innée de la jambe.

Le traitement consistait en excision du tissu en strangulation accompagnée de l'excision de la peau superflue de même que du tissu sous-cutané infiltré. L'intervention chirurgicale sur les doigts était faite en même temps que la plastie de la peau. Chez l'éléphantiasis plantair on a fait d'abord une Z plastie pour enlever la strangulation. Quand à la résection radicale de la peau et du tissu sous-cutaneux jusqu'à la fascie, suivi de réimplantation de la peau respective les auteurs conseillent de l'entreprendre en délai. L'intervention décrite donnaient de bonnes résultats, lesquels restaient stables même après la période de cinq ans.

## ZUSAMMENFASSUNG

### **Hautplastik bei chirurgischer Behandlung der angeborenen, auf Grund kongenitaler Gliedmassenstrangulation entstandener Elephantiasis**

N. I. Butikowa, V. S. Prokopowitsch

Es wurden Beobachtungen an 95 Kindern im Alter von 1 Monat bis zu 16 Jahren vorgenommen, die ausser anderer Entwicklungsfehler insgesamt 312 angeborene Strangulationen an den Gliedmassen aufwiesen. In 71 Fällen dieser Strangulationen, die bei 49 Kindern in verschiedenen Partien der Gliedmassen festgestellt wurden, zeigten die Haut und das subkutane Gewebe distale Verdickungen. Die Autoren halten dieses Symptom für eine Auswirkung der kongenitalen Elephantiasis.

Der chirurgischen Behandlung wurden 14 Kinder unterzogen und es wurden 19 Strangulationen entfernt, die mit der manifesten Form der Elephantiasis kombiniert waren. In 13 Fällen wurden ausserdem Entwicklungsfehler an den Fingern, in 2 Fällen an den Zehen, und in 4 Fällen Elephantiasis der Fusssohle mit angeborener Strangulation des Unterschenkels festgestellt.

Die Therapie bestand aus der Entfernung des strangulierenden Gewebes und Resektion der überflüssigen Haut mit infiltriertem subkutanem Gewebe. Der chirurgische Eingriff an den Fingern erfolgte gewöhnlich gleichzeitig mit lokaler Hautplastik. Im Falle der Fusssohlenelephantiasis wurde zunächst die Strangulation mittels Z-Plastik entfernt und in der zweiten Periode empfehlen die Autoren radikale Resektion der Haut gemeinsam mit dem subkutanen Gewebe bis zur Faszie mit anschliessender Reimplantation der resezierten Haut. Die beschriebene Behandlungsmethode ergab gute Ergebnisse, die nach fünf Jahren stabil geblieben sind.

## RESUMEN

### Plástica de piel en el tratamiento quirúrgico de la elefantiasis congénita aparecida sobre la base de la estrangulación congénita de las extremidades

N. I. Butikova, V. S. Prokopovich

Se realizaron observaciones con 95 niños en la edad desde 1 mes hasta 16 años los que además de otros defectos de desarrollo habían tenido en total 312 estrangulaciones congénitas en las extremidades. En 71 de estas estrangulaciones que habían comprobado en 49 niños en varias partes de sus extremidades la piel y el ligamento subcutáneo fueron distantemente engordados. Los autores consideran este síntoma como la manifestación de la elefantiasis congénita.

Al tratamiento quirúrgico se sometieron 14 niños en los que habían eliminado 19 estrangulaciones combinadas con la forma evidente de la elefantiasis. En 13 casos se comprobaron además de eso los defectos de desarrollo en los dedos de la mano, en dos casos en los dedos de los pies y en cuatro casos la elefantiasis de la planta del pie con la estrangulación congénita de la canilla de la pierna.

El tratamiento consistió en la remoción del tejido de estrangular y en la resección de la piel excesiva junto con el tejido subcutáneo infiltrado. La intervención quirúrgica en los dedos se realizó de costumbre al mismo tiempo con la plástica de piel local. En la elefantiasis de la planta se apartó en primer lugar la estrangulación por medio de la Z-plástica y en segundo tiempo los autores recomendaban la resección radical de la piel junto con el tejido subcutáneo hasta la fascia y la reimplantación de la piel reseca. El modo descrito del tratamiento llevó buenos resultados, los que quedaron estables después de cinco años de la observación.

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## ON THE QUESTION OF REGENERATION OF ARTICULAR CARTILAGE IN CASE OF DAMAGE OR IN ARTHROPLASTY

G. I. LAVRISHTSHEVA, I. M. DITMAN

The question of reconstructing damaged articular cartilage or its formation after arthroplasty has not yet been solved. Extensive literature on cartilage regeneration exists, but the results of the reports are contradictory. According to the opinion of the majority of authors articular joint cartilage possesses no distinct properties of regeneration (F. R. Bogdanov, 1937; A. A. Nemilov, 1940; M. V. Mukhin, 1951; I. A. Imershvili, 1958; P. F. Matcev, 1961; A. I. Strukov, 1967; a. o.). This opinion is supported by the fact that neither in the numerous experiments nor in clinical practice, is the damaged cartilage repaired as a rule *ad integrum*. Other authors — G. Arkhangelskiy (1868), Gies (1883), Schanz (1931), Calandruccio and Gilmer (1962) — reported on the possibility of repairing the integrity of hyaline cartilage. The last of the mentioned authors carried out experiments in pups and achieved regeneration of articular cartilage by filling a defect of 3 mm diameter with hyaline cartilage in three out of 30 animals. The authors are of the opinion that regeneration of cartilage is prevented by the rapid growth of granulation tissue which does not differentiate in chondro- but rather in desmogenesis direction. For chondrogenetic repair process, the effect of mucopolysaccharides upon granulation tissue is essential; in three positive cases, when the defect in cartilage had special edges, was such effect of mucopolysaccharides excreted from the basic cartilage mass, possible. T. P. Vinogradova (1950, 1964, 1966) considers that the idea that cells of cartilage lose their ability to multiply, must be verified again. She writes: "It would be a mistake to believe that it is not possible to achieve regeneration of hyaline cartilage with the help of the properties of cartilage tissue."

For inducing the abilities of cartilage to regenerate certain conditions are required.

The practical importance of solving the given problem, incited us to look for means of repairing damaged hyaline cartilage.

Intending to achieve optimal conditions for regeneration, we carried out experiments using hyaluronic acid, hydrocortisone and homoplastic fascia. The below reported data on the importance of the mentioned factors were required for carrying out the experiments.

Hyaluronic acid, which is a component of amorphous mass in connective tissue, is the basic mucopolysaccharide of synovial fluid causing its high viscosity which is important for the function of articular cartilage. The physiologic regeneration of articular cartilage is occurring continuously, the surface layer of articular cartilage is occurring continuously, the surface layer of articular cartilage is obviously continuously peeling, due to friction. Abnormal decrease of joint fluid (when the joint starts to be "dry") or change of its properties (decrease of viscosity, namely in trauma) are unfavourable factors for normal repair of cartilage. Thus normalisation of the conditions of the function of articular cartilage is of the greatest importance for physiologic and reparative regeneration, whereby the composition of the synovial fluid, plays the most important part. Application of hyaluronic acid decreases permeability of the joint wall, prevents exsudation into the damaged joint and forms the required viscosity of joint fluid.

In order to decrease post-traumatic inflammation in joint injury, hydrocortisone has been widely applied by our and foreign authors (Z. S. Mironova, 1961, 1962; F. P. Bogdanov, 1962; A. A. Korž, 1962; Salmon, 1957; Kappel and Thompson, 1959 a. o.). Hydrocortisone similarly as hyaluronic acid, decreases exsudation and besides, inhibits fibrocytary reaction, prevents development of banal connective tissue in the place where cartilage is damaged. The positive effect of hydrocortisone was proved by A. E. Kutsherenko and G. I. Lavrishtsheva (1965). The expedience of homoplastic fascia application in regeneration of articular cartilage in arthroplasty is evident from experiments by G. I. Lavrishtsheva and B. F. Morozov (1967). If the homoplastic fascia is placed as padding between the areas of the damaged joint, it protects the early surface, it does not induce inflammatory reaction of joint and aids regeneration of cartilage tissue. Remembering the role of hyaluronic acid in the process of regeneration and endeavouring to prolong its presence in the joint, we saturated fascia with hyaluronic acid. These were the theoretical data of the given experiments.

#### THE ACTUAL RESEARCH

**Methods of experiment.** 48 experiments were carried out in knee joints of adult animals (6 dogs and 42 rabbits). In view of the fact that the most important moment seems to be the renewal of the physiologic movements in the operated joint, we did not disturb the joint; we removed the cartilage only partly, maintaining cross suture. As model of the experiment we selected a large defect of articular cartilage and the respective subchondral plate. Spontaneous filling of such a defect by cartilage would be impossible. For this



reason we tested a complex of measures which brought the conditions in the joint near to physiologic conditions with the aim to clarify the possibilities of repairing the functional structures of articular cartilage when the joint is injured and also in arthroplasty.

Under local anaesthesia we opened the knee joint of the experimental animal by external longitudinal section. On the joint surfaces of the femoral bone condyles opposite patella, we cut by special perforator and demarker a tissue cylinder: articular cartilage with the respective bone, 4 mm in diameter and 3.6 mm in depth.

In the first series of experiments we washed the joint with a prepareate of hyaluronic acid, obtained from umbilical cords. We sutured the wound in layers, with catgut. Just as in the subsequent series of experiments, we applied plaster of Paris on the operated extremity. In this series of experiments we carried out application of hyaluronic acid by puncture of joint, one and two days after operation.

In the second series of experiments, before suturing the wound, we applied hydrocortisone into the joint. One and two days after the operation we applied hydrocortisone in periarticular injection.

