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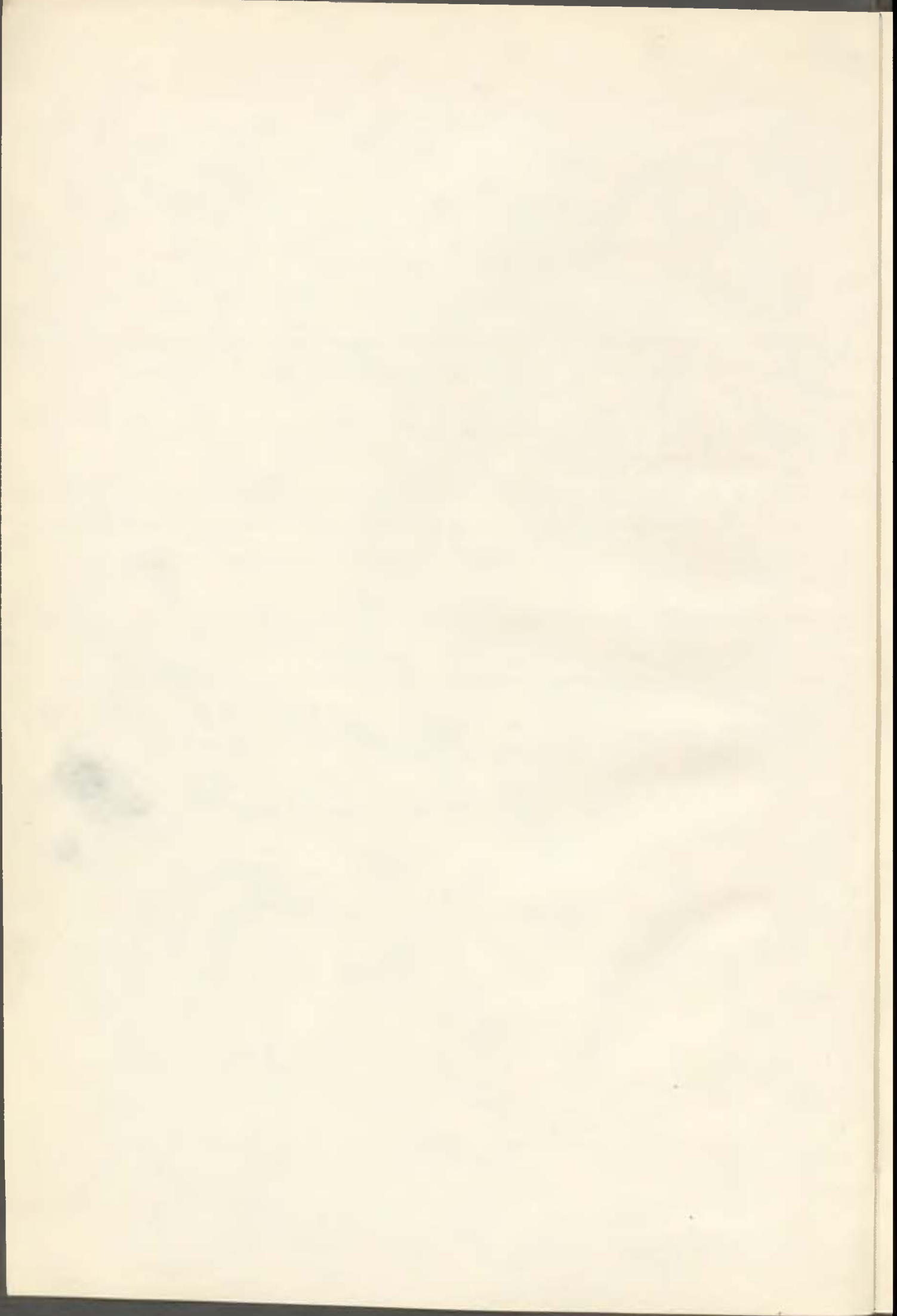
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## DEVELOPMENT OF PALATE IN NORMAL MURINE EMBRYO AND INFLUENCE OF VARIOUS AGENTS ON THE CONDITIONS OF PALATINE PLATES AT DIFFERENT STAGES OF EMBRYONIC DEVELOPMENT

E. A. LOTOSH

In the literature there are but few papers [10, 12, 13] dealing with the normal development of the palate. In the early stage of organogenesis the roof of the oral cavity is formed by the very base of the skull which is called the primary palate. By the 16th day of embryonic development in mice, the primary oral cavity has been divided into two compartments: the nasal and the definite oral cavities. This process starts with the formation of a ridge, the so-called palatine plate, on the medial aspect of each maxilla. Growing, these plates unite with each other thus forming a partition which divides the primary oral cavity into two cavities and is called the secondary or hard palate. If development of these palatine plates is impeded in any way, they cannot get into contact and unite with each other. Such disorders are called cleft of the secondary palate. It has been ascertained that union of the palatine plates occurs on the 14th or 15th day of embryonic development in mice, but variations were observed in the different strains; only strain A, DBA/1 and C57BL were studied. Since a study of normal development of the palate in strain C3HA, which we used for our experiments, has not yet been published, we should like to mention first some normal morphological data about this strain prior to giving a morphological appraisal of our findings.

Mouse strain C3HA embryos of different age were fixed in Bouin's solution starting with the 13th and terminating on the 17th day of development, whereby on the 15th day specimens were taken three times, i.e. in the hours 0 to 8, 8 to 16 and 16 to 24. After fixation, the specimens were placed into 70° alcohol. Then the lower jaw together with the tongue were removed and the condition of the palatine plates studied under a binocular microscope (MBS-1). For definition of the developmental stage, we used the classification of Walker et Fraser [12], who divided this period into a number of stages according to the





Tab. 1. Condition of Palatine Plates in Normal Embryos of Mice at Different Stages of Development

Day of development	Total number of embryos	Condition of palatine plates			
		united		united	
		number	per cent	number	per cent
13	76	76	100	0	
14	62	62	100	0	
15/0— 8 h	47	32	$68.1 \pm 2.5$	15	$31.9 \pm 2.5$
15/8— 16 h	66	23	$34.8 \pm 3.7$	43	$65.2 \pm 3.7$
15/16— 24 h	88	0		88	100
16	77	0		77	100
17	160	0		160	100

position of the palatine plates. We distinguished the following three stages: 1) vertical position of plates, 2) horizontal position of plates yet without union and 3) plates after union with each other. The results of these observations are listed in tab. 1. On the 13th or 14th day of embryonic development the palatine plates had a vertical position. In the first third of the 15th day the plates occupied a vertical or horizontal position in 68.1 % and were united in 31.9 % of specimens. In the second third of the 15th day 34.8 % were in a horizontal position and the remaining 65.2 % were united. Finally, in the last third of the 15th day the palatine plates were united in all specimens. On the 16th and 17th day of development the palatine plates were united in all embryos. Thus in embryos of mouse strain C3HA, formation of the secondary palate is completed by the last third of the 15th day of development.

First, on studying pregnant female mice subjected to X-ray irradiation (1) and A hypervitaminosis (4) we found that sprouting of the palatine ridges started — as in normal individuals — on the 11th day of embryonic development. On administration of a surplus dose of vitamin A on the 11th day, causing severe damage to the embryo, the palatine anlage was affected in a high percentage on the 12th day of embryonic development. If these agents were made to act at later days, there was either no damage to the palatine plate anlage (as in X-ray irradiation) or the damage was almost indiscernible (as in A hypervitaminosis on the 13th or 14th day, whereas on the 15th day there was no damage at all). At the same time, in another series of experiments, a single surplus dose of vitamin A plus cortisone, when given to pregnant mice on the 13th, 14th or 15th day, showed that the palatine plate anlage could also be affected, whereby from the dose given on the 13th day there were clefts in the palate in all specimens like on the 12th day (2). In connection with these findings the question arose as to why the sprouting of the palatine plates could be affected in the course of several days, although the critical period of its development had passed between the 11th and 12th day (3).

To answer this question, we decided to study the condition of the palatine plates in embryos subjected to the influence of various agents registering the results on the 17th day of development. The following specimens were examined:

1) embryos of females subjected to one 200 r dose of X-ray irradiation on the 11th, 12th or 13th day of pregnancy; 2) embryos of females which were given one dose of 35,000 u. of vitamin A on the 11th, 12th, 13th, 14th or 15th day of pregnancy; 3) embryos of females which were given one dose 20,000 u. vitamin A plus 2.5 mg. cortisone on the 11th, 12th, 13th, 14th or 15th day of pregnancy.

As can be seen from tab. 2, X-rays affect sprouting of the palatine plates most when applied on the 11th day of embryonic development which is borne out by the 37.8 % of specimens with vertical position and 16.6 % with union of the palatine plates as compared with the 18.9 % and 50.5 % resp. on application of X-rays on the 12th day. The difference between the 11th and 12th day is highly significant ( $\chi^2=35.74$ , degree of freedom 2,  $P < 0.01$ ). In A hypervitaminosis, on the contrary, the palatine plate anlage is most affected when the surplus dose is given on the 12th day of pregnancy, i.e. there is vertical position of the palatine plates in 74.6 % and union only in 4.4 % of specimens. The difference between the degrees of development of the palatine plates in 17-day-old embryos after a surplus vitamin A dose given to the mother on the 11th or 12th day of pregnancy, is highly significant ( $\chi^2 = 37.68$ , degree of freedom 2,  $P < 0.01$ ). Administration of a surplus vitamin A dose on the 13th or 14th day of pregnancy showed the palatine plates in horizontal position in all specimens of 17-day-old embryos.

This proves that X-ray irradiation affects the palatine plate anlage most, if applied on the 11th day, while A hypervitaminosis is most harmful on the 12th day of embryonic development. The circumstance that the palate anlage after its normal start is most affected by the various agents on different days prior to the palatine plates acquiring a definite form, which only starts to take

Tab. 2. Condition of Palatine Plates on 17th Day of Development in Embryos of Mice Whose Mothers were Subjected to Influence of Various Agents at Different Stages of Pregnancy

Type of agent	Day of pregnancy at which agent took action	Total number of embryos	Palatine plates					
			ununited				united	
			in vertical position		in horizontal position			
			num- ber	per cent	num- ber	per cent	num- ber	per cent
X-ray irradiation	11	180	68	37,8±3,3	82	45,6±3,4	30	16,6±2,7
	12	95	18	18,9±4,0	29	30,6±4,7	48	50,5±5,1
	13	63	0		0		63	100
A hypervitaminosis	11	91	24	26.3±4.6	52	57.2±5.1	15	16.5±3.8
	12	71	53	74.6±5.1	15	21.0±4.8	3	4.4±2.4
	13	55	0		14	25.4±5.8	41	74.6±5.8
Vitamin A + corti- sone	11	18	2	11.1±7.4	12	66.6±11.1	4	22.3±9.8
	12	72	70	97.3±1.9	2	2.7±1.9	0	
	13	70	4	5.7±2.7	66	94.3±2.7	0	
	14	47	1	2.1±2.0	27	57.4±7.2	19	40.5±7.1
	15	63	0		4	6.3±3.0	59	93.7±3.0



shape on the 13th day of embryonic development, once more proves our assumption of the critical period of palate sprouting to pass between the 11th and 12th day. The critical periods of development are connected with the process of determination, i.e. the embryo anlage has acquired a complex of factors which lead to the definite state of the foetus (7). Thus, since the processes of determination during embryogenesis are expressed by the critical periods in which there is an increased perceptibility to the influence of external agents, it can be assumed that the determination period of the palate anlage passes in mice between the 11th and 12th day of embryonic development. This is then followed by a period in which the processes of evident development (growth and differentiation) take place. It also ought to be stated that the fact, that the critical period of palate development does not coincide with the start of morphological differentiation of its anlage, is characteristic not only for this, but also for other organs developing in embryos of mammals (8) and birds (5, 6).

Finding it imperative to study the teratological mechanism of vitamin A in high doses, we carried out experiments with the administration of a single surplus dose of vitamin A given together with cortisone. The appraisal of the palatine plates in cases of cleft palate (tab. 2) showed that with this type of interference on the 13th, 14th and 15th day of development the palatine plates occupied a horizontal position in most 17-day-old embryos, unlike those damaged on the 12th day when 97.3 % showed a cleft palate with vertical position of the plates. It ought to be pointed out that the character of damage to the palatine plates caused on the 13th day differs significantly from that caused on the 14th day of embryonic development ( $\chi^2 = 34.01$ , degree of freedom 2,  $P < 0.01$ ). Cleft palate developing from damage to the palatine plates caused to 13-, 14- or 15-day-old embryos, is much less severe.

In this study we have made an attempt at qualitative appraisal of the character of damage to the palate anlage in embryos of mice. On the basis of the findings it can be concluded that the start of the palate anlage normally lies (i.e. its critical period passes) between the 11th and 12th day of embryonic development, but that the process of morphological differentiation only begins on the 13th day and continues until the 15th day, when the palatine plates unite. Our findings are in accord with those of a number of other authors (9, 11, 14) who, on the example of the eye or the brain, showed that after determination, i.e. after the critical period had passed, the cells of the anlage could be damaged, which led to retardation of growth and differentiation. Consequently, the palate anlage can be damaged not only in the critical period, but even after it, whereby the cleft palate originating from a damage suffered on the 11th or 12th day of embryonic development has a different character from that originating from damage suffered on the 13th, 14th or 15th day.

#### SUMMARY

1. In mice of C3HA strain, formation of the secondary palate is normally completed by the end of the 15th day of embryonic development.
2. The critical period of the palate anlage passes between the 11th and 12th day of embryonic development.

3. The palate anlage can be damaged after its morphological determination, but the character of this palatine plate damage differs from that suffered in the critical period.

#### RÉSUMÉ

### **Le développement du palais chez l'embryon de souris normal et l'influence de divers agents sur la condition des plaques palatines aux stades différents du développement embryonnaire**

E. A. Lotosh

1. Chez les souris de la souche C3HA la formation du palais secondaire est complétée normalement vers la fin du quinzième jour du développement embryonnaire.

2. La période critique du fondement du palais survient parmi le 11ème et 12ème jour du développement embryonnaire.

3. Le fondement du palais peut être endommagé après sa détermination morphologique, mais le caractère de ce dommage diffère de celui survenant pendant la période critique.

#### ZUSAMMENFASSUNG

### **Entwicklung des Gaumens bei normalen Mausembryo und der Einfluss einiger Stoffe auf den Zustand der Gaumenplatten in verschiedenen Stadien der Embryonalentwicklung**

E. A. Lotosh

1. Bei Mäusen des C3HA Stammes endet die Bildung des sekundären Gaumens gegen Ende des 15. Tages der Embryonalentwicklung.

2. Die kritische Periode der Gaumenanlage tritt ein zwischen dem elften und zwölften Tag der Embryonalentwicklung.

3. Die Gaumenanlage kann nach ihrer morphologischen Bestimmung geschädigt werden, der Charakter dieser Schädigung der Gaumenplatte ist jedoch von der Schädigung in der kritischen Periode unterschiedlich.

#### RESUMEN

### **El desarrollo del paladar en un embrión múrdo normal y la influencia de varios agentes sobre las condiciones de los platos palatinos en estadios diferentes durante el desarrollo del embrión**

E. A. Lotosh

1. En los ratones de la clase C3HA, la formación del paladar secundario está completada normalmente al cabo del 15º día del desarrollo embrionario.

2. El período crítico del „anlage“ de paladar toma lugar entre el 11º y 12º día del desarrollo embrionario.

3. En „anlage“ de paladar puede ser perjudicado después su determinación morfológica pero el carácter de este plato palatino perjudicado difiere de aquello que pasó durante el período crítico.