In the third basic series of experiments we placed into the bed excised by perforator, homoplastic fascia which had been immersed in a prepareate of hyaluronic acid for several days at temperature from 0°C to 4°C. We quilted the fascia with thin catgut sutures and fixated it to the surrounding soft tissues. After suturing the wound we applied hydrocortisone periarticularly.

In the first experiments of the third series, we prepared hyaluronic acid from umbilical cords, further on we applied a prepareate of hyaluronic acid — luronit.

After the operation the rabbits were given normal food rations and their condition was good. The post-operational wound healed per primam. In this period the animals already used the operated extremity. The method of preparing the prepareate: fixation in 12% formalin solution, placed in celoidin, staining of sections by hematoxylin-eosin and according to van Gieson.

## RESULTS

30 rabbits of the third (basic) series of experiments were killed in the period between the 19th and 186th day after operation. In 2 animals the defect was (not quite) filled with granulation tissue (28th day and 74th day) and in 2 animals by firm fibrillar connective tissue (35th day and 44th day) in 4 the regenerate composed with cells of rich chondroblastic tissue (in the period from 19th to 31st day), in 2 the bed perforated in operation was filled with fibrillar cartilage (28th and 112th day), in 2 it was filled by fibrillar cartilage as well as in tissues of synovial membrane type (122nd and 180th day), in 4 in the type of synovial membrane (from 35th to 145th day). In 14 cases in the period from the 28th day to 186th day after the operation

the formed defect was filled with hyaline cartilage, the articular cartilage having its integrity completely repaired.

We shall state data on preparates studied in the third series of experiments. In the period from the 28th to the 77th day since the moment of the operation, repair of integrity of the disturbed articular cartilage was observed in five rabbits. Rabbit Nr. 89 was killed 56 days after operation. Macroscopic examination: integrity of the articular cartilage was repaired, the previous defect was filled by cartilage of normal appearance (fig. 1). Microscopically: in the place of the previous defect hyaline cartilage formed rich in cartilage cells compared to the previous one. Contours of subchondral bone plate in this region are somewhat uneven (fig. 2).

In the period between 84th and 134th day, integrity of articular cartilage was repaired in 6 rabbits.

Rabbit Nr. 90 was killed after 84 days. Microscopically: the previous wound of articular cartilage was filled with hyaline cartilage rich on small round cells; its border may be determined according to the missing cartilage cells in a certain sector in the former cartilage and according to the small shrinkage on the surface of the articular cartilage in the place where the old cartilage passes into newly formed cartilage. Integrity of the subchondral bone plate is repaired but it has a very small groove corresponding to the former wound edge. Conclusion: repair of the integrity of articular cartilage after forming the defect, occurs by newly formed hyaline cartilage. The repaired tissue approaches normal tissue in structure (fig. 3).

Rabbit Nr. 82 was killed after 116 days. Microscopically: integrity of articular cartilage was repaired in its entire length, precise borders of the previously formed defect could not be determined. The cartilage on level of the former defect is of hyaline structure. The place of the former defect may be distinguished according to unevenness of the subchondral bone plate. The cartilage in this place is rich on cells (fig. 4).

In the period of more than 4 and  $\frac{1}{2}$  — 6 months after operation (145 to 186 days) the hyaline cartilage was repaired in 3 rabbits.

Rabbit Nr. 53 was killed after 145 days. Microscopically: the former defect of articular cartilage was filled with cartilage which in structure does not differ from the previous one. The former borders of the wound can only be distinguished with difficulty according to some irregularly distributed chondromes and according to the presence of small papiliform growth in the upper layer of cartilage. Integrity of the subchondral bone plate is repaired, only a negligible groove (fig. 5) is in this region.

Rabbit Nr. 56 was killed after 186 days. Microscopically: articular cartilage is represented by mature hyaline cartilage. The place of the former defect may be distinguished only by some unevenness of subchondral bone plate (fig. 6).

In the first series of experiments 6 dogs and 6 rabbits were killed in the period from 7 to 62 days after operation. Regeneration of bone cartilage was not observed in this series.

In the second series of experiments there were 6 rabbits: 3 were killed after 76 days, 3 after 91 days, after the operation had been performed. Complete repair of the integrity of hyaline cartilage after forming the defect was not achieved but in 2 cases partial filling of the defect by chondroblast tissue occurred after 76 days.

### CONCLUSION

We see from the experiments that in 14 cases of the third series of experiments, the integrity of cartilage damaged in the operation was not only repaired but also its structures, the structures of femoral bone condyles were repaired; the formed bone-cartilage defect was filled by regenerate of the organic structure. Repair of the integrity of articular cartilage, when there exists considerable damage of cartilage in 14 out of 30 rabbits, only in the third series of experiments proves that formation of cartilage cover on the joint spaces of bones in arthroplasty is only possible if a certain complex of conditions is introduced which aim at establishment of favourable conditions for regeneration of articular cartilage. Application of preparate of hyaluronic acid in experiments, the supply of which had been achieved by saturating homoplastic fascia, afforded granulation tissue normally filling any wound the possibility, to differentiate in chondrogenesis direction. The existence of fascial padding which saves the regenerate between joint spaces and the integrity of normal anatomic relations and functions in the operated joint were also favourable factors and were the conditions for organising its structure. In cases when the normal anatomic relations were not completely repaired during operation (for ex. patella was dislocated by pull of suture after suturing capsula) repair of the integrity of articular cartilage not only did not occur, but also the original cartilage underwent changes. How far repair of cartilage integrity was carried out in experiments of the third series, when the entire complex was applied (hyaluronic acid, fascia, hydrocortisone) and how far repair of integrity was missing in experiments of first and second series (18 observations) discloses that application of the named factors helped regeneration of cartilage and serves therefore quite the purpose. One month after operation, we still find in the joint a small fascial padding placed over the wound in cartilage. Its favourable role depends evidently in protecting the young tissue which fills the wound. Several early observations were not carried out by us as this question requires specification. Analogue with these experiments, where in the place of the strong fascial padding, meniscus formed (see experiments in article by G. I. Lavrishtsheva and B. F. Morozov) we may say that the task of grafted fascia in such condition is said formation of organic structures; fascia alone undergoes resorption. In clinical practice, special apparatus is necessary in arthroplasty in order to repair movements completely (for ex. A. J. Seppo).

## RESULTS

1. Repair of cartilage cover on joint spaces of bones in damage of articular cartilage in arthroplasty is completely possible, but essential conditions are required, which support normalisation of the function of the operated joint.

2. Introduction of fascial padding into the cavity of the damaged joint or artificially formed defect in the joint, application of hyaluronic acid into its cavity and periarticular application hydrocortisone, in maintenance of normal movements in joints, support regeneration of articular cartilage.

3. New formation of articular cartilage occurs as proliferation from undifferentiated cellular elements of tissues of bone marrow splits of the adjacent bone and the result is granulation tissue which fills the wound; if hyaluronic acid is present in the joint cavity, the granulation tissue differentiates into chondroblast tissue forming the hyaline cartilage, which gradually takes on the structure of normal articular cartilage.

4. Data on conditions essential for regeneration of articular cartilage obtained in the experiment, may be applied in clinical practice in arthroplasty.

5. It is essential in arthroplasty, to remember especially the importance of early and correct function of the operated joint and for this reason it would be opportune in a number of cases to use special apparatus which secures physiologic movements in the operated joints. This question has been studied only little and requires separate research.

## SUMMARY

In experiments in 42 rabbits and 6 dogs, the authors demonstrated the possibility of regenerating articular cartilage essentially adhering to the normal joint function and in presence of favourable conditions for renewal of their cartilage.

This entails:

1. Application of hyaluronic acid in joint cavity, which is the basic mucopolysaccharide of synovial fluid, decreasing the permeability of vessel wall, preventing exsudation into damaged joint, forming the necessary viscosity of sinovial fluid.

2. Periarticular application of hydrocortisone, which inhibits fibrocytary reaction, preventing development of banal connective tissue, diminishes exsudation.

3. Homologue fascia, placed over the formed defect of articular cartilage, protects the early surface of cartilage, does not induce inflammatory processes and thus simultaneously supports its regeneration.

Considering the role of hyaluronic acid in the process of regeneration and endeavouring to prolong the period of its stay in the joint, the authors saturated preserved homologue fascia with prepartate of hyaluronic acid.

In 14 rabbits out of 30, the disturbed hyalinic cartilage and the respective subchondral bone plate were restituted completely.

Positive result was only obtained in conditions of early renewal of the function of the operated joint. If there was even a short interruption of the



function (for ex. luxation of patela) not only did repair of articular cartilage not occur, but the already previously existing articular cartilage surrounding the formed defect, degenerated.

The authors pay special attention to the imperative maintenance of the function of the operated joint, even in the early stage after the operation.

Besides the suggested complex (saturation of fascia with hyaluronic acid and periarticular application of hydrocortison) supporting damaged hyaline cartilage in the experiment, there are special instruments required in clinical practice, which secure normal function of operated joint.

## R É S U M É

### **Contribution à la question de la régénération du cartilage au cours de son endommagement et l'arthroplastie respective**

G. I. Lavricheva, I. M. Ditman

Au cours des expériences sur 42 lapins et 6 chiens les auteurs ont montré la possibilité de la régénération du cartilage articulaire endommagé tout en conservant la fonction normale de l'articulation respective, de même que la présence des conditions favorables pour la régénération de son cartilage.

Pour ce but il faut:

1<sup>èremment</sup>: appliquer l'acide hyaluronique dans la cavité articulaire. Cet acide présente le mucopolysaccharide fondamental du liquide synovial dont la fonction est de minimaliser la perméabilité de la paroi vasculaire, ce qui empêche l'exsudation dans le joint endommagé tout en formant la viscosité respective du liquide synovial.

2<sup>èmemment</sup>: l'application périarticulaire d'hydrocortisone — celle-ci, en empêchant la réaction des fibrocytes, empêche de même le développement du tissu conjonctif banal et minimalise de même l'exsudation.

3<sup>èmemment</sup>: la mise-en place au-dessus du défaut du cartilage respectif articulaire de la fascie homologue qui protège la surface endommagée du cartilage, empêche la marche des processus inflammatoires et ainsi de même temps soutient la régénération du cartilage en question.

En se rendant compte du rôle de l'acide hyaluronique dans le processus régénératif et faisant le mieux pour prolonger la période de sa présence dans la cavité articulaire, les auteurs faisaient rassasier la fascie homologue conservé par l'acide hyaluronique.

Chez 14 des lapins de la somme de trente le cartilage hyaloïde endommagé et la lamelle osseuse sous-jacente se restituèrent entièrement.

Le résultat positif a été gagné seulement sous la condition du renouvellement précoce de la fonction du joint opéré. Si la fonction elle-même était endommagée minimalement (p. ex. la luxation de la rotule), la régénération du cartilage articulaire ne fonctionnait pas, au contraire, le cartilage respectif entourant le défaut se mit à dégénérer.

Ainsi les auteurs tient compte de la fonction strictement conservée du joint opéré, même dans la période précoce suivant l'opération.

A part de la thérapie citée (fascie rassasiée par l'acide hyaluronique, l'application périarticulaire d'hydrocortisone) qui, dans l'expérience, soutient le cartilage hyaloïde endommagé, on ne peut pas se passer, dans la clinique, des appareils assurant la fonction normale du joint opéré.

## ZUSAMMENFASSUNG

### Zur Frage der Regeneration des Gelenkknorpels bei seiner Schädigung und Arthroplastik

G. I. Lavrischtschewa, J. M. Ditman

Im Versuch an 42 Kaninchen und 6 Hunden zeigten die Autoren die Möglichkeit der Regeneration des geschädigten Gelenkknorpels unter unbedingter Erhaltung der normalen Gelenkfunktion und beim Vorhandensein günstiger Bedingungen für die Neubildung seines Knorpels.

Zu diesen Bedingungen gehören:

1. Intraartikuläre Applikation der Hyaluronsäure, des elementaren Polysaccharides der Synovia, das die Permeabilität der Gefäßwand verringert, Exsudation in das geschädigte Gelenk hemmt und die nötige Viskosität der Synovia erzeugt.

2. Periartikuläre Applikation von Hydrocortison, welches die fibrozytäre Reaktion hemmt, die Entwicklung des banalen Bindegewebes unterbindet und die Exsudation verringert.

3. Homologe Faszie, angebracht oberhalb des gebildeten Defektes des Gelenkknorpels, schützt die Fröhoberfläche des Knorpels, ruft keine Entzündungsprozesse hervor und unterstützt damit seine Regeneration.

In Anbetracht der Aufgabe der Hyaluronsäure im Regenerationsprozess und in der Bemühung die Dauer ihres Verbleibens im Gelenk zu verlängern, sättigten die Autoren die konservierte homologe Faszie mit einem Hyaluronsäurepräparat.

Bei 14 von 30 Kaninchen haben sich der hyaline Knorpel und die entsprechende subchondrale Knochenscheibe völlig restituiert.

Positive Ergebnisse wurden lediglich unter den Bedingungen der frühzeitigen Funktionsrestitution des operierten Gelenks gewonnen. Wenn die Schädigung sogar auch nur gering war (z. B. Verrenkung der Kniescheibe), dann ist es zu keiner Reparation des Gelenkknorpels gekommen und es degenerierte sogar auch der vorher bestehende, den entstandenen Defekt umgebende Gelenkknorpel.

Besondere Aufmerksamkeit schenken die Autoren der notwendigen Funktionserhaltung des operierten Gelenks, sogar auch im frühen Nachoperationsstadium.

Ausser des vorgeschlagenen Massnahmenkomplexes (Sättigung der Faszie mit Hyaluronsäure und periartikuläre Applikation von Hydrocortison), der die Regeneration des geschädigten hyalinen Knorpels im Versuch fördert, sind in der Klinik Spezialpräparate nötig, die die normale Funktion des operierten Gelenks sicherstellen werden.

## RESUMEN

### A la cuestión de la regeneración del cartílago de articulación en su damnificación y artroplástica

G. L. Lavrischeva, J. M. Ditman

En el experimento con 42 conejos y 6 perros los autores mostraron la posibilidad de la regeneración del cartílago de articulación damnificado en la conservación indispensable de la función normal de la articulación y en la presencia de las condiciones favorables para la renovación de su cartílago.

A ellos pertenecen: 1. La aplicación del ácido hialurónico en la cavidad de articulación, la que es el mucopolisacarido del líquido sinovial que disminuye la permeabilidad de la pared del vaso, impide la exudación en la articulación damnificada, crea la viscosidad necesaria del líquido sinovial.

2. La aplicación periarticular del hidrocortizón que suprime la reacción fibrocitar, impide el desarrollo del tejido de conexión banal, disminuye la exudación.

3. La fascia homóloga, colocada encima del defecto formado del cartílago de articulación protege la superficie de herida del cartílago, no ocasiona los procesos inflamatorios y de esta manera al mismo tiempo apoya su regeneración. Tomando en consideración el papel del ácido hialurónico en el proceso de la regeneración y acuciando la prolongación del período de su permanencia en la articulación los autores impregnaron la fascia conservada homóloga con la preparación del ácido hialurónico.

En 14 conejos de 30 el cartílago hialino alterado y correspondiente disco huesoso subcartilaginoso completamente restituyeron.

El resultado positivo se obtuvo solamente en las condiciones de la renovación temprana de la función de la articulación operada. Si la alteración de la función no fue muy grande (por ejemplo la dislocación de la rótula), pues no sólo no había llegado a la reparación del cartílago de articulación, sino también el cartílago de articulación existente ya antes, rodeando el defecto formado degeneró.

Los autores prestan la atención extraordinaria al hecho que es inevitable conservar la función de la articulación operada, incluso en el estadio temprano después de la operación.

Además del complejo propuesto (la impregnación de la faja por el ácido hialurónico y la aplicación periarticular del hidrocortizón) sustentando los cartílagos hialinos damnificados en el experimento, en la clínica son necesarios los aparatos especiales para asegurar la función normal de la articulación operada.

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## NEW METHOD OF RECONSTRUCTION OF URINARY SPHINCTER IN EPISPADIAS

### A preliminary report

V. KUBÁČEK

The plastic surgeon meets with urine incontinence most frequently in cases of epispadias or in reconstruction of the urinary bladder in extrophia of urinary bladder. Treatment of incontinence is probably in surgery one of the most difficult problems of all. We meet in literature with quite a number of various attempts to solve this problem, however in most cases they are unsuccessful or they are only successful to a limited extent. Be it the narrowing



Fig. 1

of the neck of the urinary bladder or the fascial or corial suspension of the separated urethra to rectus abdominis muscles, whereby fascia or corium is wound closely around the neck of the urinary bladder or be they strips of recti abdominis, which we wind in a similar manner around the urethra, the result of these operations is always either unsuccessful, or only partial.

For this reason we considered a new method of solving the reconstruction of the urinary sphincter, using musculus gracilis femoris as substitute for the sphincter of the urinary bladder.



## METHOD OF OPERATION

We mobilize the lower two thirds of musculus gracilis femoris, by cutting its insertion tendon below the knee, leaving its origin at the pubic bone in situ, only the lower two thirds of the muscle are mobilized. Nervous and vascular supply remains intact (Fig. 1 and 2). The muscle is then pulled into the actual field of operation in the inguinal region, slipped under the separated urethra.



Fig. 2

The neck of the bladder (into which the catheter had been introduced) and the muscle itself are fixed into the suture of recti abdominis by a few stitches. (Fig. 3, 4, 5, 6.) The shifted musculus gracilis femoris must not be stretched too much and must not be strangulated anywhere in its channel around urethra, nor around the neck of the bladder. Its passive tension must not be excessive as in such cases its nutrition would be disturbed and possibly partial sequestration of muscle fibers could occur.

## OPERATIONAL RESULTS

We operated by this method 10 of our patients with epispadias accompanied by urine incontinence. All patients are fully continent now and they are able not to urinate for 6—8 hours. We also recorded the results on our operated patients on a film which was displayed at the International Congress of Plastic Surgeons in Brighton.

## DISCUSSION

In all the experiments in reconstructing the sphincter of the urinary bladder which were mentioned in the introduction so far, fascia corium or strips of rectus abdominis narrowed considerably or almost strangulated urethra or bladder, by circular winding. Moreover, bladder and urethra were pressed ventrally and lifted by passive pull the abdominal muscles, so that the urine

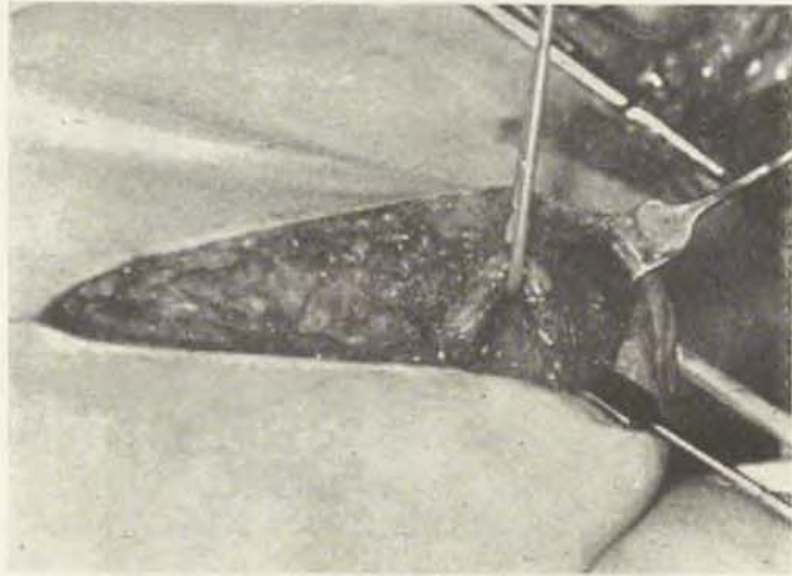


Fig. 3



*M GRACILIS*

*URETRA*

Fig. 4

level in the bladder must reach the height of this bend and only then micturition starts. Because it is practically a matter of transplanting tissues which have been deprived of their nutrition [fascia, corium, muscle strips of rectus abdominis] these methods are threatened by a high percentage of compli-

cations and thus tend to necrosis and elimination, frustrating in this way the result of the operation. Furthermore, all these kinds of material very often stretch after a period of time and loose their strength and thus the ability to substitute at least partially the function of the sphincter of the urinary bladder.