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E. A. Lotosh, Gertsena 23/12—21, Leningrad, 65, USSR

### Spanish Society of Plastic and Reconstructive Surgery

The Second National Congress of Plastic and Reconstructive Surgery will be held at Barcelona Cap Sa Sal (Costa Brava) June 2 to June 7 1968. — President: Dr. D. M. Gras Artero, Secretary: Dr. D. J. Abades y Blanchart, Vice President: Dr. D. R. Sans Gassio, Treasurer: Dr. D. R. Benedito Ramón.

Full and corresponding members of the various Societies related to the International Confederation for Plastic Surgery and all surgeons and specialists having a scientific or professional interest in the problems of plastic and reparative surgery are sincerely invited.

All communications, inscriptions and inquiries as regard this Congress should be addressed as soon as possible to the Secretary of the Congress: Dr. D. J. Abades y Blanchart. Avenida Infanta Carlota 100—102, Barcelona (15), España.

### Asociacion Mexicana de Cirujanos Plasticos

On the last session of the Mexican Association of Plastic Surgeons the new executive committee for the period of 1967—1969 was elected.

The following members have been assigned:

President:	Dr. Angelo Gonzáles Rodríguez
Secretary:	Dr. Sergio Zenteno Alanís
Treasurer:	Dr. Carlos León Valle
First Vocal:	Dr. Pedro Castro Figueroa
Second Vocal:	Dr. Mario Ceballos Longoria

The Address of the headquarters is: Lerma 333, Apt. 9, Mexico City, Mexico.



Burian Laboratory of Plastic Surgery of the Czechoslovak Academy of Sciences, Prague  
(Czechoslovakia)

Director: Prof. V. Karfík, M.D., D.Sc.

## LOCALISATION OF AURICLE BY MEANS OF ANTHROPOMETRIC METHODS

P. FIGALOVÁ, L. G. FARKAŠ

In recent years the reconstruction of auricles and its methods have been elaborated with great detail, particularly as far as shaping of contours of the auricle is concerned. Nevertheless, otoplastics still lacks a reliable and exact determination of the place of insertion of the auricle. When localising the new auricle, the majority of surgeons follow only their aesthetic sense and feeling making correction as to the position of the auricle when comparing it with the position of the other one only by sight. In the course of an otoplasty, the main stress has been laid upon symmetry of the size of the two auricles. When examining a large number of patients suffering from hypoplasia or aplasia of the auricle, the Clinic of Plastic Surgery in Prague found enough material for verifying the opinion that a correct localisation of insertion of the new auricle is one of the conditions of a successful result of the operation.

### PROBLEMS

Determination of the place of insertion of the new auricle is a relatively easy task whenever there are signs of the auricle both in case of hypoplasia and aplasia. Such a determination of the place of insertion of the new auricle in accordance with the state of the defectless side is, however, much more difficult if the defect is accompanied by atresia of the porus acusticus externus and facial hypoplasia. But if there is a case of a bilateral aplasia combined with the atresia of the porus acusticus externus, the surgeon must trust his aesthetic sense when marking the place of insertion of the auricles which are to be formed.

### METHOD

In the Burian Laboratory of Plastic Surgery we introduced an objective method of determination of the place of localisation of the new auricle based on the cephalometric methods modified in accordance with the needs of plastic surgery. In his candidate's thesis, L. G. Farkaš (1959) reported on a method of localisation of the planned auricle in use at that time at the Clinic of Plastic Surgery in Prague. This method already took some anthropometric points into

consideration. The place of insertion of the auricle was determined here with the aid of the distance to the outer corner of the eye, the place of the tragus with the aid of the distance from the edge of the ala nasi and the lower edge of the lobulus with the aid of distance from the corner of the mouth. This method may suffice, perhaps, for a rough orientation but, when carrying out the pre-operation measurements of patients, it proved insufficient and inac-

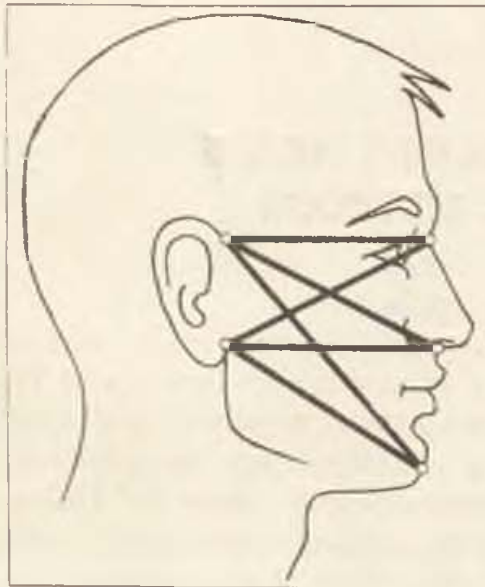


Fig. 1. Measuring points on the auricle and in medium plane of face, used for purpose of localisation of auricle. — A — otobasion superius — obs, B — otobasion inferius — obi, I — nasion — n, II — subnasale — sn, III — gnathion — gn

curate: the reason on the one hand, is that points lying outside the medial plane are affected to the greatest extent in cases of unilateral hypoplasia and, on the other hand, it is impossible to determine the position of a point by geometric methods only with reference to one further point.

Our proposed method starts with the measuring points on face and skull currently in use in anthropometric practice and quoted in international litera-

Table 1. Average values of sizes determining the insertion of the auricle

Distance between the points	6—7 years		16—17 years	
	boys	girls	boys	girls
otobasion superius — nasion	106.4	104.9	121.9	115.3
otobasion superius — subnasale	115.1	113.0	135.9	127.7
otobasion superius — gnathion	128.7	126.3	156.7	146.6
otobasion inferius — nasion	105.7	102.7	120.8	115.1
otobasion inferius — subnasale	98.8	95.2	113.9	108.1
otobasion inferius — gnathion	99.6	97.7	117.3	113.5

ture. For measurements proper, we use gauges employed in anthropology for measuring the head and the face, more particularly the contact measure — cephalometer — and a slide rule. For some purposes, a tape measure with a millimeter scale may be also used.

The localisation of the auricle on the head is determined by two points: the cranially placed point otobasion superius "obs" (i.e. the point lying at the



Fig. 2. Transmission of sizes with aid of cephalometer from defectless side to affected one during a postoperation control (Patient V. H. 19 years old, No. 38, 579)

place of the upper insertion of the auricle to the head) and the inferiorly placed otobasion inferius "obi" (i.e. the point lying at the place where the lobulus is attached to the skin of the face. The localisation of these two points is then determined in comparison with anthropometric points lying in the medial plane of the face and the neurocranium. These are the nasion "n" (i.e. the point

Table 2. Average values of sizes of the auricle

Age group	Height of auricle				Width of auricle			
	boys		girls		boys		girls	
	sin	dx	sin	dx	sin	dx	sin	dx
0—9 months	43.9	44.5	40.8	41.3	26.2	27.7	24.8	25.0
1 year	49.7	50.2	46.8	46.8	31.0	31.9	28.8	24.9
2 years	48.6	50.1	48.5	48.9	31.5	32.4	30.2	31.3
3 years	50.2	51.5	49.5	50.8	31.9	32.5	31.1	31.5
4 years	51.6	53.0	50.8	51.4	30.8	32.4	31.3	31.5
5 years	53.2	54.5	52.0	52.3	33.4	33.2	31.9	32.0
6 years	54.8	55.8	53.1	53.9	32.9	33.7	32.4	32.7
7 —8 years	56.1	56.8	56.5	56.5	33.3	33.8	32.8	32.9
9 —10 years	57.0	58.3	55.5	58.5	34.8	35.1	32.1	33.0
11—12 years	59.7	60.8	57.7	57.9	34.6	35.2	33.1	33.3
13—14 years	60.5	60.3	57.0	58.3	34.6	36.3	33.2	34.3
15—16 years	62.6	63.4	57.8	58.6	36.7	36.8	32.3	33.9
17—18 years	63.4	63.7	58.7	59.3	34.6	36.0	31.7	33.2



lying on the intersection of the medial plane and the nasofrontal suture) then the subnasale "sn" (i.e. the point lying at the top of the passage of the nasal partition and the upper lip) and gnathion "gn" (i.e. the point lying in the medial plane at the lower edge of mandible at the extreme downward and forward directions). Fig. 1.

In practice, the measurement is carried out in such a way that the distance between the two points mentioned is transmitted from the defectless side to the



Fig. 3. Patient (J. Č. 7 years old, No. 37, 839), suffering from hypoplasia of the right half of mandible, ranged among the patients of the first group

affected one (Figs. 2a, 2b). The position of obs and obi must always be determined in relation to at least two points in the medial plane.

This method of measurement can be employed, however, only with symmetrical faces. The method of determining the localisation of the new auricle is somewhat different if the patient is suffering from unilateral hypoplasia and aplasia of the auricle, combined with a facial hypoplasia affecting the same side. At the Prague Clinic of Plastic Surgery 120 patients suffering from aplasia of the auricle were operated on from 1929 to 1957. Of this number 63.3 per cent of patients also suffered from the unilateral hypoplasia of the face (L. G. Farkaš, M. Fára, 1958). The said simple method of measurement relates, therefore, to only one third of the total number of patients: it has, therefore, to be modified in respect of the remaining, larger, group of patients.

Cephalometric examinations of patients suffering from unilateral hypoplasia of face disclosed that the degree of hypoplasia in the different planes of the face might differ. The patients were then divided into three groups according to which plane of face was affected by hypoplasia. The first group includes



patients half of whose lower jaw is hypoplastic. When determining the position of the auricle we cannot, consequently, make any use of the gnathion point, since it is displaced towards the affected side. Therefore, localisation of obs and obi on the affected side has to be carried out in dependence on the remaining two unaffected points, the nasion and the subnasale (Fig. 4).

The second group comprises patients whose subnasale point is displaced, most frequently in the direction of the affected side. Consequently, it is of no

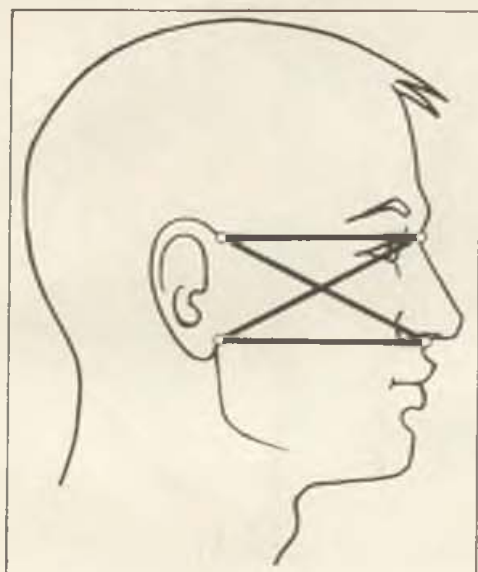


Fig. 4. Measuring points used for localisation of auricle of patients of the first group (A, B, I, II, see Fig. 1). — Fig. 5. Patient (K. CH. K., 10 years old, No. 66, 013) suffering from hypoplasia of the right half of face, belonging to the third group

use for our measurement purposes. The localisation of the new auricle is made in this group with the aid of the points nasion and gnathion.

The third group covers patients, the entire half of whose face is affected (Fig. 5). The localisation of the new auricle is, in this instance, one of the most difficult tasks, since the connecting line between the nasion and gnathion does not divide the face into two symmetric halves. For determining the right position of insertion of the auricle, there remains only one point in the medial plane of the face, namely nasion, but this point is, in itself, insufficient for determining the insertion. Therefore, in such an event we have to make use of one further auxiliary point, that is the vertex "v" [i.e. the place lying at the uppermost point of the head at the intersection between the medium plane with the arch connecting both tragions over the cranial vault perpendicularly to the me-



dium plane]. (Fig. 6). In order to improve the localisation and to make it more accurate the width of insertion of the auricle (obs — obi), ascertained on the unaffected side is also taken into consideration. This size, of course, may be used in all instances for the purpose of checking and controlling the results of the measurement (Fig. 7).

The method proposed for measurement of patients of the third group is the least objective one, since the only and entirely reliably determined point

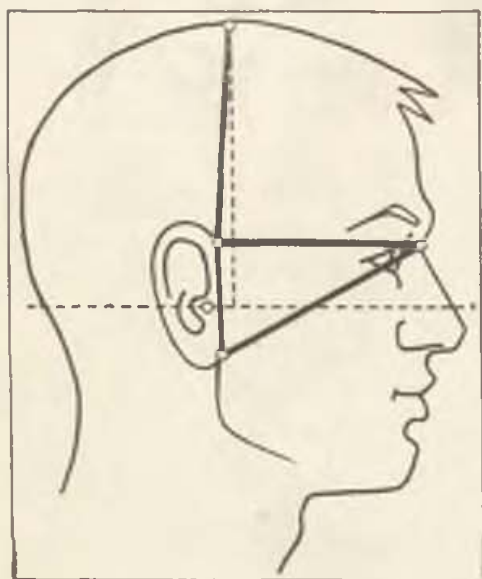


Fig. 6. Anthropometric points, used for localization of the auricle in patients of the third group [A, B, I — see Fig. 1, IV/Vertex' — v']. — Fig. 7. Measuring of insertion of auricle by means of a sliding rule (patient K. CH. K., 10 years old. No. 66, 013)

is, in this case, the nasion. Vertex is a point which is difficult to ascertain since it is not determined by a bone base and it cannot be palpated. In addition, its position may be affected by the asymmetry of the neurocranium. The asymmetry of face is accurately determinable with the aid of sizes, while the asymmetry of neurocranium can be ascertained only by sight, particularly in infants with undeveloped contour of the skull. Consequently, the task with which the surgeon is faced in such instances is to correct, with the aid of his aesthetic feeling, the final localisation of the new auricle by looking at the patient from the front and back and from above.

If there is a case of bilateral aplasia, the localisation of the new auricle may be determined with the aid of standard figures acquired during the anthropometric examinations of normal population. For these purposes, we elaborated rules for two age groups, more particularly for children of 6 years and for

adolescents (both boys and girls) of 16 years. The six years group was selected because at that age the first stage of reconstruction of the new auricle is usually undertaken. As a rule, this first operation fixes the otobasion inferius. The auricles of 16 year old youths grow very little subsequently ([J. Ryšánek, 1949; L. G. Farkaš, M. Dobisíková, K. Hajniš, 1966]). As far as further growth of the face is concerned M. Hajnišová and K. Hajniš (1966) expressed the opinion that the size of face of girls of that age no longer grows, while the face of boys of that age is subject to only minimum growth. The measurements acquired in the course of examinations of this age group may, therefore, serve for control of the results of the reconstruction. Table I.

The next table shows the average values for the height and width of the auricle: the figures were arrived at and elaborated for the needs of our Laboratory from the results of anthropometric measurements of the normal population (Dobisíková M., 1965).

#### SUMMARY

The Burian Laboratory of the Plastic Surgery of the Czechoslovak Academy of Sciences presents a suggestion of how to determine the place of insertion of the new auricle in the course of its reconstruction in patients suffering from unilateral or bilateral hypoplasia or aplasia of the auricle. The determination is carried out with the aid of cephalometric methods, starting with points in the medium plane of the head which the authors selected for these purposes. The accompanying drawings and photographs illustrate the proposed method of measurement as well as the gauges which it is suitable to use.

#### RÉSUMÉ

##### **La localisation du pavillon d'oreille à l'aide des méthodes anthropométriques**

P. Figalová, L. G. Farkaš

Le collectif des travailleurs du Laboratoire de la chirurgie plastique au nom de l'académicien Burian à Prague, membre de ČSAV, présente une proposition comment fixer la place du nouveau pavillon d'oreille au temps de la reconstruction chez les malades atteints soit d'hypoplasie, soit d'aplasie uni-ou bilatérale. La mode de fixation est réalisée à l'aide des méthodes céphalométriques des points de la zone médiale de la tête, que le auteurs eux-mêmes ont fixé. Un tas de photographies et des dessins démontrent la mode de la mesure proposée de même que les ustensiles dont il faut se servir.