In the plastic surgery of the sphincter of the urinary bladder by means of musculus gracilis femoris, all these disadvantages disappear. The muscle maintains its vessel and nerve supply and thus also the conditions for activity,

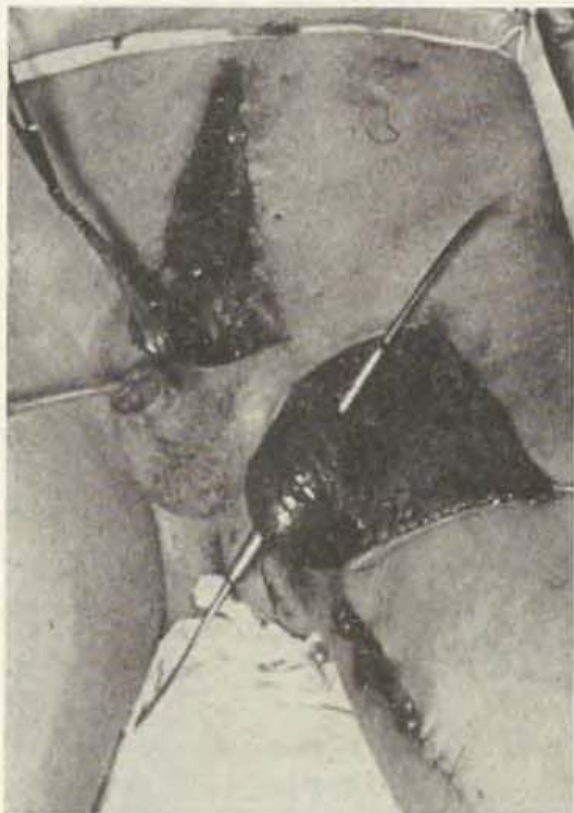


Fig. 5



Fig. 6

its muscle fibers do not change fibrotically and the muscle mass remains intact. We had opportunity to make in three cases sure of this in another later performed surgical procedure. The mass of musculus gracilis, slid below the urethra is comparatively large and already itself presses the separated urethra perfectly against the pubic bone. In this manner, full continence in the afflicted patients was achieved. The period of rehabilitation i.e. the training of use of the transplanted muscle, takes  $\frac{1}{2}$  to 1 and  $\frac{1}{2}$  years and depends upon age and intelligence of the patient. For this reason it is of advantage to carry out the plastic surgery at the age of 6 years at the earliest, i.e. just before starting school attendance when in the majority of cases cooperation on part of the patient as well as his interest in the result of the operation can be already assumed.



## CONCLUSION

Plastic surgery of the sphincter of the urinary bladder by means of musculus gracilis has proved to be the best of all methods of reconstructing the sphincter, so far. In respect of technique, the operation is not too complicated, difficult is only the separation of the neck of the urinary bladder and the urethra itself as care must be taken here to prevent tearing of the urethra or possible penetration into rectum. Although we do not intend to maintain apodictically — considering the experience gained so far — that treatment of incontinence by means of musculus gracilis will alleviate final solution of this difficult problem, we recommend it as a more hopeful and more practicable way in solving urinary incontinence.

## SUMMARY

The study reports on a new method of reconstruction of the sphincter of the urinary bladder by means of musculus gracilis femoris. The operational procedure is described and the methods of reconstruction of the sphincter of the urinary bladder applied so far, are being discussed. Altogether 10 patients were operated by the new method successfully. For this reason the reconstruction of the sphincter of the urinary bladder at urinary incontinence in epispadias, is therefore recommended as the most successful method applied at the Clinic of Plastic Surgery in Brno.

## RÉSUMÉ

### **Une nouvelle méthode de la reconstruction du constricteur de la vessie chez les épispadias.**

V. Kubáček

Le travail nous informe de la nouvelle méthode de la reconstruction du constricteur de la vessie à l'aide du muscle droit interne. La méthodique opératoire vient d'être décrite et les méthodes jusqu'alors pratiquées de la reconstruction du constricteur de la vessie sont discutées.

10 malades ont été opérés par la nouvelle méthode, tous avec le succès complet. C'est pourquoi cette reconstruction du constricteur de la vessie au cours de l'incontinence de l'urine chez les épispadias vient d'être recommandée en tant que la méthode la plus efficace de nos jours de la clinique de la chirurgie plastique à Brno.

## ZUSAMMENFASSUNG

### **Ein neues Verfahren für die Wiederherstellung des Harnblasensphinkters bei Epispadien**

V. Kubáček

Die Arbeit berichtet über ein neues Verfahren für die Wiederherstellung des Harnblasensphinkters mittels des musculus gracilis femoris. Es wird die Operationsmethode beschrieben und die bisherigen Methoden der Wiederstellung des Harnblasensphinkters diskutiert. Mittels der neuen Methode wurden insgesamt 10 Kranke operiert, und zwar mit vollem Erfolg. Es ist deshalb die Wiederherstellung des Harn-



blasensphinkters im Falle von Harninkontinenz bei Epispadien als die bisher erfolgreichste Methode zu empfehlen, welche an der Klinik für plastische Chirurgie in Brno benutzt wird.

#### RESUMEN

### **Nuevo método de la reconstrucción del constrictor de la vejiga urinaria en las epispadias**

V. K u b á č e k

En la obra se refiere un nuevo modo de la reconstrucción del constrictor de la vejiga urinaria por medio de musculus gracilis femoris. Se describe el método de operación y se discuten en resumen los métodos de nuestros días de la reconstrucción del constrictor de la vejiga urinaria. Con el nuevo método fueron operados diez pacientes en total es decir con pleno éxito. Por eso la reconstrucción del constrictor de la vejiga urinaria en la incontinencia de la orina en las epispadias se recomienda como hasta el presente el más fructífero método, utilizado en la clínica de anaplastia en Brno.

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## MECHANISM OF THE ORIGIN OF NOSE DEFORMATION IN PATIENTS WITH INBORN CLEFT OF UPPER LIP

R. D. NOVOSELOV

Repair of nose deformations, accompanying inborn clefts of the upper lip, is one of the most difficult parts of reconstructing face surgery.

The various reasons for the origin of nose deformations in patients with inborn clefts of the upper lip are clarified in a number of reports (Burian: I. V. Berdyuk; A. N. Gobskaya; V. S. Dimitriyeva; G. G. Kriklyas; A. A. Limberg; Psaume; R. D. Novoselov and B. N. Davydov; G. I. Semenchenko a.o.).

A lot is unclear however on the mechanisms of the formation of pre-operational nose deformations in inborn facial clefts and these mechanisms have been insufficiently investigated.

Studies of pre-operational nose deformations in 107 patients with one-sided and 17 both-sided clefts of the upper lip and anatomic and craniometric investigations in 3 dead bodies of infants and children of early age with inborn facial clefts disclosed that in the mechanism of pre-operational nose deformations there exists an entire complex of causes, of which according to our opinion, of basic importance is the inborn insufficient development of the upper jaw, forward protrusion of the premaxilla and the effect of the mimical muscles of face.

The inborn insufficient development of the upper jaw in the region of the edge of apertura piriformis and fossa canina and the alveolar protuberance on side of the cleft causes a widening of the apertura piriformis and flattening of half of the face, this causing deformation of the cartilage part of the nose — flattening and shifting of its nostril in outward direction and a bit backwards (fig. 1a). The intensity and extent of these changes depends upon the type of cleft. In separated clefts of the upper lip the occur according to our data in 40% of the cases and they are conditional not to dynamic but to static factors — by the relief of the facial bones in the given area.

Prominence of premaxilla forwards in onesided clefts is accompanied by a shift of spina nasi and the entire part of the upper jaw in region of the

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Reported at the Allunion Congress of Stomatologists of the Ukrain (Kiew 1968).

edge of apertura piriformis and also of a large fragment of the alveolar protrusion on the healthy side in forward direction and to the healthy side. This leads to widening of apertura piriformis, deviation of the nasal partition and to the shift of the nose as a whole to the healthy side (fig. 1b). Finally the result is intensive flattening of the nostril on side of the cleft, the skin



Fig. 1. Insufficient development of face skeleton (a) and upper jaw (b) in dead body of 1 and ½ years old child with right-sided cleft of upper lip with penetrating cleft of palate

part of the nasal partition is shifted to the healthy side and its cartilago septi nasi protrudes into the nasal cavity of the healthy side (fig. 2a).

In both-sided clefts the flattening of nostrils is symmetrical, it is induced by both-sided insufficient development of the edges of apertura piriformis, insufficient development and the reclining of the alveolar protrusion, by intensive shift of premaxilla in forward direction (fig. 2b). The shifting, induced by the protrusion of the premaxilla in forward direction in one-sided clefts as well as in both-sided clefts, depends to a great extent-according to A. N. Gubskaya, Psaume and according to our data, upon the bone tissue, which spreads in the zone of growth of the premaxilla, in response to excessive and unbalanced pressure of the tongue. As proof for this may be mentioned the fact that in significant shortening of the frenulum, the protrusion of premaxilla is only negligible (fig. 2c) or not observed at all (there are 20 such cases with us).