#### ZUSAMMENFASSUNG

##### **Die Lokalisation des Ohrlappens mit Hilfe anthropometrischer Methoden**

P. Figalová, L. G. Farkaš

In der vorliegenden Arbeit schlägt das Laboratorium Prof. Burians für plastische Chirurgie in Prag eine Methode vor, wie die Insertionsstelle des neuen Ohrlappens bei Patienten zu bestimmen ist, bei denen enie Ohrlappenrekonstruktion wegen einseitiger oder beiderseitiger Hypoplasie bzw. Aplasie des Ohrlappens durchgeführt



werden soll. Die Bestimmung geschieht mit Hilfe kephalometrischer Methoden, wobei die Verfasser bestimmte Punkte in der Sagittalebene des Kopfes als Ausgangspunkt wählten. Eine Reihe von Zeichnungen und Lichtbildern demonstriert anschaulich die vorgeschlagene Methode der Messung und die dafür geeigneten Messgeräte.

#### RESUMEN

### La localización del pabellón de la oreja por los métodos antropométricos

P. Figalová, L. G. Farkaš

El laboratorio de cirugía plástica de Praga del prof. Burian, propone cómo determinar el lugar de origen del nuevo pabellón, durante su reconstrucción en los pacientes con hipoplasia lateral o bilateral o aplasia del pabellón de la oreja. La Forma de determinación se realiza con la ayuda de los métodos cefalométricos desde unos puntos en el centro, en un plano central de la cabeza, los cuales designaron los autores para este fin. —

Una serie de dibujos y fotografías ilustran el método de medición propuesto y las medidas que son mas adecuadas. —

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### The Pan-Pacific Surgical Association

The Eleventh Congress of the Pan-Pacific Surgical Association will be held in Honolulu, Hawaii on October 14 through October 22, 1969.

The scientific program will consist of some 300 speakers in all surgical specialties. Concurrent meetings will be held in Colon and Anorectal Surgery, General Surgery, Neurosurgery, Obstetrics & Gynecology, Ophthalmology, Orthopedics, Otolaryngology, Plastic Surgery, Thoracic-Cardiovascular Surgery and Urology. Included in the program will be meetings in Anaesthesiology and Radiology.

For any further information write to: The Pan-Pacific Surgical Association, Alexander Young Building — Rm. 236, Honolulu, Hawaii 96813, USA.

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## BASIC AURICULAR CHARACTERISTICS IN CHILDREN WITH CLEFT ANOMALIES AS COMPARED WITH THE STANDARD

K. HAJNIŠ, L. G. FARKAŠ

Attention has been drawn in several previous papers to the potential presence of anomalies in shape and size in various organs or their parts in subjects with cleft deformities (F. Burian, L. G. Farkaš, K. Hajniš 1964; K. Hajniš, L. G. Farkaš 1964; K. Hajniš, L. G. Farkaš 1965; K. Hajniš, L. G. Farkaš, M. Hajnišová — 1966). These considerations were based on a number of detailed non-specific observations made by Academician Burian (1954) during his long years of practice.

Table 1. Number of cases in which length and width of ear-lobe (sa-sba and pra-pa) or one of these dimensions differs from normal size among three-year-old children by at least  $\pm 1 s$

3 years	Boys (n = 5)		Girls (n = 8)	
	left	right	left	right
n	1	3	2	2
%	20.00	60.00	25.00	25.00
Cases not differing from normal				
n	4	2	6	6
%	80.00	40.00	75.00	75.00

The assumption that there may be deviations from the norm in shape and size and asymmetry on the two sides in some of the parts of the head, in subjects with cleft deformities of the face was based on the conception of a partial decrease in their growth potential resulting from impairment of the growth centres, which was also put forward by Derichsweiler (1959) and Skotnický (1963).

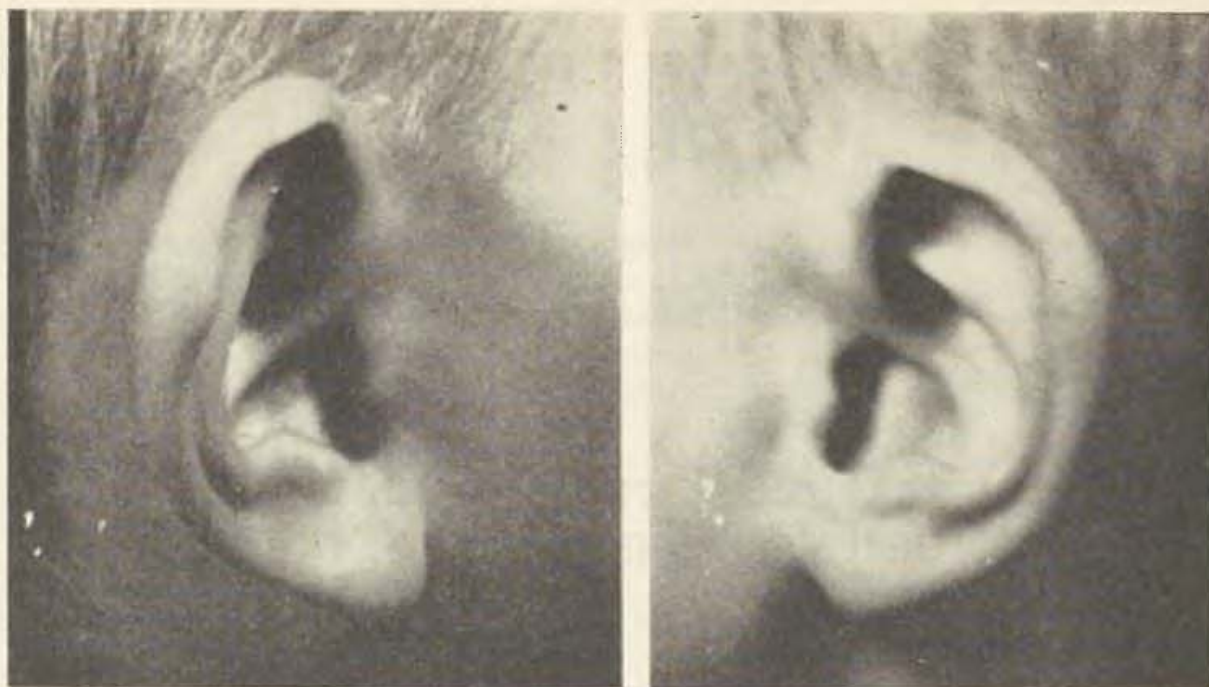


Fig. 1a, b. B. V. No. 49130. Boy aged 3 years. Dimensional and shape asymmetry of the ear-lobes. The right ear-lobe stands out conspicuously. Hypoplastic lobulus on left. Cheilo-gnatho-palatoschisis sin

Table 2. Number of cases in which length and width of ear-lobe or one of these dimensions (sa-sba and pra-pa) differs from normal size among three and a half year-old children by at least  $\pm 1$  s

3½ years	Boys (n = 7)		Girls (n = 6)	
	left	right	left	right
n	6	2	4	4
%	85.71	28.57	66.66	66.66
Cases not differing from normal				
n	1	5	2	2
%	14.28	71.42	33.33	33.33

In order to confirm or refute this assumption a comparative study was made of the basic dimensions and abnormalities in the shape of the auricle, taking asymmetry into consideration, in children with cleft deformities. Data obtained in children with cheilo-, gnatho- and palatoschisis were compared with the average values of the various dimensions of the auricle. The average values were taken as those regarded as normal for Bohemia and Moravia on the basis of the anthropometric investigation of the Czech population in the 0-18 agegroup, carried out in 1964.

# MATERIALS AND METHODS

The material comprised 110 children with complete, partial, unilateral or bilateral cleft deformities or with isolated clefts of the soft or hard and soft palate. The group was composed of 71 boys and 39 girls aged 2—17 years. Most of the subjects were concentrated in to age groups of 3, 3½, 4 and 14, 15, 16 and 17 years (as can be seen from the table).

The essential metric data for the auricle were obtained in the course of the detailed cephalometric examination of patients with clefts carried out at the Burian Laboratory for Plastic Surgery of the Czechoslovak Academy of

Table 3. Number of cases in which length and width of ear-lobe (sa-sba and pra-pa) or one of these dimensions differ from normal size among children aged four years by at least  $\pm 1$  s

4 years	Boys (n = 7)		Girls (n = 7)	
	left	right	left	right
n	7	2	3	3
%	100.00	28.57	42.85	42.85
Cases not differing from normal				
n	0	5	4	4
%	0.00	71.42	57.14	57.14



Fig. 2a, b. V. F. No. 42 613. Boy aged 5 years. Shape deformity of helix. Cheilo-gnathopalatoschisis sin



Sciences in Prague during the autumn of 1964 and the spring of 1965. All subjects were patients born in various parts of Bohemia and who had been operated on at the Prague University Department of Plastic Surgery. Various types of operation had been performed according to age — suture of the lip in the youngest and in most of the older patients, also the palate operation.

The most important dimensions of the auricle are generally considered to be the distance between points sa-sba, that is the height of the auricle, and

Table 4. Number of cases in which length and width of ear-lobe (sa-sba and pra-pa) or one of these dimensions differ from normal size among children aged fourteen years by at least  $\pm 1$  s

14 years	Boys		Girls	
	left	right	left	right
n	2	2	4	4
%	50.00	50.00	100.00	100.00
Cases not differing from normal				
n	2	2	0	0
%	50.00	50.00	0.00	0.00

pra-pa, that is the width of the auricle. These measurements were made in all patients on both sides using the sliding scale of Martin and Saller (1957) generally employed in anthropology.

To permit comparison of the data on the size of the auricles in children with clefts with that of normal Czech children, detailed growth standards were elaborated for the auricle for children from 0—18 years. These standards have been published elsewhere (L. G. Farkaš, M. Dobisíková, K. Hajniš, 1966). The measurements obtained in each patient were compared individually with the



Fig. 3a, b. G. M. No. 16 787. Boy aged 17 years. Dimensional and shape asymmetry of both ear-lobes. Total bilateral cleft



Fig. 4. B. V. No. 21 936. Boy aged 2 years. Hypoplastic lobulus. Standing out ear-lobes with deep concha. Partial cleft of lip on left. — Fig. 5. E. V. No. 12 166. Boy aged 4 years. Dimensional asymmetry of ear-lobes. Slightly standing out ear-lobes. Cheilo-gnatho-palatoschisis on both sides

standard, for the right and left ears separately and naturally according to sex. However, the size of the auricle was assessed with respect to the norm, as a whole, that is both measurements (sa-sba and pra-pa) at once. In Tables 1—7 auricles are classified as deviating from dimensional standards if they differed in either direction (larger or smaller) by one standard deviation.

The question of the size of both auricles is also interesting, for example, in unilateral clefts. This problem can be illustrated from Tables 8 and 9 which

Table 5. Number of cases in which length and width of ear-lobe (sa-sba and pra-pa) or one of these dimensions differ from normal size among children aged fifteen years by at least  $\pm 1 s$

15 years	Boys (n = 23)		Girls (n = 6)	
	left	right	left	right
n	17	16	3	5
%	73.91	69.56	50.00	83.33
Cases not differing from normal				
n	6	7	3	1
%	26.08	30.43	50.00	16.66

give all possible dimensional combinations of both ears in right, left and bilateral complete clefts and in clefts involving only the lip and only the palate.

Apart from the most important dimensions mentioned above, and thus also the dimensional asymmetry of the auricles, note was also taken of asymmetry in shape, for example, adherent lobulus on one side and free on the other,



Fig. 6a, b. D. R. No. 11780. Girl aged 19 years. Characteristic enclosed lobulus on both sides. Complete bilateral cleft [operated on elsewhere]

a well-marked Darwin's tuberculum on one side and poorly marked on the other and a more convoluted helix on one side than on the other.

### RESULTS AND CONCLUSIONS

An investigation was carried out of the most important dimensions and morphological characteristics of the auricle in 110 children (71 boys and 39 girls) with cleft deformities. Records were made of asymmetry of the auricle

Table 6. Number of cases in which length and width of ear-lobe (sa-sba and pra-pa) or one of these dimensions differ from normal size among children aged sixteen years by at least  $\pm 1$  s

16 years	Boys (n = 9)		Girls (n = 3)	
	left	right	left	right
n	6	7	1	2
%	66.66	77.77	33.33	66.66
Cases not differing from normal				
n	3	2	2	1
%	33.33	22.22	66.66	33.33

in size and shape, of dimensional deviations from the standard for the corresponding age group, and of the relation between auricle size on the side of the cleft and various, mostly very conspicuous anomalies of shape. (Fig. 1—7.)

The following conclusions can be drawn from this research work:

1. In children with all types of clefts of the lip, jaw and palate, the incidence of abnormalities in the size and shape of the auricle is significantly higher than in the normal population. Moreover, asymmetry in shape and size also appears to be more numerous.

2. Tables 1—7 show that in children with clefts, the number of auricles deviating from the standard, that is, larger or smaller by more than 1 s [standard deviation] is on an average about the same in the two sexes and on both sides.

3. From the data in Tables 4—7, it can be assumed that the percentual incidence of dimensional deviations found in the lowest age groups decreases in the pubertal and postpubertal growth phase. This observation is similar to our findings in relation to the incidence of abnormalities in size and shape

Table 7. Number of cases in which length and width of ear-lobe (sa-sba and pra-pa) or one of these dimensions differ from normal size among persons aged seventeen years by at least  $\pm 1$  s

17 years	Boys (n = 7)		Girls (n = 2)	
	left	right	left	right
n	1	3	1	1
%	14.28	42.85	50.00	50.00

Cases not differing from the normal				
n	6	4	1	1
%	85.71	57.14	50.00	50.00

in the normal population. If this impression proves to be correct the possibility of the temporary action of the basic anomaly on auricular growth will have to be considered.

4. In all types of complete clefts the auricles were of normal size on both sides in most of the subjects. In the remaining children with clefts, however, the auricles were larger or smaller than the standard on both sides. In a small percentage there were various combinations of auricular dimensions.

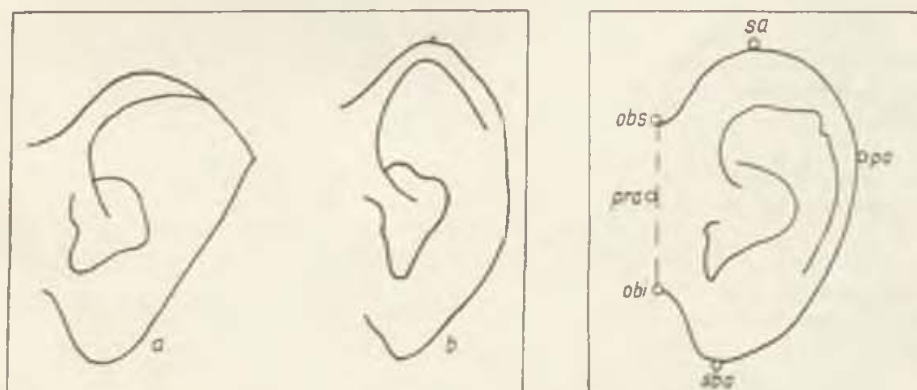


Fig. 7a, b. Diagram of ear-lobe of Macacus type (a) and Cercopithecus type (b). — Fig. 8. Anthropometric points of ear-lobe: pra=preaurale, pa=postaurale, sa=superaurale, sba=subaurale, obs=otobasion superius, obi=otobasion inferius



5. The assumption that the auricle on the cleft side must be smaller than the standard for the corresponding age, was not confirmed.

6. Deformation of the auricle and asymmetry in shape are often present in patients with clefts. This most often takes the form of unilateral differences in the attachment of the lobulus, in the convolutions of the helix, in the size of Darwin's tubercle, in the depth of the relief, etc.

7. In several patients we found auricles of the *Macacus* form (or only a suggestion) or both auricles showing evidence of the *Cercopithecus* type.

8. Since some deformities in shape and dimensional asymmetry of the auricles were sometimes also found in the non-affected parents and grandparents of the children with clefts, it can be assumed that defects in the shape and size of the auricles behave like recessive-heterozygotic characters. It is possible that their incidence may run parallel with a heredity disposition to cleft abnormalities which need not be manifest in every generation, and they could signalize the possible occurrence of a cleft deformity in a subsequent generation.

Table 8. The dependence of area of ear-lobes on side of clefts. Boys

	Cleft (of any type)							
	on the left side		on the right side		bilateral		palate	
	n	%	n	%	n	%	n	%
bilaterally larger than normal	4	13.33	—	—	3	20.00	1	14.28
larger than normal on the left side and of normal area on right side	3	10.00	2	10.52	—	—	—	—
larger than normal on the right side and of normal area on left side	—	—	1	5.26	—	—	1	14.28
larger than normal on left side and smaller than normal on right side	—	—	—	—	1	6.66	—	—
larger than normal on right side and smaller than normal on left side	2	6.66	—	—	—	—	—	—
of normal area on left side and smaller than normal on right side	1	3.33	3	15.78	1	6.66	—	—
of normal area on right side and smaller than normal on left side	—	—	1	5.26	1	6.66	—	—
of normal area on both sides	12	40.00	10	52.63	6	40.00	2	28.57
bilaterally smaller than the normal	8	26.66	2	10.52	3	20.00	3	42.85

Table 9. The dependence the area of ear-lobes on side of clefts. Girls

		Cleft (of any type)							
		on left side		on right side		bilateral		palate	
		n	%	n	%	n	%	n	%
Ear - lobe	bilaterally larger than normal	1	5.88	2	25.00	1	11.11	—	—
	larger than normal on left side and of normal area on right side	2	11.76	—	—	—	—	—	—
	larger than normal on right side and of normal area on left side	1	5.88	—	—	—	—	—	—
	larger than normal on left side and smaller than normal on right side	—	—	—	—	—	—	1	20.00
	larger than normal on right side and smaller than normal on left side	5	29.41	1	12.50	—	—	1	—
	of normal area on left side and smaller than normal on right side	—	—	—	—	—	—	—	20.00
	of normal area on right side and smaller than normal on left side	1	5.88	—	—	—	—	—	—
	of normal area on both sides	5	29.41	5	62.50	6	66.66	—	—
	bilaterally smaller than normal	2	11.76	—	—	2	22.22	3	60.00

The above-mentioned observation points to a possible genetically separate group of clefts associated with congenital deformities of the auricle.

9. Since our observations were made on a comparatively small number of children in different age groups, no definite conclusions can be drawn from our findings.

The aim of our work was to draw attention to the above question and stimulate further work in making measurements and searching for the incidence of abnormalities in the shape of the auricle in the normal population and in patients with clefts.

#### RÉSUMÉ

#### Une comparaison entre les signes fondamentales du pavillon de l'oreille des enfants atteints de bec-de-lièvre et ceux normales

K. Hajniš, L. G. Farkaš

Se basant sur les données du contrôle des principales dimensions de même que des singes morphologiques du pavillon de l'oreille chez 110 des enfants atteints de bec-de-lièvre — dont 71 ont été des garçons et 39 des filles — à l'âge de 2 à 17

ans on a étudié leur grandeur, asymétrie de leur forme, les différences de leur grandeur vis-à-vis de la norme de l'âge en question, la dépendance de la grandeur du pavillon de l'oreille à la partie atteinte de bec-de-lièvre et les différentes — surtout celles très remarquées — anomalies de leur forme (voir fig. 1—7).

Nos données signalent:

1. Chez les enfants atteints de toutes les formes possibles du bec-de-lièvre de même que de la fente du palais la présence des anomalies osseuses et celles de la forme du pavillon de l'oreille est remarquablement plus fréquente en comparaison avec la population en bonne santé. De même les asymétries des formes et de la grandeur sont plus nombreuses chez ces sujets.

2. Nos figures No. 1—7 démontrent le nombre augmenté des pavillons de l'oreille de différence quand à la grandeur — plus petits ou plus grands — dans la quantité surpassante une différence décisive — 1 s — qui est à peu près la même chez les deux sexes à gauche et à droite.

3. Les données de fig. No. 4—7 soulignent la possibilité de supposer la diminution du pourcentage des différences de la grandeur trouvée dans des classes de l'âge adolescent dans la phase pubertale et celle postpubertale. Cette observation n'est qu'une analogie de notre constatation quand à la fréquence de la grandeur et des anomalies des formes dans la population en bonne santé. Si nous parvenons à prouver cette supposition présentée, on pourrait parler d'une influence temporaire du défaut principal quand à la croissance du pavillon de l'oreille.

4. Chez toutes les formes de la fente complète la plupart des atteints possède les pavillons de l'oreille d'une normale grandeur. Les autres formes des fentes montrent des pavillons de l'oreille d'une grandeur réduite ou augmentée en comparaison avec celles des personnes en bonne santé. Un pourcentage insignifiant montre de même des différentes combinaisons de la grandeur des deux pavillons de l'oreille.

5. La supposition d'une grandeur réduite du pavillon de l'oreille du côté endommagé par la fente en face de la norme pour la classe de l'âge en question — n'a pas été prouvée.

6. Les sujets atteints des fentes démontrent assez souvent des déformations du pavillon de l'oreille de même que leur asymétrie de forme. Le plus souvent il s'agit d'un degré de la liberté du lobe différant quand à la côté, de la forme de l'enroulement du hélix, de la grandeur du tubercule de Darwin, de la profondeur du relief etc.

7. Quelques-uns des sujets ont de même présenté des pavillons d'oreille du type macacus (éventuellement en indice) ou même ceux en tendance de ressembler au type cercopithecus.

8. Comme nous avons trouvé quelques-unes de ces anomalies de la forme de même que l'asymétrie de la grandeur du pavillon d'oreille même chez les parents et les arrière-parents des enfants en question, ne possédant aucun signe de fente, nous pouvons prétendre que les anomalies des formes et de la grandeur des pavillons de l'oreille ont un comportement des signes récessifs hétérozygotes. On peut supposer que leur existence en sens cité pourrait signaler éventuellement quelques-unes des anomalies en fente de la face dans des générations en avenir.

Cette observation pourrait même, dans ce cas, conduire à la pensée d'une extra-groupe génétique des fentes jointe à une anomalie innée du pavillon de l'oreille.

9. A l'égard du fait que nous avons examiné les différentes groupes de l'âge des deux sexes enfermant un petit nombre des enfants atteints de la fente, nous ne pouvons pas tirer de notre matériel, malgré qu'il soit jusqu'alors unique, des conclusions définitives.



Le but de notre travail est celui de signaler la thématique donnée et de faire inciter des recherches sur mésurage et l'existence des anomalies de la forme dans la population en bonne santé de même que chez les malades atteints de fentes.

## ZUSAMMENFASSUNG

### **Die grundlegenden Merkmale der Ohrmuschel bei Kindern mit Spaltbildung im Vergleich zu denen bei normalen Kindern**

K. Hajniš, L. G. Farkaš

Die Verfasser untersuchten die hauptsächlichsten Masse und morphologischen Merkmale der Ohrmuscheln bei 110 Kindern mit Spaltbildung (71 Knaben und 39 Mädchen) im Alter von 2 bis 17 Jahren; dabei wurden Asymmetrien der Grösse und Form, Abweichungen der Grösse von der Norm der entsprechenden Altersklasse, Abhängigkeit der Ohrmuschelgrösse von der Seite der Spaltbildung und verschiedene (vor allem besonders auffallende) Gestaltsabweichungen verfolgt (Abbildungen 1 bis 7).

Aus den Studien der Verfasser geht hervor:

1. Bei allen Typen der Lippen-, Kiefer- und Gaumenspalte traten Grössen- und Gestaltsabnormitäten der Ohrmuscheln signifikant häufiger auf als bei der normalen Population; häufiger scheint auch das Auftreten von Form- und Grössenasymmetrien zu sein.

2. Wie die Tabellen 1 bis 7 zeigen, ist bei Spaltbildung die Anzahl der von der normalen Grösse abweichenden Ohrmuscheln — das heisst um mehr als 1 s (massgebende Abweichung) grösser oder kleiner als der Durchschnitt — ungefähr gleich gross bei Mädchen und Knaben sowie rechts und links.

3. Aus den Angaben der Tabelle 4 bis 7 könnte gefolgert werden, dass sich der Prozentsatz der in den unteren Altersklassen festgestellten Grössenabweichungen in der pubertalen und postpubertalen Wachstumsphase verringert. Diese Beobachtung entspricht unseren Feststellungen über das Vorkommen von Grössen- und Formanomalien bei der normalen Bevölkerung. Falls sich unsere Vermutung als richtig erweist, könnte man einen vorübergehenden Einfluss des grundlegenden Defektes auf das Wachstum der Ohrmuscheln annehmen.

4. Bei allen Typen der Lippen-, Gaumen-, Kieferspalt pflegen bei den meisten Betroffenen die Ohrmuscheln beiderseitig normal gross zu sein. Bei den restlichen Kindern mit dieser Spaltbildung sind jedoch beide Ohrmuscheln kleiner oder grösser als normal. Ein kleiner Prozentsatz weist sogar verschiedene Kombinationen der Ohrmuschelgrössen auf.

5. Nicht bestätigt hat sich die Annahme, dass die Ohrmuschel auf der Seite der Spaltbildung in allen Fällen kleiner sein muss, als die Norm für die entsprechende Altersklasse angibt.

6. Bei den Individuen mit Spaltbildung treten Deformationen der Ohrmuscheln sowie Formasymmetrie häufig auf. In den meisten Fällen handelt es sich darum, dass zwischen beiden Seiten ein Unterschied in der Fixation des Ohrlappens, in der Windung des Helix, in der Grösse des Darwinschen Tuberkulums sowie in der Tiefe des Reliefs u. a. m. besteht.

7. In einigen Fällen fanden wir bei den Patienten mit Spaltbildung auch Ohrmuscheln von Makakgestalt (gegebenenfalls nur angedeutet) oder Ohrmuscheln mit Tendenz zum Cercopithecus-Typ.

8. Da wir Deformationen oder Grössenasymmetrien der Ohrmuscheln manchmal auch bei den Eltern und Grosseltern der Kinder mit Spaltbildung feststellen konnten

[wobei jene jedoch keine Spaltbildung aufwiesen], kann man annehmen, dass sich diese Form- und Grössendefekte der Ohrmuscheln wie rezessive heterozygote Merkmale verhalten. Man kann vermuten, dass ihr Vorkommen vielleicht mit einer erblichen Disposition zu Spaltbildung einhergeht, und dass die Spaltbildung nicht in jeder Generation zur Ausbildung kommen muss und eventuell auch das Auftreten der einen oder anderen Spaltbildungen bei späteren Generationen signalisieren könnte.

Die vorliegenden Beobachtungen geben Anlass zu der Erwägung, ob es sich in einem derartigen Falle nicht um eine besondere genetische Gruppe von Spaltbildungen handelt, die mit angeborener Deformation der Ohrmuscheln verbunden sind.

Im Hinblick darauf, dass wir verschiedene Altersklassen beider Geschlechter mit einer nur geringen Anzahl von Kindern mit Spaltbildung untersuchten, können aus unserem Material, wenngleich es bisher einzigartig ist, keine definitiven Schlüsse gezogen werden. Zweck unserer Arbeit ist es, auf diese Thematik aufmerksam zu machen und den Impuls zu weiteren Messungen und zur Suche nach dem Auftreten von Formabweichungen bei der normalen Population sowie auch bei Individuen mit Spaltbildung zu geben.

## RESUMEN

### **Una comparación, con lo normal, de los caracteres fundamentales del pabellón de la oreja de los niños con escisiones**

K. Hajniš, L. G. Farkaš

En base de un examen controlativo de las principales dimensiones y de los caracteres morfológicos del pabellón de la oreja de 110 niños con escisiones (71 varones y 39 hembras) de edades entre 2 y 17 años, fue observada su asimetría dimensional y morfológica, las diferencias de tamaño con lo normal en su respectivo grupo de edades, la dependencia del tamaño de los pabellones en el lado de las escisiones, 4 diferentes (principalmente muy significativas) anormalidades morfológicas [ilustraciones 1—7].

De nuestra investigación se desprende que:

1. En los niños con todos los tipos de escisiones del labio, el maxilar y el paladar, la frecuencia de las anormalidades morfológicas y dimensionales del pabellón de la oreja, es marcadamente mayor que en la población normal. Mas numerosa parece ser la asimetría morfológica y dimensional.

2. Como muestran nuestras tablas 1—7, el número de pabellones de orejas en los niños con escisiones es dimensionalmente diferente a lo normal, es decir, son mayores o menores, o mayor que 1 desviación decisiva del promedio, casi de igual tamaño en los dos sexos y en el lado izquierdo y derecho.

3. De los datos de las tablas 4—7 se puede suponer que disminuye el por ciento de frecuencia de las desviaciones dimensionales, comprobadas en los grupos de edades bajas en las fases de crecimiento pubertal y postpubertal. Esta observación es análoga a nuestra comprobación de la frecuencia de anomalías morfológicas y dimensionales en la población normal. Si se logra demostrar como correcta nuestra suposición, se podría razonar sobre el efecto actual del defecto básico en el crecimiento de los pabellones.

4. En todos los tipos de escisión total es frecuente, en la mayoría de los afectados, tener a ambos lados pabellones de tamaño normal. En el resto de los niños con escisiones por el contrario, los pabellones son a ambos lados, mayores o menores que los normales. En un pequeño por ciento se presentan también diferentes combinaciones de tamaño en los pabellones.

5. No se confirmó la suposición de que en todos los casos, el pabellón tiene que ser menor, en el lado de la escisión, que lo declarado en la norma para el determinado grupo de edades.

6. En los individuos con escisiones son frecuentes las deformaciones de los pabellones y también su asimetría morfológica. Sobre todo se trata de un grado diferente de tamaño de los pabellones a ambos lados, de la circunvolución de la hélice, del tamaño del tubérculo de Darwin, de la profundidad del relieve y otras.

7. En algunos casos encontramos también en los pacientes afectados de escisiones, pabellones de forma macacus (eventualmente en indios) o pabellones inclinados al tipo cercopithecus.

8. Debido a que algunas deformaciones y asimetrías las comprobamos en algunas partes, también en los padres y en los abuelos de los niños afectados, los cuales por supuesto no tenían escisiones, se puede deducir que los defectos morfológicos y dimensionales de los pabellones, se comportan como caracteres heterozigóticos recesivos. Se puede suponer que su frecuencia podría estar acompañada, en dirección marcada, de una disposición hereditaria hacia la escisión, la cual no tiene por qué desarrollarse en cada generación y señalar eventualmente también algunos de los defectos escisivos de la cara en las siguientes generaciones.

La observación comprobada podría conducir al razonamiento de que si en este caso no se trata de un grupo genético especial de escisiones unido a una deformación congénita del pabellón.

Debido a que hemos juzgado diferentes grupos de edades, de ambos sexos con un número no muy grande de niños con escisiones, no podemos hacer conclusiones definitivas partiendo de nuestro material, aunque sea hasta ahora el único.