The activity of the mimical facial muscles is one of the active factors in the mechanism of the origin of preoperational nose deformations. Study of the topography of mimical facial muscles in three dead bodies of children with inborn clefts of the upper lip together with the cleft of the alveolar protrusion and palate disclosed that the mimical muscles around the lip and nose on side of the cleft are well developed and are in complicated correlation (different that on the healthy side) to the relief and size of bones of the facial skeleton and alar cartilage.

The interrupted labio-bucal-pharyngeal muscle ring in inborn cleft of upper lip shifts a small fragment of the alveolar protrusion backwards and in-

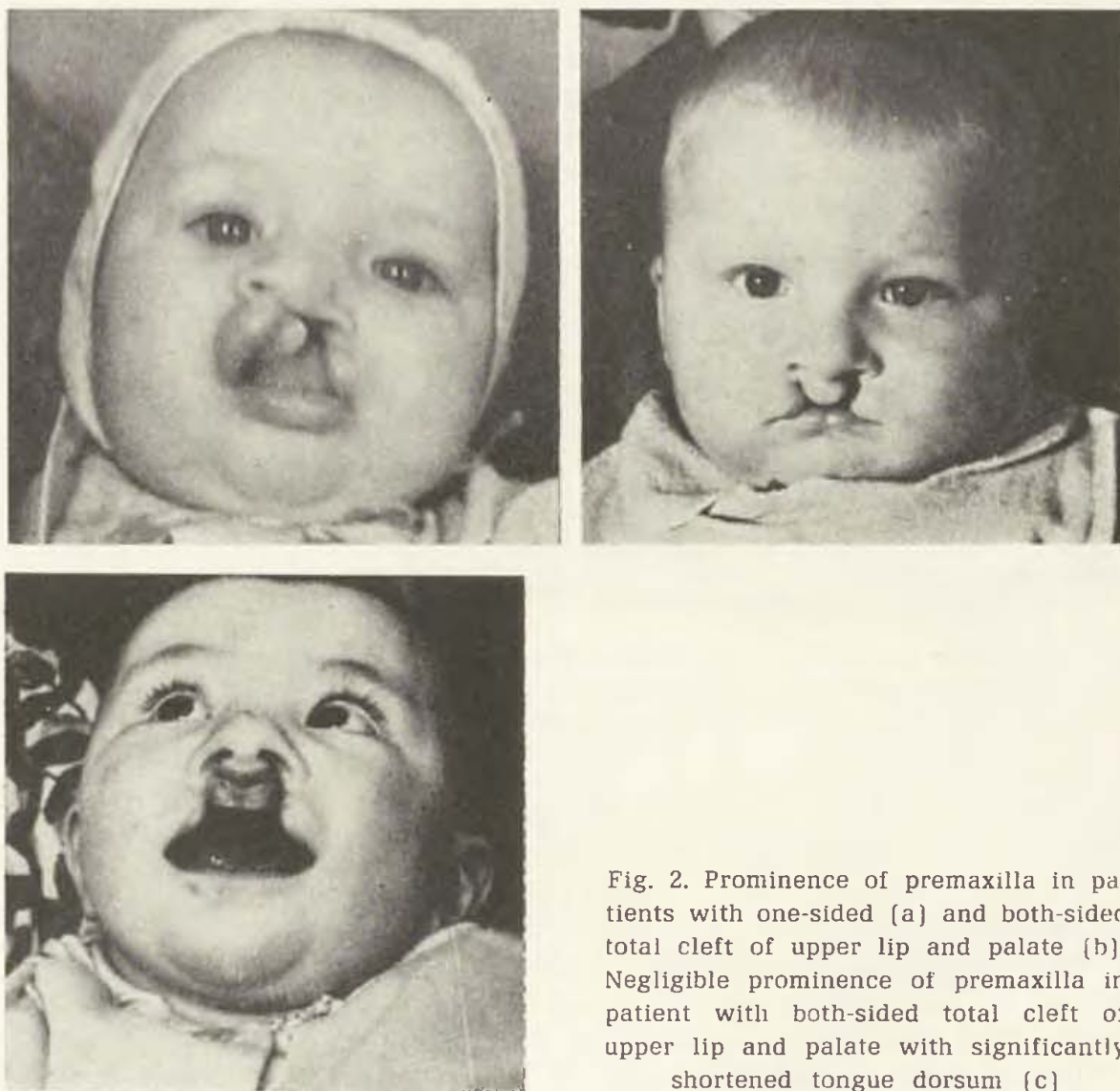


Fig. 2. Prominence of premaxilla in patients with one-sided (a) and both-sided total cleft of upper lip and palate (b). Negligible prominence of premaxilla in patient with both-sided total cleft of upper lip and palate with significantly shortened tongue dorsum (c)

creases the flattening of the facial half on side of the cleft, it conditions the shift of the large fragment of the alveolar protrusion to the healthy side. Under the effect of the pull of the muscles of the interrupted labio-buccal-pharyngeal muscle ring, the fragments of the alveolar protrusion diverge to the sides, the slot between them widens and the apertura piriformis becomes wider (fig. 3a).

Interruption of the muscle ring has the effect that the localisation and course of muscles in the region of the nostril base on side of the cleft, differs considerably from the healthy side. Thus the m. levator labii superioris and the m. levator labii superioris alaeque nasi penetrate into the skin of the upper lip, into the surface layer of the circular muscle of lip and — this is especially important — into the surface part of the nostril base at a greater length than on the healthy side.

Locality of m. orbicularis oris differs considerably. On the upper side of the cleft, the most distinct muscle bundle of the internal deep layer of



the circular muscle penetrates towards the base of the nostril and into it penetrate as well as penetrating into the skin, the external lower areas of the nasal cavity (fig. 4a — marked by an arrow). On the healthy side the most distinct upper bundle of muscle fibers of the circular lip muscle penetrates to the basis of the nose partition (fig. 4b — marked by arrow), to the base of the nostril not a single cranially deposited bundles of muscle fibres of this muscle penetrates.

Thus those muscles are active in the region of the base of the nostril on side of the cleft when the muscles are shortened, which elevate the upper lip and the nostril and also the circular muscle of the lip with all mimical muscles reaching it. At present there exists on the healthy side no such complex of active muscles. The nostril flattens under the effect of the muscle pull on the side of the cleft, it shifts in outward direction and a bit downward.

All this tends to prove that activity of the mimical facial muscles is the main factor in the complex of deforming moments, inducing pre-operational changes of the cartilage section of the nose.

The mechanism of post-operational deformations, forming in early and later period after cheiloplasty was studied by us in 200 patients by means of direct (according to the author's method) and side teleroentgenography of the scull and anthropometrical measurements in plaster of Paris models of the jaw. The obtained data disclosed that the origin of post-operational nasal deformations depends to a great extent how successfully dysfunction of mimical muscles in the region around the lips was removed during operation.

If the edges of the cleft are blood stained and the nostril base is separated from the apertura piriformis and in the region of fossa canina, erroneous locating of muscles is — under the existing methods — not removed. After cheiloplasty the mimical muscles placed in the region of the nostril base shift the nostrils again. This is especially significant in case of incomplete sewing of the lip sphincter in the region of the bottom of the nasal cavity.

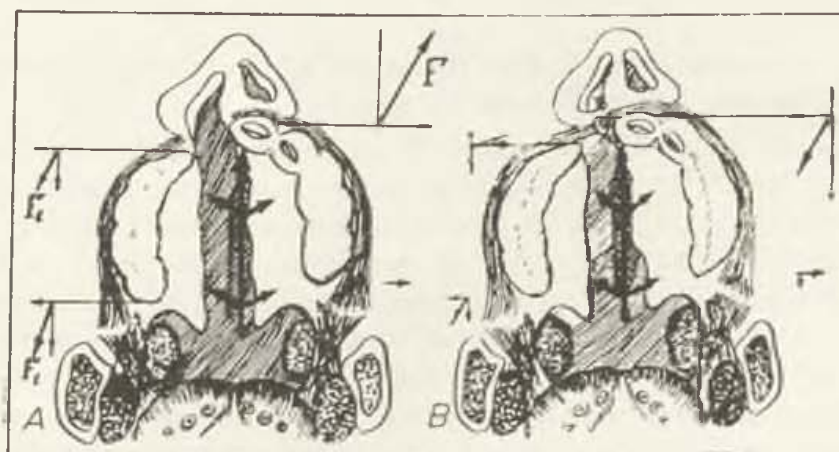


Fig. 3. Scheme of muscle forces, affecting the upper jaw in patients with one-sided cleft of upper lip and penetrating cleft of palate before cheiloplasty (a) and after (b)

The labio-bucal-pharyngeal muscle ring reconstructed into again uninterrupted course after cheiloplasty bears favourable effect, bringing the fragments of the alveolar protrusion closer and decreasing the width of the apertura piriformis (fig. 3b). The cleft of the alveolar protrusion becomes entirely covered within  $\frac{1}{2}$ —2 years in average.

Simultaneously with the decrease of the width of the cleft of the alveolar protrusion, as may be seen in direct teleroentgenograms made before and



Fig. 4. Insertion of the surface bundle of muscle fibers of the circular lip muscle in the region of the nostril base on side of the cleft (a) and in the region of spina nasi on the healthy side (b)

three weeks after cheiloplasty, also the width of the apertura piriformis (fig. 6a and 6b) decreases (though not as distinctly).

In one-sided clefts of the upper lip after cheiloplasty, the base of the nose partition shifts simultaneously with premaxilla and with the central line, this causing a decrease of the pre-operational shift of the nasal cartilage section to the healthy side. Yet the sooner cheiloplasty is carried out the better the upper lip is reconstructed, the nearer to the central line is spina nasi, the shift of the entire nose to the healthy side and flattening of the nostril on side of the cleft is less distinct. Thus in patients with one-sided clefts of the upper lip connected with perforated cleft of the palate amongst patients operated within one year of age showed distinct deformations in 34,7%, slight ones in 65,3%, amongst patients operated after reaching the age of one year, distinct deformations appeared in 61,1%, slight in 38,9%.