El fin de nuestro trabajo es llamar la atención sobre el tema presentado, y estimular la realización de nuevas mediciones y más búsquedas en la frecuencia de las desviaciones morfológicas en la población normal y en los individuos con escisiones.

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## THE BIOLOGICAL BEHAVIOUR OF HAEMANGIOMA IN CHILDREN

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The morphology of haemangioma in children and its dynamics of development are variform indeed. From the therapeutic point of view it is of practical importance to distinguish between those types of haemangioma which tend towards spontaneous involution, and those with a progressive character which may lead to undesirable growth. In this communication, our team, which has been dealing with the clinical manifestations and treatment of haemangioma in children for a considerable time, refers to the results of our own observations concerning both phenomena, i.e. that of spontaneous involution and of progressive proliferation.

Mention was made in the dermatological literature about spontaneous involution of haemangioma already 60 years ago. The first detailed and statistically evaluated study, however, was that of Lister in 1938. On the basis of observations in 93 cases of capillary and cavernous haemangioma, this author showed that most of these lesions, which we have classified as haemangioma planotuberosum, tuberosum, nodosum and tuberonodosum (Schwank et collab., 1963) disappear spontaneously by the age of about five. However, greater attention to the problem of spontaneous involution has been paid in the world literature only in the last ten years (Ronchese, 1953; Wallace, 1953; Walter, 1953; Bivings, 1954; McCuiston, 1954; Modlin, 1955; Andrews et collab., 1957; Falk et Levy, 1957; Jacobs, 1957; etc.).

Although in this report main attention is paid to capillary and cavernous haemangioma, because these types occur in children far more frequently than any other, for completeness sake telangiectatic naevus (naevus flammeus et vinosus) is also mentioned and its behaviour with regard to spontaneous involution dealt with.

The typical localization of medial telangiectatic naevus is in and near the median line of the body, mainly in the nape of the neck, the middle of the forehead above the root of the nose, the nasolabial region, on the eyelids and in the sacral region. It is present in 50% of newborn. The foci of



medial telangiectatic naevus in the face disappear spontaneously in nearly all children by the age of two, while those in the sacral region and particularly in the nape of the neck, often persist. This is why such pink spots may be found in about 5 to 20% of adults. From a cosmetic point of view, medial telangiectatic naevus is usually of less importance.

Lateral telangiectatic naevus, whose localization is mainly on the lateral parts of the face, less frequently on the extremities and the trunk differs



Fig. 1. Telangiectatic naevus with tuberous transformation later in life

essentially from the former in that it never disappears spontaneously; on the contrary, later in life, at about the age of 40 to 50, and particularly the foci in the face, undergo tuberous transformation type. Neither the originally red spots nor the nodes developing in them during adult age, ever disappear spontaneously (Fig. 1). Reports on spontaneous involution of lateral telangiectatic naevus, are evidently based on the erroneous classification of planotuberous haemangioma under telangiectatic naevus. This is due to the fact that an underdeveloped, quite flat planotuberous haemangioma may, by its outer appearance, well be taken for a telangiectatic naevus. The biological behaviour of these two types, however, differs diametrically.

Spontaneous involution is of great practical significance in capillary and cavernous haemangioma. The main components of these haemangiomas are endothelial cells with embryonic character and that is why their capacity for proliferation is preserved for a certain time. The enlargement of such an haemangioma is effected by the "budding of capillaries". However, the development proceeds in stages. The little tumour may stop growing after a certain period and then — after a stage of certain stability — spontaneous involution may set in.

We studied the phenomenon of spontaneous involution first at the University Department of Plastic Surgery by observing a series of 429 untreated cases of capillary and cavernous haemangioma. After a sufficient lapse of time, we were able to evaluate whether or not spontaneous involution had set in and what the appearance of the patient was from a cosmetic point of view.

*Planotuberous and Tuberous Haemangioma (Cutaneous Form)*

We investigated 281 foci. The growth of these angiomas, which was sometimes rather fast in the first months of life, stopped, as a rule at the age of six to ten months. Around the age of one year, most frequently, however, between one and three years, all cases investigated showed signs of involution, as can be seen from the table below:

Beginning of spontaneous involution at 1 year				in 28% of cases			
"	"	"	"	at 2 years	"	44%	" "
"	"	"	"	at 3 years	"	18%	" "
"	"	"	"	at 4 years	"	7%	" "
"	"	"	"	at 5 years	"	2%	" "
"	"	"	"	at 6 years	"	1%	" "

In this process the originally bright red colour turned dark and later still changed as though a greyish film had formed on its surface and in the further course white spots and stripes appeared. Fibrous septa developed which gradually divided the haemangioma into ever smaller compartments which con-



Fig. 2a, b. Typical planotuberous haemangioma in girl aged four months. Fully developed haemangioma (a); condition ten months later with characteristic signs of spontaneous involution (b)

tinued to grow paler (Fig. 2a, b). The turgor of the tumour, too, clearly diminished and the tissues started to shrink. In the group of subjects investigated, complete disappearance took place after a varying lapse of time:

To the end of the 3rd year . . . . .	in 32% of cases		
" " " " " 4th year . . . . .	in 27%	"	"
" " " " " 5th year . . . . .	in 23%	"	"
" " " " " 6th year . . . . .	in 14%	"	"
" " " " " 7th year . . . . .	in 2%	"	"
" " " " " 8th year . . . . .	in 2%	"	"

Fig. 3a, b. Spontaneous involution of planotuberous haemangioma in girl aged ten months (a); complete disappearance of focus 20 months later (b)



The ultimate results from the point of view of cosmetic appearance, was very good in 60 %, i.e. actually no trace of the haemangioma could be found and the skin had a normal appearance (Fig. 3a, b), in 40 % the condition was good, i.e. the skin was slightly uneven and less elastic; these cases, as a rule, were sequelae of the more voluminous foci of tuberous haemangioma (Fig. 4a, b). Sometimes, there were foci of telangiectasis, also residua of the original haemangioma, which were different in size and inconspicuous from a cosmetic point of view.

The mechanism of spontaneous involution is, most probably, based on thrombosis of the vascular spaces in the haemangioma. In these large spaces the blood flow is slowed down which constitutes favourable conditions for the development of thrombosis.

In the individual case, it is very important to predict whether or not one can rely on spontaneous involution of an haemangioma. Our experience, in accord with reports published in the literature, is that planotuberous and tuberous haemangioma, which means the types not involving the subcutaneous tissue, show a great tendency towards spontaneous involution. Most foci — according to our and other authors' experience around 90 % — disappear without any therapy.



In adolescents and adults such types of haemangioma are found but exceptionally. From this an important lesson may be drawn for the practice: A conservative attitude, i.e. abstention of any treatment whatsoever, is fully justified in types of cutaneous haemangioma. As to the question whether or not to operate, further factors may be decisive in the individual case. These are the

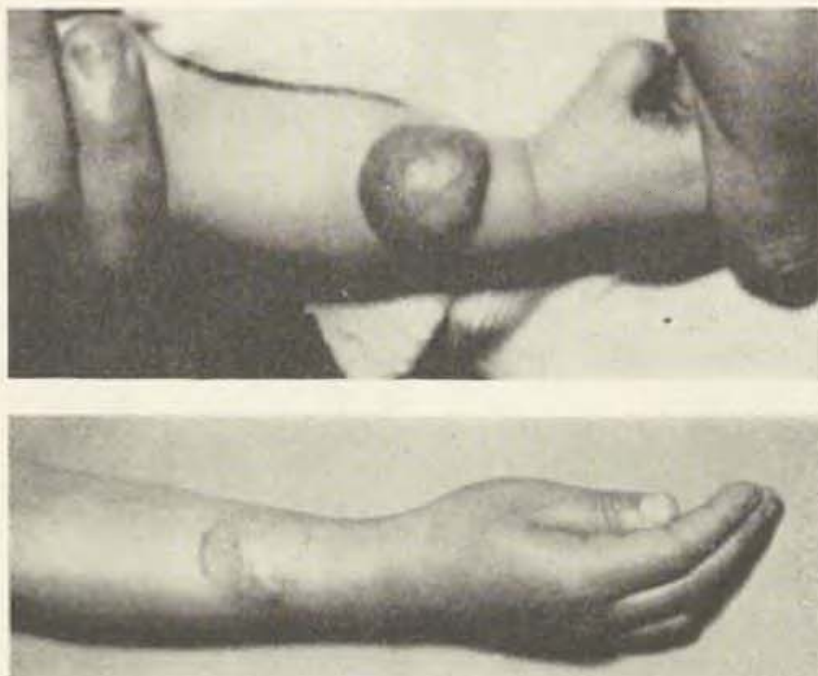


Fig. 4a, b. Tuberous haemangioma in girl aged 11 months [a]; spontaneous recession by the age of five years [b]

localization and size of the haemangioma, the danger of ulceration, etc. Both from foreign and Czechoslovak statistics it becomes evident that planotuberous and tuberous haemangioma constitute more than 50 % of all cases whose bearers ask for medical advice. If the assessment of the individual case as to the type of haemangioma and its developmental dynamics, has been correct, a large number of babies and children may be spared any treatment at all. Regular check-ups at the children's clinic will be quite sufficient for these cases.

#### *Nodose Haemangioma (Subcutaneous Form)*

Investigation of a group of 47 such cases revealed that even this type of haemangioma tends towards spontaneous involution, though less than the cutaneous types; the foci receded in 34 out of 47 cases, i.e. in 72.3 %. Most foci started to grow smaller at the age between one and three years.

Beginning of spontaneous involution at the age of	1 . . .	30 % of cases
" " " " " " "	2 . . .	41 % " "
" " " " " " "	3 . . .	12 % " "
" " " " " " "	4 . . .	6 % " "
" " " " " " "	5 . . .	6 % " "
" " " " " " "	6 . . .	5 % " "

The process of recession lasted three years on an average, but in some cases it terminated after the fifth or sixth year of life and even later. Of the



34 foci, 80 % disappeared completely and in the remaining 20 % residua could be ascertained. After involution of a subcutaneous haemangioma, too, the skin has a normal appearance (Fig. 5a, b).

#### *Tuberonodose Haemangioma (Mixed Cutano-subcutaneous Form)*

In the 101 cases of this type of haemangioma, spontaneous involution took place in 70, i.e. in 70 %. The beginning of involution and its course were similar to those of the preceding two types:

Beginning of spontaneous involution at the age of 1 . . in 14 % of cases									
"	"	"	"	"	"	"	"	2 . . .	42 % " "
"	"	"	"	"	"	"	"	3 . . .	18 % " "
"	"	"	"	"	"	"	"	4 . . .	10 % " "
"	"	"	"	"	"	"	"	5 . . .	7 % " "
"	"	"	"	"	"	"	"	6 . . .	6 % " "
"	"	"	"	"	"	"	"	7 . . .	3 % " "

In most cases involution, therefore, started around the second year of life and terminated by the fifth or seventh year (Fig. 6a, b). Only exceptionally did it last longer. The cosmetic result of spontaneous involution was very good in 32% and good in 68%.

From our investigation of nodose and tuberodanose haemangioma it becomes evident that in these cases spontaneous involution is not as unequivocal and reliable as in planotuberous and tuberous haemangioma. In 25 % of cases of those types, spontaneous involution did not set in at all. It can be seen that in haemangioma whose proliferation precedes towards the subcutaneous tissue, proliferation of this subcutaneous portion is usually far more intensive than that of the superficial portion, and after the cessation of growth this subcutaneous section shows much less tendency towards spontaneous involution. This is



Fig. 5a, b. Nodose haemangioma on right side of chest in girl aged 16 months (a); spontaneous recession by the age of four years (b)

also why persistence of this section is found far more frequently. The main cause for this behaviour is, most probably, the cavernous structure of the angiomatous tissue.

In accordance with the above is also the finding that cavernous haemangioma on visible mucous membranes (oral and nasal cavities), mainly, however, on the vermillion of the lips, undergoes spontaneous involution only very exceptionally. From a practical point of view it should be anticipated that it does not recede at all from these sites.

From the group of 429 cases of capillary and cavernous haemangioma not treated but only checked up at the University Department of Plastic Surgery in Prague, we tried to verify our further observations. The question was whether or not an expectant attitude, mainly stressed for the treatment of planotuberous and tuberous haemangioma, was also justified in these cases.

An investigation, therefore, was carried out at the University Department of Radiology in another 64 non-treated cases of capillary and cavernous haemangioma, of which there were:

56 cases of planotuberous and tuberous haemangioma

2 cases of nodose haemangioma

6 cases of tuberonodose haemangioma

As to localization there were: 17 cases on the head and neck

28 cases on the trunk

19 cases on the extremities



Fig. 6a, b. Tuberous haemangioma on right side of chest in girl aged ten months (a); spontaneous recession by the age of four years (b)



Fig. 7a, b. Extensive, mainly planotuberous to even tuberous haemangioma in boy aged seven months (a); marked spontaneous involution of entire structure by the age of five years (b)

Of the types with a subcutaneous portion, i.e. nodose and tuberonodose haemangioma, this was but a small group of eight cases. This makes it impossible to carry out any detailed analysis. Nevertheless, it may be said that with regard to spontaneous involution, these few cases did not essentially differ in biological behaviour from those seen in the previous cases.

In 56 cases of the cutaneous type of haemangioma (50 planotuberous and 6 tuberous), the dynamics of development could be followed up for a sufficiently long time. As to the speed of growth, 17 enlarged in proportion with the growth of the whole body, 36 grew faster and three became bigger with striking rapidity. In spite of this, proliferation was only temporary in all cases, because they all ceased growing and showed signs of involution after a certain time without exception, i.e. even the very large foci (Fig. 7a, b). As in the types described above, in this type of haemangioma involution started between the first and third year of life.

Degree of involution:

Complete involution . . . . .	in 37 cases, i.e. 66 %
Incomplete involution . . . . .	in 10 cases, i.e. 34 %
Unfinished involution . . . . .	in 9 cases, i.e. 34 %

In most cases involution was complete by the age of five, but in 12 cases, i.e. in 21 %, it continued seven and even 9 years. The cosmetic results were all very good; the skin had a normal appearance in 35 cases, i.e. 62 %. In the



remaining cases, residua of the haemangioma could be detected or the skin had lost some of its elasticity after the involution of large tuberous foci.

Analysis of this group of non-treated haemangioma, therefore, proved our previous statements to the full. An expectant attitude is fully justified in most cases of planotuberous and tuberous haemangioma.

#### *Progressive Haemangioma*

Spontaneous involution is, however, but one feature of the biological behaviour of capillary and cavernous haemangioma. These structures also have a tendency towards growing in the initial stage of development. This tendency varies with the individual case. Of the 3,000 cases treated at the Department of Plastic Surgery and the Department of Radiology, only 10% showed very rapid and progressive growth, so that a very small focus became bigger reaching many times its original size both in area and volume. This percentage has, of course, been taken from the total number of cases diagnosed and treated at the two university departments. The real percentage of progressive haemangioma is still smaller, because not all patients with haemangioma ask for medical advice. These cases, however, are of no less importance for it, because it is imperative to recognize them correctly among the large number of banal cases, register them and start treating them at the right time.

These progressive types are usually mixed cutaneous and subcutaneous, i.e. tuberonodose haemangioma. At birth or soon after it they usually appear as



Fig. 8a, b. Rapidly progressing tuberonodose haemangioma in girl aged six weeks (a); enlargement many times its original size two months later (b)





Fig. 9. Progressive tuberonodose haemangioma of left periauricular region in boy aged nine months. — Fig. 10. Very rapidly progressing tuberous haemangioma in boy aged six weeks. Extensive ulceration started in second week of life

a little red spot on top of a flat infiltration in the skin. This spot soon starts growing and may, in a relatively short time, reach a size many times its original. Without treatment, the fate of these foci varies. Patients have been described who died in consequence of a complication based on the growth of such an haemangioma (Michel et al., 1952). On the other hand, we know even from our own observations that these rapidly progressing foci stop growing after a time, usually by the first year of life, and the later development may even lead to spontaneous involution. It may, therefore, be assumed that even these types of haemangioma do not, in principle, depart from the pattern of properties common in all haemangiomias, actually constituting certain types of hamartoma whose origin lies in a deviation from the usual development. They are therefore, not tumours in the current sense of the term. Their growth potential, even if the proliferative phase has been intensified to the utmost, is not unlimited.

On rapid proliferation of a tuberonodose haemangioma, considerable enlargement of the cavernous spaces may take place which may seriously hamper the function of the organs in its neighbourhood. These cases are called hypertrophic or "malignant" haemangioma, because — as was pointed out by Karfík in 1959 — the clinical manifestations can become malignant, although the histological structure remains that of a benign haemangioma throughout the entire course of development.

The clinical importance of a progressive haemangioma is, to a large extent, determined by its localization. This, for instance, is the case in a rapidly growing haemangioma of the face. Here it occurs quite often and constitutes a difficult therapeutic problem. Such an haemangioma of the face sometimes grows very rapidly and may surprise the surgeon by the change in appearance which has taken place even after a few weeks (Fig. 8a, b). Progressive haemangiomas grow larger not only in area, but sometimes form rather prominent, ugly structures which are prone to ulceration and bleeding. Among the localizations in the face, that on the auricle and in the periauricular region is typical (Fig. 9).

Even if growing very fast, an haemangioma takes several weeks, usually two to four months, for developing, so that there is always time enough for deciding on the treatment. Cases of enormously rapid proliferation, in which the chance of getting them under treatment in good time, is very small, are very rare, indeed (Fig 10).

Both spontaneous involution and the possibility of rapid and considerable proliferation clearly show the great variety of morphology and biological behaviour in capillary and cavernous haemangioma which is very important from a clinical point of view. These properties must be borne in mind on making the diagnosis and on deciding about the treatment and prognosis of each individual case.

#### S U M M A R Y

The authors first deal with the question of spontaneous involution in medial and lateral telangiectatic naevus. Spontaneous involution of capillary and cavernous haemangioma is of great importance from the point of view of treatment. The authors have carried out an investigation in a group of 429 checked-up but untreated cases of haemangioma. Of the four clinical types, the cutaneous types, i.e. planotuberous and tuberous haemangioma, show the greatest tendency towards spontaneous involution; 90% disappear completely. In the types of haemangioma with a subcutaneous component, i.e. nodose and tuberonodose haemangioma, this tendency is less pronounced; spontaneous involution takes place in 70%. Investigation in another group of 56 cases of planotuberous and tuberous haemangioma fully proved the results of the previous observations.

From a therapeutic point of view this justifies an expectant attitude and this is what the authors recommend in these types of haemangioma.

The authors then deal with the progressive types of haemangioma most of which are of the tuberonodose form. Out of the total number of 3000 cases of haemangioma treated at the University Departments of Plastic Surgery and of Radiology in Prague, only 10% were of the progressive types. Tuberonodose haemangioma of the face requires particular attention, because by its rapid growth, it may not only lead to gross disfigurement, but also to serious anatomical and functional disorders.

## RÉSUMÉ

### A propos du problème de comportement biologiques des hémangiomes chez les enfants

V. Bek, R. Vrabec, J. Kolář

Les auteurs traitent d'abord la question de l'involution spontanée des naevus vasculaires médiaux et latéraux. Cette évolution prouve sa plus grande signification chez les hémangiomes capillaires même que cavernaux quand à la pratique en face de leur thérapie. Les auteurs ont entrepris son étude en classification précise d'un groupe de 429 cas sans traitement, mais sous contrôle clinique. Il existe quatre formes des hémangiomes, dont la plus grande tendance à l'évolution spontanée présentent les formes cutanées, c'est-à-dire les hémangiomes plano-tubéreux et tubéreux. L'involution en est présente chez environ 90 %. Cette tendance diminue chez les hémangiomes à la composante sous-cutanée, voir les hémangiomes nodulaires et tubéro-nodulaires, ne possédant que 70 % de l'involution spontanée. Un autre groupe de 56 cas des hémangiomes plano-tubéreux de même que tubéreux a fait preuve des observations citées ci-dessus, cela soutenant le procédé expectatif en pratique des auteurs.

De même les types progressifs des hémangiomes, que présentent le plus souvent les hémangiomes tubéro-nodulaires, vient d'être discutés. Il est bien soulageant de savoir que, des 3.000 des malades atteints des hémangiomes, qui ont cherché les soins de la clinique, seulement 10 % ont été atteints des hémangiomes progressifs. Ce sont souvent les hémangiomes tubéro-nodulaires en localisation dans la face, qui méritent avant tout notre attention respective car, en suite de leur évolution violente, ils peuvent causer non pas seulement une déformation esthétique, mais, en pis, des troubles anatomiques et fonctionnels.

## ZUSAMMENFASSUNG

### Zum biologischen Verhalten von Hämangiomen bei Kindern

V. Bek, R. Vrabec, J. Kolář

Die Autoren befassen sich zunächst mit der Frage der spontanen Involution medialer und lateraler teleangiektatischer Naevi. Die spontane Involution kapillärer und kaverner Hämangiome ist für die Praxis vom Standpunkt der Behandlung von grösser Bedeutung. Die Verfasser studierten sie an einer Gruppe von 429 nichtbehandelter und systematisch beobachteter Patienten mit Hämangiomen. Von den 4 klinischen Formen haben die Hämangiome der Haut, das heisst plantuberöse und tuberöse Formen, die grösste Tendenz zur spontanen Rückbildung. Sie verschwinden in ungefähr 90 % der Fälle. Diese Tendenz ist weniger markant bei Hämangiomen, die ins Unterhautgewebe eindringen, das sind nodöse und tuberonodöse Hämangiome; hier trat die spontane Involution in ungefähr 70 % ein. Eine weitere beobachtete Gruppe von 56 Patienten mit plantuberösen und tuberösen Hämangiomen bestätigte in vollem Umfang unsere früheren Ergebnisse. Es ist also ein abwartendes Vorgehen berechtigt, wie dies die Verfasser bei solchen Hämangiomen empfehlen. Ferner werden fortschreitende Typen des Hämangioms besprochen, die am häufigsten tuberonodöse Formen sind. Von den insgesamt 3 000 Hämangiomen, die an die Klinik zur Behandlung überwiesen wurden, bilden fortschreitende Formen lediglich 10 %. Es ist nötig, besondere Aufmerksamkeit den im Gesicht lokalisierten tuberonodösen Hämangiomen zu widmen, da diese durch ihr überstürztes Wachstum nicht nur einen ästhetischen Defekt, sondern auch anatomische und Funktionsstörungen bewirken können.



## RESUMEN

### En cuanto a la cuestión del comportamiento biológico de hemangiomas en niños

V. Bek, R. Vrabec, J. Kolář

Los autores tratan primeramente sobre la cuestión de la involución espontánea de los lunares teleangiectáticos mediales y laterales. Desde el punto de vista terapéutico tiene un gran significado práctico, la involución de los hemangiomas capilares y cavernosos. Los autores la estudiaron en un grupo de 429 hemangiomas observados sin tratamiento. De 4 formas clínicas, las formas cutáneas, esto es los hemangiomas tuberosos y planotuberosos, tienen la mayor tendencia hacia una involución espontánea. La desaparición llega casi a un 90%. Esta tendencia está menos expresada en los hemangiomas con algún componente subcutáneo, esto es, en los hemangiomas nodosos y tuberonodosos, en los cuales resultó en casi un 70%. Otro grupo observado de 56 hemangiomas tuberosos y planotuberosos confirmó en toda su extensión los resultados de las anteriores observaciones. Por eso los autores recomiendan en estos hemangiomas, un legítimo proceder expectativo.

Seguidamente se trata de los hemangiomas de tipo progrediente, como son frecuentemente las formas tuberonodosas. De un número total de 3,000 hemangiomas, llegados a nuestra clínica para su reconocimiento, los hemangiomas progredientes formaron solamente el 10%.—

Es necesario dedicar particular atención a los hemangiomas nodosos, localizados en la cara, donde debido a su precipitado crecimiento pueden ocasionar no sólo una deformación estética, sino también modificaciones anatómicas y funcionales. —

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## PRINCIPLES AND PLANNING OF LOCAL PLASTY IN CHRONIC FACIAL PALSY

M. E. YAGIZAROV

The planning of local plastic operations for chronic facial palsy always requires a meticulous analysis of the clinical ANATOMY with regard to the aetiology, the pathogenesis and the results of electrophysiological tests in each individual case. The clinical picture of the disease as presented in the numerous text books bears but a descriptive character and does not contain a detailed analysis of clinical [surgical] anatomy.

In a flaccid paralysis the functional and cosmetic disorders become most markedly manifest in the perioral and orbital regions. These are the "loci minoris resistentiae" (sites of lesser resistance) in peripheral paralysis.

The corner of the mouth is limply drooping on the affected side, can easily be pulled away due to the flabby and drawn-out tissues of the perioral region and cheek, and appears displaced toward the "healthy" side due to the pull of muscles of that side, thus standing 1.0 to 2.5 cm. medially of the vertical line drawn through the pupil of the eye. The difference in horizontal level between the two corners of the mouth may amount to 2.5—3.0 cm. The tissues of the cheek are drawn out and drooping like a bag which is most conspicuous either just at the corner of the mouth or which forms a massive skin fold below the mandibular margo that makes the impression as though the closed upper and lower lips were drawn out into it. Not infrequently the upper overlaps the lower lip. The oral fissure on the side of the palsy is drawn out to such an extent that, if the philtrum and the corner of the mouth are placed in symmetry with the "healthy" side, a considerable surplus of tissue becomes apparent (particularly in inveterated cases of palsy) which gathers in radial folds around the mouth. This surplus of tissue develops not only from the drooping due to the loss of muscle tonus and trophic influence of nerves, but also due to smoothing-out of all natural folds in the affected half of the face, particularly of the nasolabial groove. The age of the patient, too, has its bearing on this phenomenon.

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In children with their excellent tissue turgor and their well developed layer of subcutaneous fat, including the fatty Komok Bisha, deformation of the face is not so marked.

Asymmetry of the face becomes most conspicuous on emotional and other functional movements of the facial musculature (smiling, baring one's teeth, opening and closing the eye, twinkling, etc.). On smiling the oral fissure (and also the tip of the nose) are pulled over to the "healthy" side, where the mouth opens to showing the teeth, while on the paralytic side the lips remain passively closed. At the same time a deep nasolabial groove forms on the "healthy" side as a result of the one-sided pull of intact facial muscles whose points of insertion have been approximated by contraction. Changes also take place in the organs and tissues of the oral cavity. Palsy of the buccinator, which normally functions as the sphincter of the parotid duct, leads to permanent gaping of the latter's orifice and the danger of retrograde infection. Due to buccinator palsy and the drooping of the cheek, the lower fornix of the oral vestibulum turns into a deep pocket retaining food and making normal shifting of the food morsel during chewing impossible. In adults who seek medical advice for facial palsy contracted in early childhood, changes in the teeth and jaws can also be found frequently. Most frequently we have seen one-sided prognathism (laterognathia) together with open bite. In the world literature there are only occasional publications dealing with the subject (Neiding, 1938—1940; Toman, 1954). The development of such deformities is explained by the cheek and lips of the paralytic side exerting lesser pressure on the growing and shaping jaw-

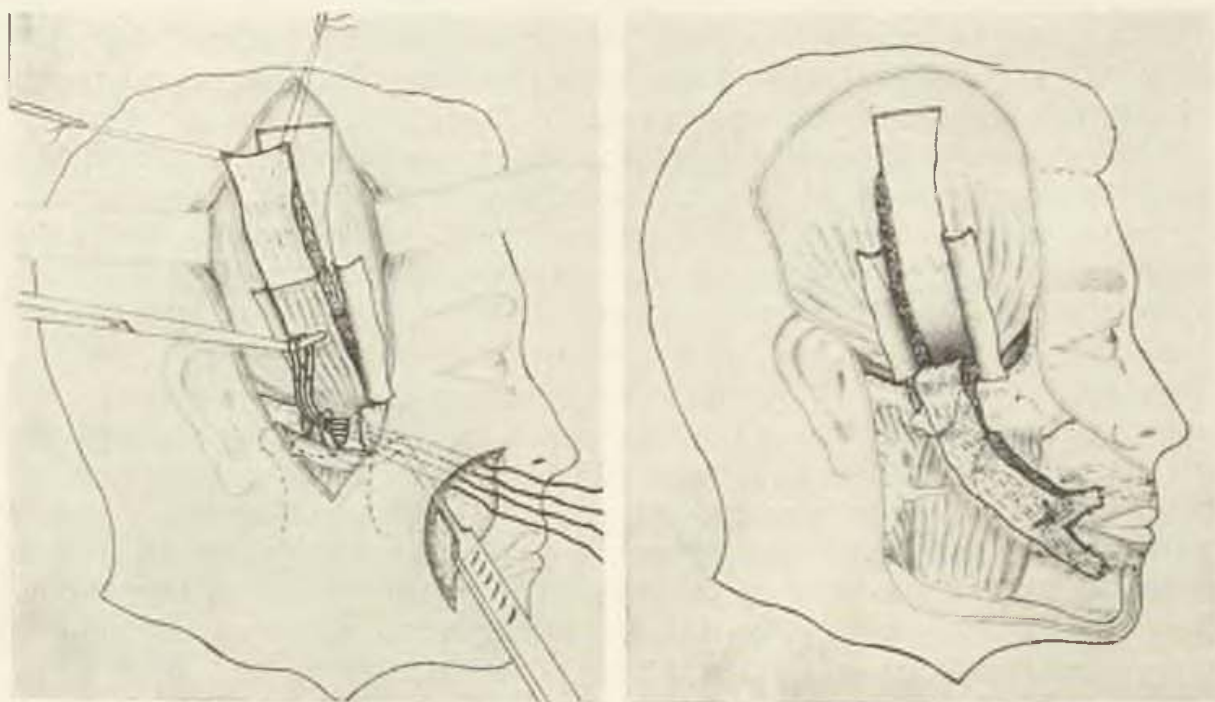


Fig. 1. Schematic demonstration of particular stages of an operation, based on muscle plasty and motion suspension. — Fig. 2. Schematic demonstration of the situation before the operation was finished



Fig. 3. Patient K-va, 28 years, lasting paralysis of the mimic muscles (before the operation). — Fig. 4. The same patient (after the operation)

bones as compared with that of the "healthy" side. Laterognathia and open bite also develop by mainly shewing on the "healthy" side which leads to one-sided growth of the mandible and its lateral displacement. Paralytic deformation of soft tissues of the face enhanced by deformation of the bony skeleton becomes more conspicuous and hampers chewing still more.