## CONCLUSIONS

1. Results of the carried out research disclosed that in the mechanism of pre-operational nose deformations a complex of causes takes effect, in which of basic importance are the inborn insufficient development of the upper jaw, protrusion of premaxilla in forward direction and the effect of mimical facial muscles.

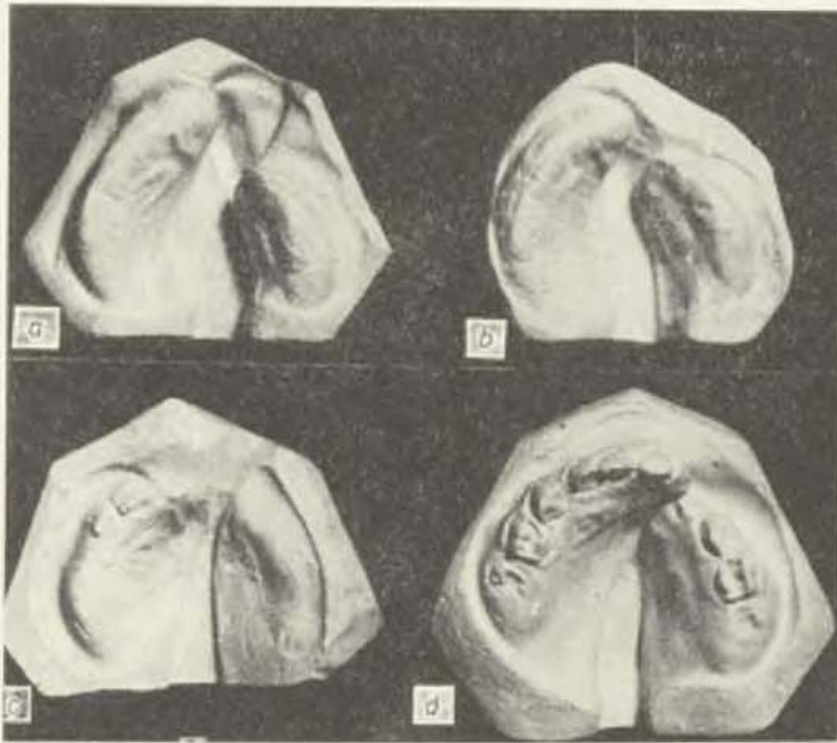


Fig. 5. Covering of cleft of alveolar protrusion in patient R. a — before cheiloplasty at the age of 6 months, b — 2 weeks after cheiloplasty, c — after 3 months, d — 23 months after cheiloplasty

2. Dysfunction of the mimical muscles around the lip and the subsequent incorrect effect of these muscles upon the cartilage part of the nose and the skeleton of the face in clefts are the main factors in the complex of deforming moments.

3. The origin of secondary post-operational deformations depends to a great extent how successfully dysfunction of mimical muscles around the lip was removed during cheiloplasty. In this connection it is of special importance in the reconstruction of the integrity of the circular muscle of the lip, to consider the direction and insertion of the upper muscle bundles of this muscle, carefully separating these bundles in the region of the nostril base and in the region of the nose partition base and finally carrying suture by means of synthetic fibres (capron, lavsan a.o.).



## SUMMARY

Studies of preoperational (additional) deformations of nose in 107 patients with one-sided, in 17 with both-sided clefts of upper lip and anatomic and craniometric examinations of three dead infants bodies and bodies of children of early age with inborn facial clefts disclosed that of basic importance in the mechanism of nasal deformations in the inborn insufficient development of the upper jaw, the premaxilla protruding in forward direction and the effect of the mimical facial muscles. Dysfunction of mimical muscles around the lip and subsequent permanent effect upon the cartilage part of nose and skeleton of face are in clefts the main factors in the complex of deforming moments (the original scheme of the effect of muscles is stated).

Study of postoperational nasal deformations in 200 patients by means of side and ventro-dorsal teleroentgenograph and anthropologic measurements on plaster of Paris models disclosed that the origin of nose deformation depends to a great extent on the successful removal of mimial muscle dysfunction in the region around the lip, in cheiloplasty. Simultaneously with this fact it is essential in reconstruction of the continuity of the circular lip muscle to pay attention to the direction and insertion of its surface muscle bundles, carefully separating them in the region of the nostril base and nasal partition followed by suture with synthetic fibres (lavsan a.o.).

## RÉSUMÉ

### **Le mécanisme du développement des défauts du nez chez les malades atteints de bec-de-lièvre**

R. D. Novoselov

Les études des défauts prae- et postopératoires du nez chez 107 des malades atteints du bec-de-lièvre unilatéral et des 17 des malades au bec-de-lièvre bilatéral de même que les méasurements anatomiques et la craniométrie chez 3 des cadavres des nouveau-nés et des petits enfants aux fentes de la face innées ont montré que le rôle principale dans le mécanisme du développement des malformations du nez est présenté par le développement insuffisant de la mandibule respective, par l'os interposé prominent trop en avant de même que par l'influence des muscles mimiques de la face. La dysfonction des muscles mimiques dans les environs de la lèvre et sa suite — leur influence à la longue sur la partie cartilagineuse du nez et sur la partie osseuse de la face dans les becs-de-lièvre respectifs — voici les principeaux agents dans le complexe des moments de déformation. (Un schéma original de l'influence des muscles est présenté.)

L'étude des déformations postopératoires chez 200 des malades à l'aide de la prise au télérays X latérale et antéro-postérieure en combinaison avec les méasurements anthropologiques sur les modèles en plâtre ont montré que le développement des malformations du nez dépend de la possibilité d'enlever, au cours de la chéiloplastie, la dysfonction des muscles mimiques dans les environs de la lèvre. En même temps, il faut au cours de la reconstruction du muscle circulaire se rendre compte de la direction et de l'origine de ses parties superficielles, les séparer dans la région de la base des ailes et des narines en ajoutant la suture à lavsan et al. (fibres synt.).



## ZUSAMMENFASSUNG

### Entwicklungsmechanismus der Nasendeformationen bei Kranken mit angeborenen Oberlippenspalten

R. D. Novoselov

Das Studium der präoperativen Nasendeformationen bei 107 Kranken mit einseitigen und bei 17 Kranken mit beiderseitigen Oberlippenspalten sowie die anatomischen und kranio-metrischen Untersuchungen an drei Leichnamen neugeborener Kinder und Zartalterkinder mit angeborenen Gesichtsspalten haben gezeigt, dass die grundlegende Bedeutung im Entwicklungsmechanismus der Nasendeformationen der angeborenen mangelhaften Entwicklung des Oberkiefers, dem Hervortreten des Zwischenkiefers und der Wirkung der mimischen Gesichtsmuskulatur zuzuschreiben ist. Die Dysfunktion der mimischen Muskeln im Lippenbereich und die daraus folgende ständige Wirkung derselben auf den Knorpelteil der Nase und auf das Gesichtsskelett bilden bei den Spalten im Komplex der deformierenden Faktoren die Hauptkomponenten (es wird ein Originalschema der Muskelwirkung angeführt).

Das Studium der postoperativen Nasendeformationen bei 200 Kranken mittels Tele-röntgenogramme in Seiten- und Vorder-hinterprojektion und mit Hilfe anthropologischer Messungen an Gipsmodellen hat gezeigt, dass die Entstehung der Nasendeformationen in meisten Fällen davon abhängig ist, mit welchem Erfolg während der Cheiloplastik die Dysfunktion der mimischen Muskeln im Lippenbereich beseitigt worden ist. Gleichzeitig ist bei der Wiederherstellung der Kontinuität des Ringmuskels der Lippe die Richtung und der Ansatzpunkt seiner oberflächlichen Muskelbündel zu berücksichtigen; diese sollen im Bereich der Base des Nasenflügels und der Nasenscheidewand sorgfältig abgetrennt werden mit anschließender Anlegung einer Sutur aus synthetischen Fasern (Lavsan u. a.).

## RESUMEN

### Mecanismo del origen de las deformaciones de la nariz en los enfermos con la grieta congénita del labio superior

R. D. Novoselov

El estudio de las deformaciones antes de la operación (hasta la operación) de la nariz en 107 enfermos con unilaterales, en 17 enfermos con bilaterales grietas del labio superior y los exámenes anatómicos y craneométricos de tres cadáveres de los niños recién nacidos y de los niños de la edad tierna con las grietas de la cara mostraron, que la importancia fundamental en el mecanismo de las deformaciones de la nariz tiene el desarrollo insuficiente congénito del maxilar, el sobresalir del os incisivum adelante y la actividad de la musculatura mímica de la cara. La disfunción de los músculos mímicos en los alrededores del labio y por consiguiente su actividad permanente a la parte cartilaginosa de la nariz y al esqueleto de la cara en las grietas son los factores principales en el conjunto de los factores de deformación (se indica el esquema original de la actividad de los músculos).

El estudio de las deformaciones postoperatorias de la nariz en 200 enfermos por medio de la teleradiografía lateral y delantera-trasera y el de las mediciones antropológicas mostró, que el origen de la deformación de la nariz las más veces depende de eso, con cual éxito se apartaba durante la cheiloplástica la disfunción de los músculos mímicos en la zona alrededor del labio. Al mismo tiempo con eso en la re-

construcción de la continuidad del músculo circular del labio es necesario tomar en cuenta la dirección y la fijación de sus fascículos musculares de superficie, con cuidado separarlos en la zona de la base de la ala de nariz y del tabique con siguiente fundación de la sutura de los filamentos sintéticos (lavan y otros).

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Vendredi 1er Mai 10 h 30 Journée touristique. Assemblée Générale de l'AICM.