Another "locus minoris resistentiae" (site of lesser resistance) fraught with serious complications is facial muscle palsy of the orbital region. At rest the palpebral fissure on the paralytic side is gaping widely, the lower lid is drooping leaving a large area of the sclera exposed below the cornea, and sometimes there is ectropion, particularly in elderly patients. The skin of the lids is flabby resembling cigarette paper. Frequently the lowerlid is thinned out to 0.5 mm. and less. This sign (thinning-out of the lower lid caused by atrophy of the orbicularis oculi and other trophic changes) has not yet been described in the literature, although it is particularly important to be taken into account on selecting the correct method of surgical treatment. The margo palpebrae of the upper lid is arched in an upward convex curve instead of the downward convex arch its forms normally. This is due to the pull of the levator palpebrae superioris (which remains unaffected in facial palsy because of its innervation by the oculomotor nerve) and its insertion into the middle third of the upper lid. This, too, is the cause why thickness of the upper lid remains unchanged in facial palsy. The eyebrow on the paralytic side is dropping, sometimes even



overhanging the eye thus adding to the gloomy appearance of the face and screening off the upper parts of the visual field. The grooves and wrinkles of the forehead are smoothed out on the paralytic side.

The so-called Bell's sign is characteristic for paralytic lagophthalmos. When the patient tries to close his eyes, the eyelids on the paralytic side do not close the palpebral fissure completely and the eyeball can be seen as it turns up- and slightly outwards exposing to sight only part of the lower sclera. This sign is

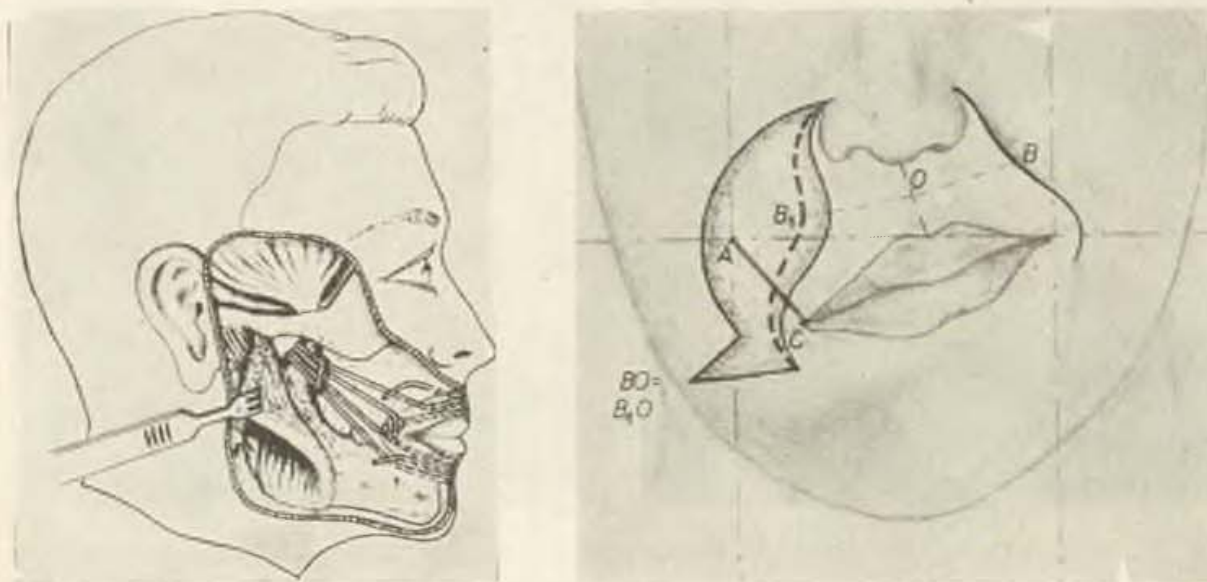


Fig. 5. Schematic demonstration of the motion suspension technique. — Fig. 6. Removal of the needless skin in nasolabial area (definition and shape of the removed flap

caused by the rolling-up of both eyeballs on closing one's eyes, though normally this movement cannot be seen, because the eyelids are firmly closed. On studying the clinical manifestations of Bell's sign, we have found three variants which we think important for the correct indication of scleroblepharorrhaphy, the surgical treatment we recommend for the disorder. These variants are: 1) the eyeball turns up- and slightly outwards (most frequently observed), 2) the eyeball turns up- and considerably outwards (rather rare), 3) turning of the eyeball up- and inwards, only inwards or only outwards are very rare observations, the same as turning upwards of the eyeball with subsequent horizontal nystagmus and very slow rolling-up of the eyeball.

The numerous surgical methods of treatment for chronic facial palsy have many special features and are mainly aimed at the repair of paralytic deformations in the region of the corner of the mouth. Repair of paralytic lagophthalmos has remained an unsolved problem. Frequently repair of other, less conspicuous paralytic deformations, such as the displacement of the eyebrow, of the tip and the columella of the nose, etc., is omitted, although the clinical picture of facial palsy is the worse for them.

Taking this into account, we think it imperative to bring more system into the treatment of these patients so as to make sure of the gradual repair of all



deformations due to facial palsy. Only repair of all their components will bring about more satisfactory results. Evident skeletal deformations demand repair in the first instance. With due regard to their aetiology the surgical operation ought to be carried out on the body or the articular processes of the mandible. In laterognathia and open bite, bilateral osteotomy plus wedge-shaped bone resection of the mandibular body is performed. Osteotomy in

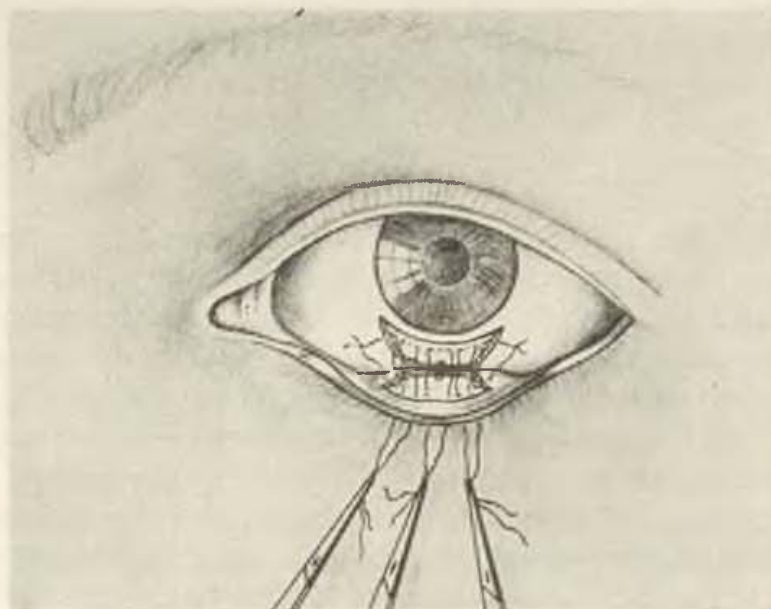


Fig. 7. Last but one stage of the scleroblepharorrhaphy operation before tightening the suture (schematic demonstration)

the section of the open bite is usually carried out between the first and last articulating pairs of teeth. In isolated laterognathia it is expedient to carry out resection on the longer of the two articular processes. Osteotomy thus runs horizontally, and after bone resection a horizontal shift of the mandible corrects laterognathia.

The following stages of treatment are aimed at the correction of deformations in the soft tissues, in the first place, of course, the most conspicuous one, i. e. that in the region of the corner of the mouth and the cheek. If muscle plasty is possible, i. e. when the masticatory muscles are functioning normally, we adhere to the principle of muscle plasty (dynamic suspension) to be carried out together with static suspension (Bogoraz, 1944; Bernadsky, 1960; Mathews, 1953). Taking into account the shortcomings of static suspension (early cutting-through of the suspending threads or bands in the region of the corner of the mouth etc.), we have elaborated and used the method of kinetic suspension which I am going to describe below.

Static or kinetic suspension supplement and improve the effect of muscle plasty and create favourable conditions for the take and subsequent functioning of the transplanted muscle flap. Muscle plasty as the only procedure leads, shortly after operation, to recurrence of the oral ptosis, because the muscle flap soon stretches and then its contracting power diminishes (Khitrov, 1954) due to overloading by the considerable weight of tissues of the oral and buccal

regions and also due to considerable stretching on opening of the mouth. Drooping of the corner of the mouth is then most conspicuous at rest, when the masticatory muscles are relaxed.

In the combined method we take a pedicle flap from the temporal muscle [a method which is best-founded and most effective (Mukhin, 1953; Chuprina, 1961; Katzenstein, 1916; Sheehan, 1932)] and, at the same time, carry out partial resection of the zygomatic arch. — The operation starts with the formation of the muscle flap (usually by the Chuprina approach, 1961), then the skin surplus is excised from the region of the nasolabial groove. Kinetic suspension on the coronoid process of the mandible is carried out and finally the pedicle muscle flap is sutured under slight tension to the corner of the mouth which has been raised and reduced to its proper position. In the diagram of fig. 1 and 2 the individual stages of the operation are depicted.

Fig. 1 shows the pedicle flap formed from the temporal muscles and flaps of fascia turned aside (in the lower part). Through the gap in the zygomatic arch resulting from resection, part of the coronoid process of the mandible can be seen. From the wound in the nasolabial region a ligature needle with two lavsan double threads has been introduced around the oral aspect of the coronoid process emerging through the mandibular notch, the two loops are caught with a clamp, then led round the lateral aspect of the process and slipped over the four distal ends of the threads. Thus, on tightening, a double loop is wound around the coronoid process and the distal ends of the threads emerging through the nasolabial wound are anchored to the tissues of the lips and corner of the mouth as in isolated kinetic suspension (see below and fig. 5).

Fig. 2 shows the terminal stage of the operation, in which the muscle flap, turned over by  $180^{\circ}$  and placed into the gap in the zygomatic arch, is being attached to the corner of the mouth and the lips which have been lifted up and fixed in their raised position by threads.

We have employed the combined method of muscle plasty and kinetic suspension in 22 patients and have achieved good functional and cosmetic results (fig. 3 and 4). In those cases in which muscle plasty is impracticable



Fig. 8. Patient K-va, 28 years. Paralytic lagophthalmus (before the operation). — Fig. 9. Patient K-va (after the operation)



Fig. 10. Patient A-na. Paralytic lagophthalmus at rest (before the operation). — Fig. 11. Patient A-na (after operation in the rest situation)

[facial combined with trigeminal nerve palsy and subsequent atrophy of masticatory muscles, craniocerebral injuries or an elderly patient who presents too great a surgical risk], we employ kinetic suspension only. This suspension of the corner of the mouth on the coronoid process of the mandible has — unlike the static suspension on the zygomatic arch — the advantage of the suspended part moving together with the mandible, i. e. being lifted up on closing and lowered on opening of the mouth (fig. 5). This also prevents overloading of the suspending threads and their early cutting through the tissues at the corner of the mouth, because the distance between their points of anchorage (coronoid process — corner of the mouth) remains unchanged on movement; in static suspension, on the contrary, it changes constantly thus causing considerably tension in the threads. Another advantage of this method also lies in that access to the coronoid process can be achieved through the wound resulting from excision of surplus skin in the region of the nasolabial groove, thus making a second incision unnecessary. From this wound a tunnel is burrowed towards the coronoid process by blunt dissection, a Déchamps hernia needle is introduced around the process (let out through the mandibular notch) and with it two No. 3 "lavsan" double threads, whose ends are then anchored to the corner of the mouth, to both lips, the columella of the nose and to the tissues of the chin. This permits raising all the drooping parts of the face proportionately. If only kinetic suspension is employed, it is expedient to carry out myotomy (usually of the zygomatic and buccinator) on the "healthy" side. We have used this method in 20 patients with good or satisfactory results.

I, now, should like to draw attention to the shape of the section of surplus skin to be excised in the region of the nasolabial groove, because the position of the postoperative scar in relation to the nasolabial groove on the "healthy" side depends on it. We recommend excision of skin in the way shown in fig. 6.

The medial incision, indicated by the dotted line, more-or-less runs along the future nasolabial groove. This line is in symmetry with the nasolabial groove on the "healthy" side. The lateral incision forms a semicircle which is the more complete the more the corner of the mouth must be pulled upwards. In the diagram it is indicated by the full line A-C. Determination of the length



and curve of the incision becomes clear from the diagram. The resulting suture line usually corresponds with the nasolabial groove on the „healthy“ side.

Sometimes it becomes necessary to deepen the newly formed nasolabial groove at its upper end (the ala nasi) in order to bring it into symmetry with the „healthy“ side. For this purpose an additional suture is layed through the columella of the nose which, at the same time, repairs the marked deviation of the tip and colemella of the nose towards the „healthy“ side.

Repair of paralytic deformations in the region of the eye, particularly of paralytic lagophthalmos, is very difficult indeed.

We have given up both pedicle flap muscle plasty from the temporalis (Tomashevskaya, 1960; Lexer, 1908; Gillies, 1934; Anderson, 1961) and large-scale blepharorrhaphy. Even in favourable outcome of a muscle plasty in the region of the eyelids, the resulting movements are associated with those of mastication and not with those characteristic for the movements of the eyelids. On chewing the palpebral fissure is rhythmically drawn out laterally which greatly molests the patient. Blepharorrhaphy, if it does not repair lagophthalmos, grossly deforms the palpebral fissure, diminishes the visual field (particularly central blepharorrhaphy) though only partially protecting the eyeball from constant trauma.

In two patients, we used the method of Morel-Fatio et Lalardrie (1962), based on the introduction of a U-shaped spring, which, acting in reciprocity with the intact levator palpebrae superioris, is supposed to renew movements of the upper lid. However, this method did not prove good enough, since it is practically impossible to balance the force of the spring against that of the muscle. Apart from this, the antagonist should instantly relax on contraction of the muscle, only to regain its power the following moment in order to lower the lid, a function which can never be fulfilled by a mechanical spring.

At our department, we are of the opinion that only two methods are really efficacious: 1) scleroblepharorrhaphy, as elaborated and published by us in 1963, and 2) suspension of the lower lid on a „plastmass“ implant forming a shell in the lid (Grignon, Chouard, Benoist; 1962).