Samedi 2 Mai 9 h 30 Séance de travail. Nerfs, plaies et réparation — 10 h 30 Séance de travail. Informatique et nomenclature. 21 heures Banquet.

Dimanche 3 Mai Séparation.

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Ž. Havlová, V. Brejcha, K. Hajniš, J. Růžičková

DEVELOPMENT OF SINUS MAXILLARIS IN CHILDREN WITH  
COMPLETE UNILATERAL CLEFT (Age class 4—7 years)

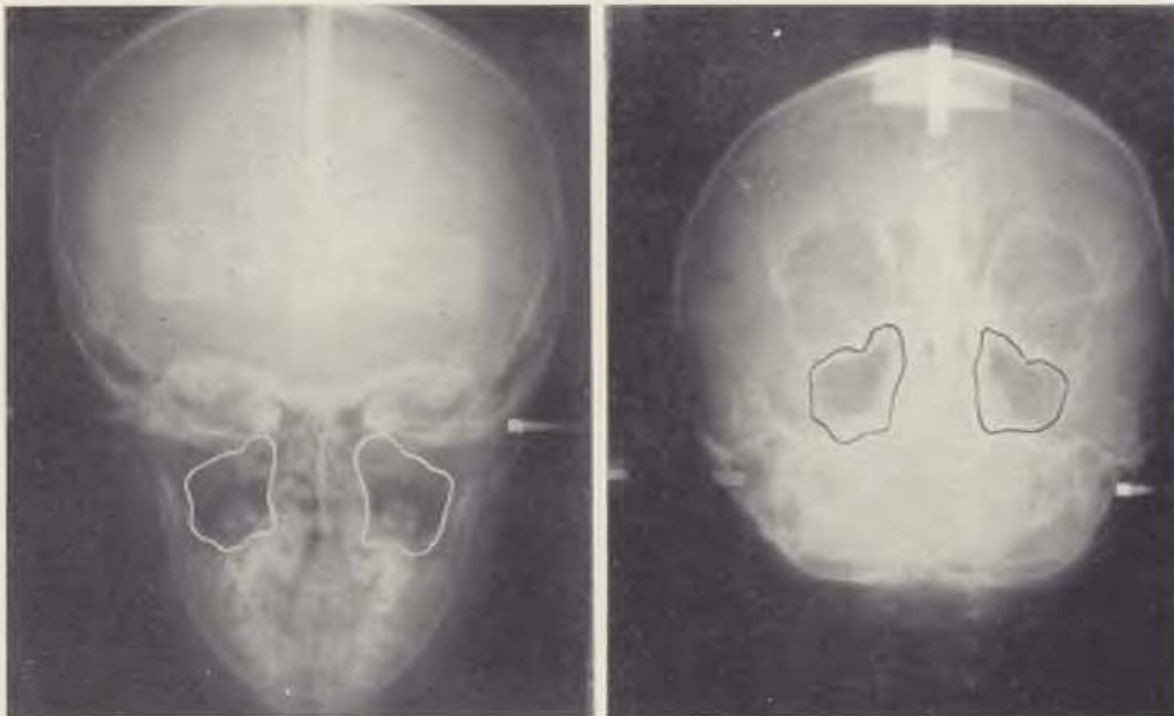


Fig. 1. Frontal position of skull with 15° decline caudally from Frankfurt horizontal. —  
Fig. 2. Water's position of skull

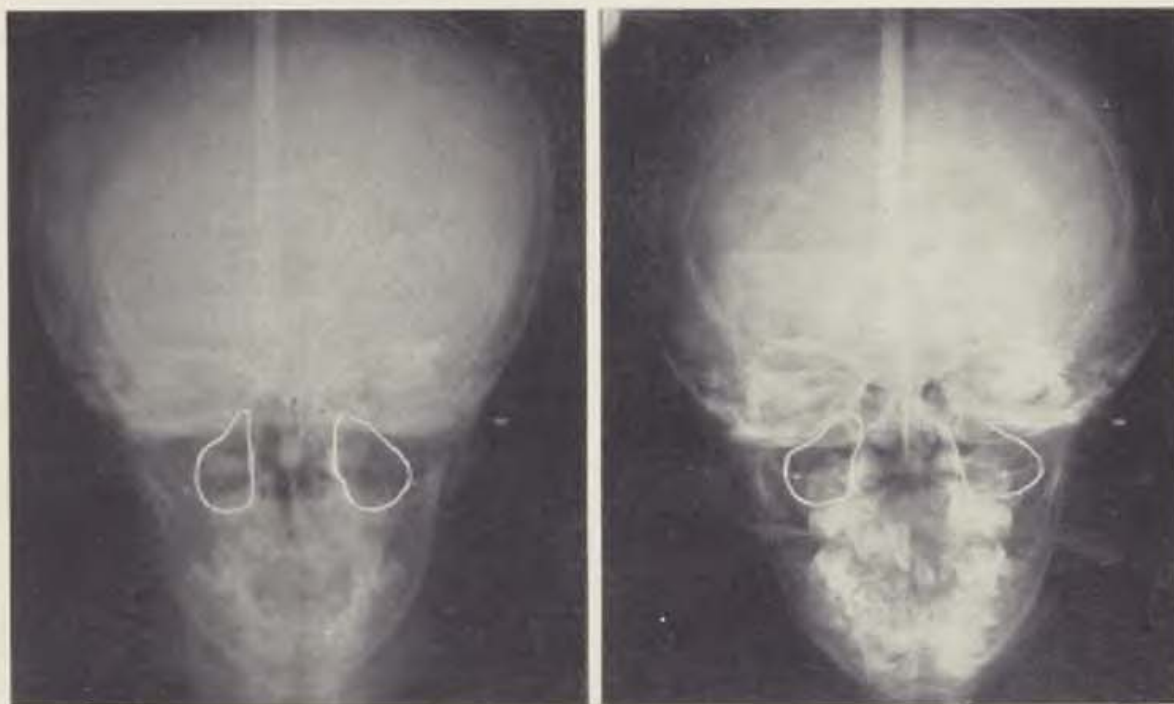


Fig. 3. Asymetry of antrum Highmori in healthy proband (boy J. P., age 5 years 3 months). — Fig. 4. Asymetry of antrum Highmori in patient with cheilo-gnathopalato-schisis sing. (girl A. T., 6 years, 5 months)



N. T. Yelisseyev

APPLICATION OF PRESERVED HETEROPERITONEUM FOR  
PLASTIC OPERATION OF POSTOPERATIONAL VENTRAL HERNIA



Fig. 2. Experiment 14. Period of observation 12 days. Microphoto. Fragmentated heteroperitoneum, appearance of new formed vessels. Stained by hematoxylin-eosin. Lens 20, ocular 8.



Fig. 3. Experiment 82. Period of observation 24 days. Microphoto. Heterogenic graft is rebuilt by irregular connective tissue. Stained by hematoxylin-eosin. Lens 20, ocular 8.



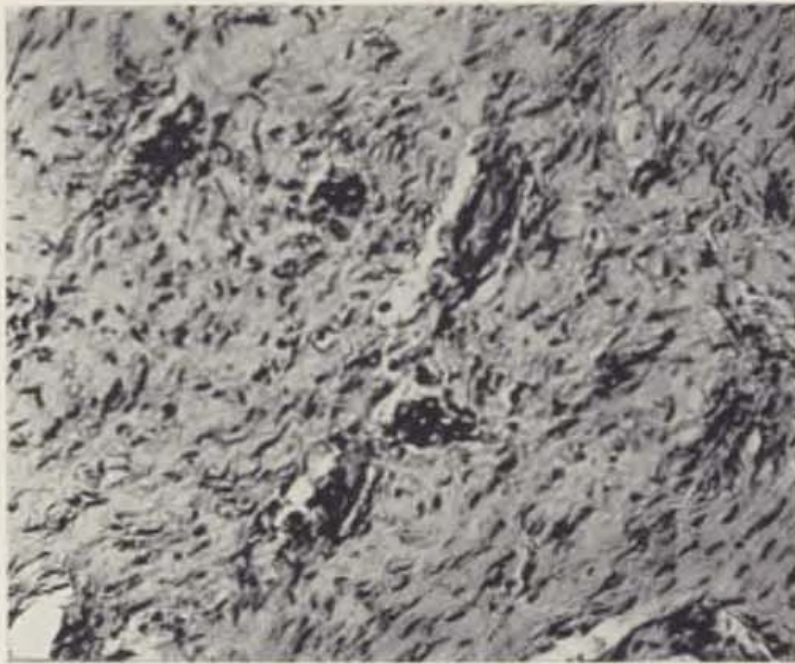


Fig. 4. Experiment 77. Period of observation 88 days. Microphoto. Irregular connective tissue in place of heterogenic graft. Vessels. Stained by hematoxylin-eosin.  
Lens 20, ocular 8.

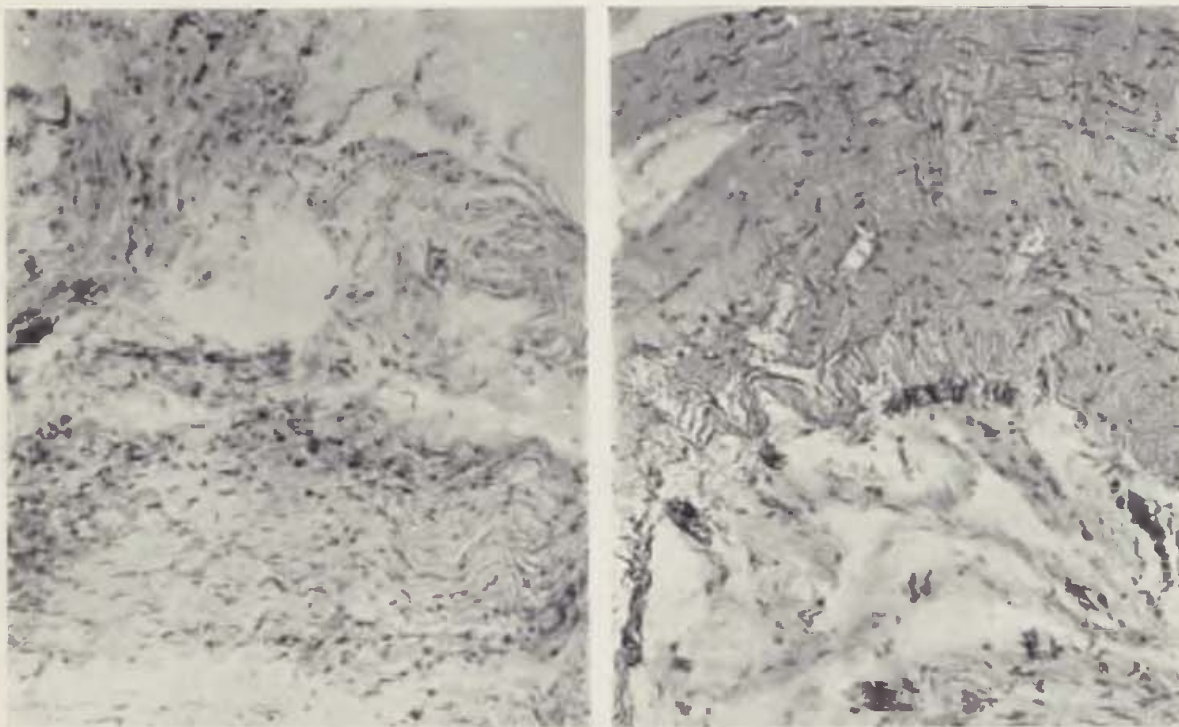


Fig. 5. Experiment 43. Period of observation 178 days. Microphoto. In place of heteroperitoneum regular connective tissue formed in some areas. Stained by hematoxylin-eosin. Lens 20, ocular 7. — Fig. 6. Experiment 21. Period of observation 480 days. Microphoto. Heterogenic peritoneum transformed into regular connective tissue. Stained by hematoxylin-eosin. Lens 20, ocular 8.

G. I. Lavrishtsheva, J. M. Ditman

ON THE QUESTION OF REGENERATION OF ARTICULAR  
CARTILAGE IN CASE OF DAMAGE OR IN ARTHROPLASTY



Fig. 1. Microphoto of knee joint in rabbit 56 days after operation

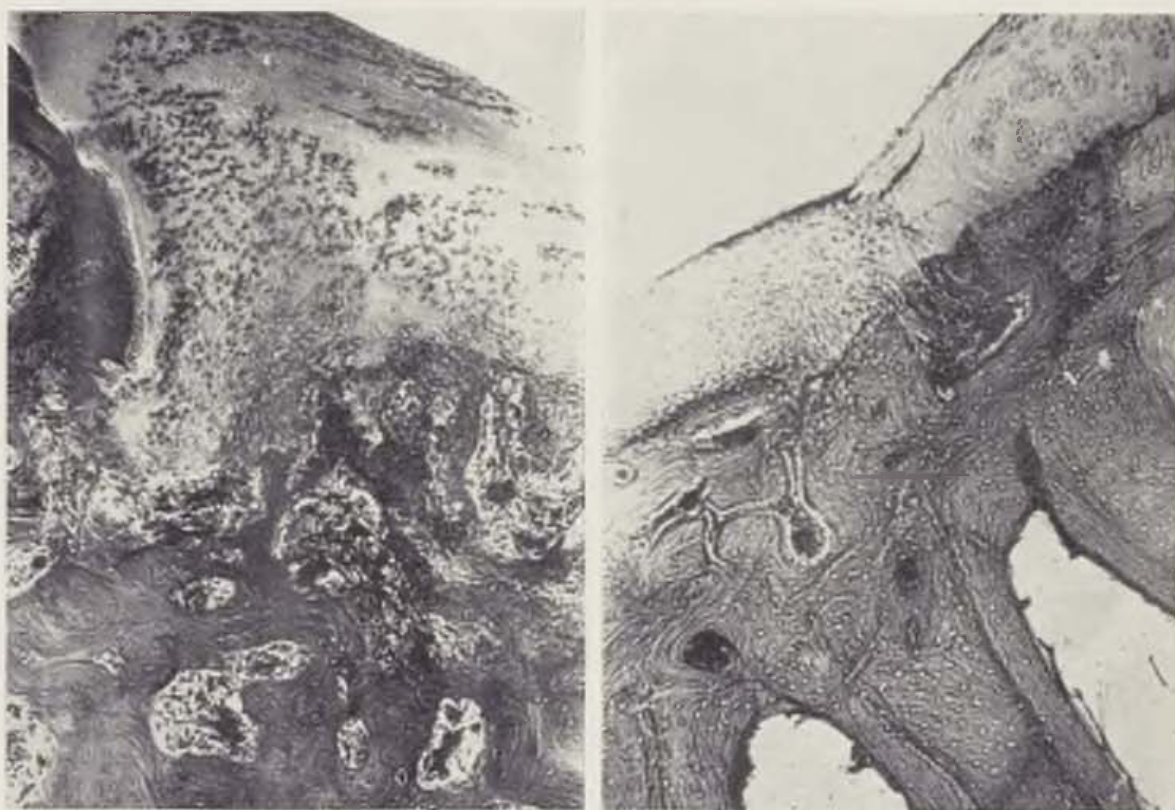


Fig. 2. Microphotograph. New formed cartilage (a) and bone (b) filling the bed. Period of observation 56 days. Staining by hematoxylin - eosin. Enlargement 40X. — Fig. 3. Microphoto. New formed cartilage (a) and new formed subchondral bone plate (b) in place of the former defect. 84th day after the operation. Staining by hematoxylin - eosin. Enlargement 40X



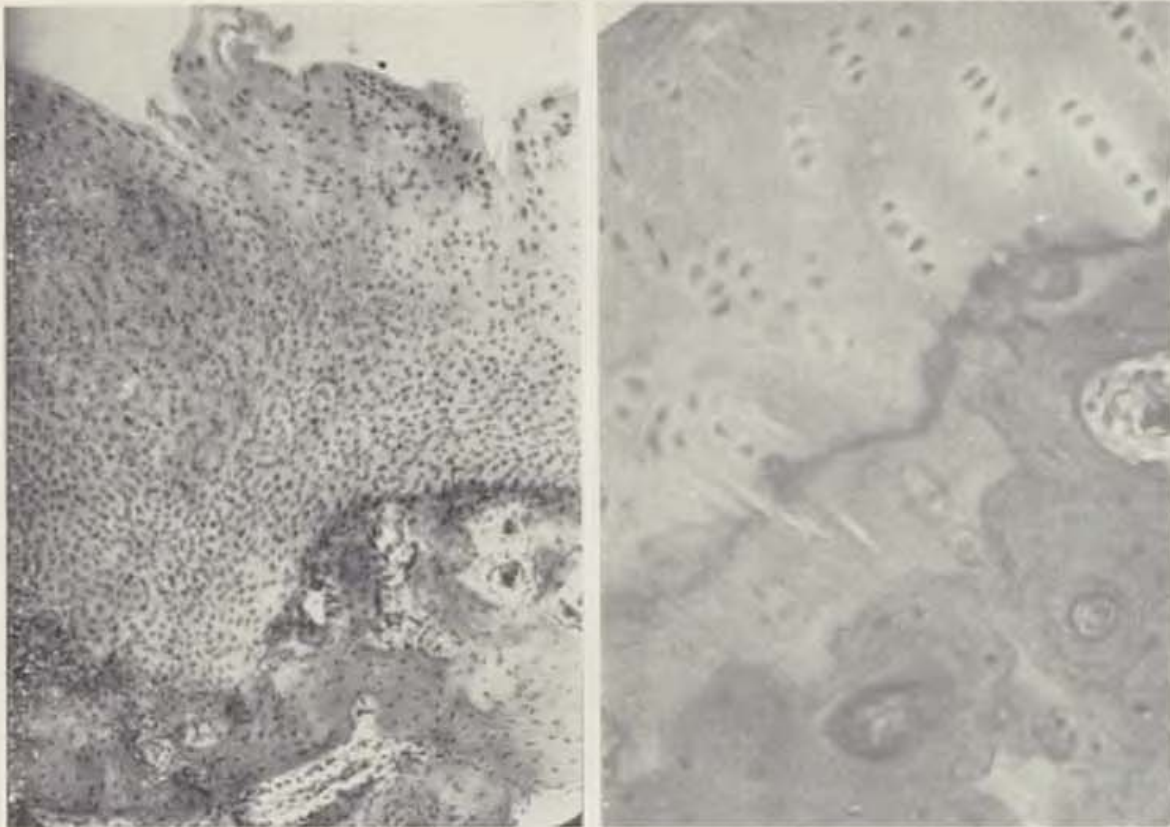


Fig. 4. Microphoto. New formed cartilage (a). Incomplete repair of subchondral bone plate (b). Period of observation 116 days. Stained by hematoxylin - eosin. Enlarged  $40\times$ . — Fig. 5. Microphoto. New formed articular cartilage (a) with almost completely repaired subchondral bone plate (b). Period of observation 145 days. Stained by hematoxylin - eosin. Enlargement  $120\times$



Fig. 6. Microphoto. New formed articular cartilage (a) with repaired subchondral bone plate (b). Period of observations 186 days. Stained by hematoxylin eosin. Enlargement  $40\times$

R. D. Novoselov

MECHANISM OF THE ORIGIN OF NOSE DEFORMATION IN PATIENTS WITH INBORN CLEFT  
OF UPPER LIP



Fig. 6. Teleroentgenograms of patient K. L. before cheiloplasty (a) and 3 weeks after (b)



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