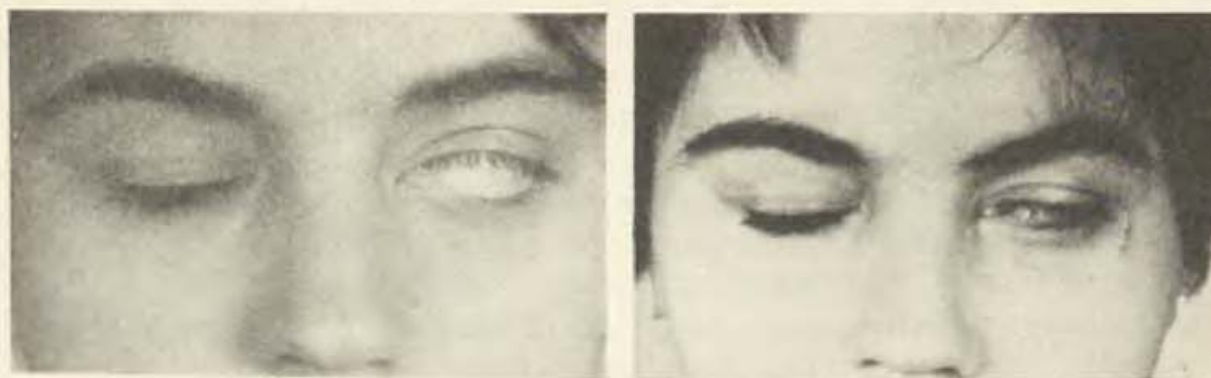


Fig. 12. Patient A-na. Paralytic lagophthalmus during the attempt to close the eye. —  
Fig. 13. Patient A-na (after the operation suspending the inferior eyelid upon the graft while the eye is closed





Fig. 14. Patient M-ov (before the operation). — Fig. 15. Patient M-ov (after the left eyelid was lifted)

Scleroblepharorrhaphy, fixation of the lower lid to the sclera, is based on the utilization of Bell's sign, i. e. of the movement of the eyeball upwards on closing the eye. The lower eyelid, when fixed to the eyeball, moves together with the eyeball, i.e. on closing the eyes upwards firmly contacting the upper lid with its entire margo and on opening of the eyes downwards, re-opening the palpebral fissure. After preliminary creation of wound surfaces on the middle thirds of the eyelid and sclera, fixation is effected by three thin episcleral catgut stitches. The conjunctival edges of the two wound surfaces are approximated and sutured with reversed catgut stitches (fig. 7). Then a moulding bandage is applied in each case. Fixation of a small part of the thinned-out and flabby eyelid to the sclera does not affect the movements of the eyeball, as has been proved in practice. This method also repairs ectropion of the lower lid leaving the palpebral fissure sufficiently agape at rest. The renewal of lower lid movements corrects lagophthalmos up to a width of the residual gap of 1.5 to 2.0 cm. We have employed the method in 15 patients suffering from chronic paralytic lagophthalmos and the results are good; on closing the eyes the lids close the palpebral fissure completely but at rest a normal width of the fissure is preserved. In properly indicated cases (variant 1 of Bell's sign) this operation is very efficacious indeed (fig. 8 and 9). Variants 2, 3 etc. of Bell's sign, which are met with much more rarely, are contraindications to this method. In these cases we usually employ suspension of the lower eyelid on an

implanted "shell", as modified by us: A crescent-shaped implant made of elastic plastic material (EgMass-12) which has been modelled on a meticulously formed wax mould, is introduced into the tissues of the lower lid. The medial pole of the implant is the highest point which makes it possible to diminish the lacrimal pool. The implant is suspended with slight hypercorrection on the periosteum of the lateral orbital margin and on the medial eyelid commissure with thin "lavsan" stitches. Thus the lower lid is suspended evenly over its entire extent, which is an advantage over all other methods using threads or small plates for the purpose. The mould implanted into the thinned-out lower lid also brings the lid into close contact with the eyeball and, in addition, greatly improves its appearance. However, the method has its limits: lifting of the lid margin in severe cases of lagophthalmos, so as to achieve complete closure of the palpebral fissure, may narrow the lower visual field to a considerable extent. Good results are achieved, if lagophthalmos does not exceed the width of 5 mm. In cases wider than 5 mm., the method only narrows down the gaping palpebral fissure at rest which is of great advantage in severe lagophthalmos (fig. 10, 11, 12, 13). A total of 12 patients have been operated on at our department by this method and the results are good or satisfactory.

The following part of the operation, which is usually completed at the same stage with the correction of lagophthalmos, is reconstruction of normal appearance of the eye brow and the region above it. Lifting-up of the eye brow is carried out with about three to four thick (No. 2 or 3) "lavsan" stitches introduced into the subcutaneous tissue of the eye brow and anchored, each thread separately, to the galea aponeurotica near the crown of the head. On pushing the needle upwards superficial parts of the skin are caught in the stitch at sites corresponding to the creases and wrinkles of the forehead so that symmetry in appearance is attained with the "healthy" side (fig. 14, 15). We do not practice excision of an oval skin section above the eye brow for correction of an eye brow ptosis, because it causes tension in the skin of the forehead on the affected side which greatly contrasts with the appearance of the "healthy" side.

In order to lift the eye brow evenly in all its parts (and not each part separately), it is expedient to implant a thin "plastmass" plate bent to the shape of the brow into the depth of tissues and to purchase the fixing threads, which are anchored to the galea aponeurotica, on this plate.

We have employed the above described methods of surgical treatment in chronic, complete and unilateral facial palsy. However, only the systematic repair of all components of the paralytic deformation will give good results.

#### S U M M A R Y

The actual surgical treatment of chronic facial palsy must be preceded by a meticulous analysis of the surgical anatomy of this condition.

Good results can only be achieved, if the repair of all, even the less marked deformations, which however aggravate the clinical picture, are included into the surgical plan. In the first place, deformations of the bony skeleton must be

repaired and after that gradual repair of deformations in the soft tissues of the perioral and periorbital regions should be undertaken.

Deformation of the region of the corner of the mouth is repaired by the combined method of pedicle flap plasty from the temporal muscle and kinetic suspension as elaborated by the author. The latter is based on suspension on the coronoid process of the mandible with "lavsan" threads which not only maintains the corner of the mouth in its proper position, but also gives it a certain amount of movement. In cases, in which muscle plasty is impracticable, kinetic suspension is used as the only method, but, in addition, myotomy on the "healthy" side is carried out.

The repair of paralytic lagophthalmos is carried out by scleroblepharorrhaphy, a method elaborated by the author and based on the utilization of Bell's sign. Thus not only repair of lagophthalmos is achieved, but also movement of the lower lid is renewed. In some cases, the author carries out suspension of the lower lid on a plastmass implant shell.

Correction of eye brow ptosis is effected by the suspension on "lavsan" threads anchored to the galea aponeurotica.

#### RÉSUMÉ

#### **Les principes et la planification de la plastie locale dans la paralysie faciale chronique**

M. E. Yagizarov

Le traitement chirurgical actuel de la paralysie faciale chronique doit être précédé d'une analyse soignée de l'anatomie chirurgicale de cette condition.

De résultats satisfaisants peuvent être obtenus seulement dans les cas où la correction comprend dans le plan chirurgical toutes les déformations, y compris même celles qui sont peu prononcées, causant cependant une aggravation de l'image clinique. Avant tout il est exigé de corriger les déformations osseuses, ensuite il se recommande de corriger les déformations dans les mous tissus des régions péri-orales et péri-orbitales.

La déformation de la région de l'angle de la bouche est corrigée par la plastie utilisant un lobe en forme de pédicule du muscle temporal, combinée avec la suspension kinétique développée par l'auteur. La dernière est basée sur la suspension au processus coronoïde de la mandibule au moyen des fils «lavsan» qui maintient non seulement l'angle buccal en propre position, mais qui permet aussi une certaine étendue de mouvements. En cas où la plastie musculaire est impraticable la suspension kinétique est employée comme la seule méthode, mais la myotomie du «sain» côté est pratiquée en plus.

La correction de la lagophtalmie paralytique s'effectue par la blépharorrhaphie, une méthode développée par l'auteur et basée sur l'utilisation du signe de Bell. Cette méthode permet non seulement la correction de la lagophtalmie mais aussi la restauration du mouvement de la paupière inférieure. En quelques cas l'auteur fait suspendre la paupière inférieure à une coquille plastique implantée.

La correction de la ptose des sourcils est effectuée par une suspension au fils «lavsan» qui sont fixés au casque aponévrotique.



## ZUSAMMENFASSUNG

### Die Grundsätze und die Planung der lokalen Plastik bei chronischer Fazialislähmung

M. E. Yagizarov

Der eigentlichen chirurgischen Behandlung der chronischen Fazialislähmung muss eine sorgfältige Analyse des Zustandes vorgehen.

Gute Ergebnisse können nur dann erzielt werden, wenn bei der Behandlung in den chirurgischen Plan alle Deformationen eingeschlossen werden, einschliesslich derjenigen, die weniger ausgesprochen sind, dabei aber das klinische Bild verschlechtern. Vorerst müssen die Deformationen des Knochenskeletts beseitigt werden, danach erfolgt allmählich die Wiederherstellung in den weichen Geweben der perioralen und periorbitalen Gegend.

Die Wiederherstellung der Deformation in der Mundwinkelgegend erfolgt mittels der Stiellappenplastik aus dem Schläfenmuskel, kombiniert mit dem kinetischen Aufhang nach der Methode des Autors. Die letztere beruht auf der Aufhängung auf dem Kronenfortsatz des Kiefers mit „Lavsan“ Nähten, welche den Mundwinkel in der entsprechenden Lage hält und ihm darüber hinaus in gewissem Umfang Bewegung verleiht. In denjenigen Fällen, in welchen die Muskelplastik undurchführbar ist, wird die kinetische Aufhängung als die einzige Methode benützt, darüber hinaus wird aber auch Myotomie an der „gesunden“ Seite durchgeführt.

Zur Wiederherstellung des paralytischen Lagophthalmus wird die Skleroblepharorrhaphie angewendet, eine Methode, die der Autor erarbeitet hatte und die auf der Anwendung des Bellschen Phänomens beruht. Mit diesem Verfahren wird nicht nur der Lagophthalmus beseitigt, sondern auch die Bewegung des unteren Augenlides erneut. In einigen Fällen benützt der Autor zur kinetischen Aufhängung eine implantierbare Schale aus Plaste.

Zur Beseitigung der Augenbrauenptosis benützt der Autor die Aufhängung auf „Lavsav“ Nähten, die an der galea aponeurotica verankert sind.

## RESUMEN

### Los principios y la planificación de la plastia local en la parálisis facial crónica

M. E. Yagizarov

El tratamiento quirúrgico actual de la parálisis facial crónica tiene que ser precedida por un análisis meticolosa de la anatomía quirúrgica de esta condición.

Buenos resultados pueden ser adquiridos solamente si el reparo de todas deformaciones — aunque menos distintos-pero cuáles exageran el cuadro clínico, están incluídas en el plan quirúrgico. En primer lugar las deformaciones del esqueleto óseo tienen que ser restauradas y después el reparo gradual de las deformaciones de los tejidos blandos pertenecientes a las regiones periorales y periorbitales deben ser realizado.

La deformación de la región de la comisura de la boca está restaurada por el método combinado que emplea la plastia de un colgajo pediculado desde el músculo temporal y la suspensión dinámica, lo que fué elaborado por el autor. El segundo método se apoya en la suspensión sobre el proceso coronoideo de la mandíbula con los hilos de „lavsan“ el que no solamente mantiene la comisura de la boca en su posición propia sino también le presta ciertas posibilidades del movimiento. En los casos cuando la plastia de músculo es impracticable, se emplea la suspensión dinámica como el método único pero, además de ésto, se realiza miotomía de la parte „sana“.

El reparo del lagofthalmos paralítico se realiza por escleroblefarorrhaphía, un método elaborado por el autor que se basa en la utilización del signo de Bell. De tal manera el reparo del lagofthalmos se lleva a cabo sino también se restaura el movimiento del



párpado de abajo. En algunos casos el autor realiza la suspensión del párpado de abajo sobre una cubierta de implantación.

La corrección de la ptosis de la ceja se efectúa por la suspensión sobre los hilos de „lavan“ fijados a la galea aponeurótica.

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## ENORMOUS JUNCTION NAEVUS OF BACK RADICALLY REMOVED BY SURGERY

V. KUBÁČEK

A number of papers on melanoblastoma and pigmented naevus published in recent years bear witness to the fact that this complex of questions is in the forefront of specialists' interest.

In Prague, Brno and Ostrava teams of specialists have been formed, the members of each being a surgeon, a plastic surgeon, a radio-oncologist, dermatologist and pathologist. This team of specialists aims at solving a number of problems of theoretical, diagnostic and therapeutic character, but mainly at gathering very valuable clinical experience which may become a guide for further therapeutic tactics and also permit providing information to the practitioner based on more knowledge and responsibility.

It is not the task of this communication to evaluate the work of one of these teams nor to deal in detail and complexity with the entire, very complicated problem of melanoblastoma and its treatment. I should only like to stress the demand for unconditionally radical operation and demonstrate that it can be complied with even under very difficult circumstances caused by the unusual extent of a pigmented junction naevus showing signs of activity.

### THE CASE PROPER

In March, 1963, a boy, J. K., No. 28037, was admitted to the Department suffering from a black, hairless naevus with dry and glossy skin occupying the entire left half of the back, the shoulder, the axilla and half of the dorsal aspect of the arm (fig. 1). The naevus crossed the median line of the back to the right half of the thorax, had a blurred border line and at several places showed signs of junction activity (fig. 2). The boy, aged seven, was otherwise healthy and developed according to his age.

The Brno team of specialists was of the opinion that removal of the naevus was inevitable, because of possible malignant degeneration after puberty, and recommended radical surgical treatment to be — if possible — carried out in one stage. Total excision of the naevus and axillary lymph nodes was carried out under intratracheal general anaesthesia (fig. 3). The lymph nodes were

found enlarged and contained a considerable amount of melanotic pigments [fig. 4]. The defect resulting from this excision was covered with four dermatome grafts taken from the abdomen and the thighs. The operation was, of course, very exacting to the child, requiring not only preoperative but also postoperative blood and plasma transfusions, combined, after operation, with the administration of vitamins and food rich in proteins, in order to ensure good healing.

The grafts took well and the patient recovered soon; today, three years after operation, he feels well (fig. 5 and 6). Histology proved the diagnosis of pigmented naevus of junction type.



Fig. 1



Fig. 2

#### DISCUSSION

In childhood, melanoblastoma occurs very rarely. In his monograph of 1962, Rode quoted Mc Whorter and Woolner who had stated that in the entire world literature only 18 cases of melanoblastoma up to the age of 15, had been described.

It is well known that 60 % of cases of melanoblastoma originate from junction naevi, either congenital or developing during childhood. From this and from what was said above it follows that malignant degeneration usually occurs at adult age and the junction activity during childhood prior to puberty is not at all dangerous. Adequate surgical treatment during childhood is, therefore, not only safe, but, from the point of view of the etiopathogenesis of melanoblastoma also a prophylactic measure, to a certain extent.

Another problem is the question as to how radical surgical excision should be and whether or not it should be total. This problem was dealt with in detail in the papers of Krenar and Kluzák, so it seems superfluous to deal with it here. We advocate total excision in any case. Partial excision of large and enormous





Fig. 3



Fig. 4

naevi is but traumatization capable of causing dissemination of the malignant process. Although traumatization is generally not recognized as the etiological factor of malignant dissemination, our clinical experience and that of other authors (Shaw, etc.), however, prove it. We are convinced that repeated and chronic irritation and traumatization may, in some cases, evoke malignant degeneration. Biological and clinical variability of the potential malignant tumour of which we never can find out anything beforehand, may play an



Fig. 5



Fig. 6



important role, and because of it, total excision is imperative. Shaw described a case of an eight-year-old boy in whom an enormous pigmented junction naevus has been partially excised in childhood and in whom later, at adult age, malignant degeneration took place just at the sites of the former partial excisions. This patient had a number of minute junction naevi all over the body, but none of these showed malignant degeneration. This experience, even if only single, justifies our demand for total excision the more so, since up to date there is still very little known about the biological basis and the behaviour of melanoblastoma.

The case referred to in this paper also shows that total excision can always be carried out and that it is a smaller problem than the radical surgical operation itself.

#### CONCLUSION

Enormous junction naevi are very rare, but even those must be surgically removed in time in the same way as smaller junction naevi, because they represent a potential danger of malignant degeneration in adult age. Total excision can be carried out in any case, because plastic surgery with its operative procedures and other means make coverage even of large skin defects always practicable. Excision ought to be carried out in one stage, because partial excision or shaving-off represent an unsuitable and noxious traumatization which may well evoke malignant dissemination later.

#### SUMMARY

The paper deals with the surgical treatment of a case of enormous pigmented junction naevus of the back in a seven-year-old boy by total excision in one stage. The necessity for early and total excision prior to puberty is shortly discussed with the view of possible malignant degeneration in adult age. The surgical treatment has, in a certain sense, a prophylactic character. It ought to be carried out in one stage, because partial excision represents unsuitable and noxious traumatization. Total excision in one stage is made possible by the surgical procedures and other means of plastic surgery.

#### RÉSUMÉ

#### **Un énorme naevus du dos traité radicalement par une intervention chirurgicale**

V. Kubáček

Le travail présenté rapporte un cas d'un énorme naevus du dos traité radicalement par une intervention chirurgicale-excision totale en un temps — chez un garçon âgé de 7 ans. On discute brièvement la nécessité d'une excision totale précoce de cette malformation avant la puberté, car la malignisation en n'est pas exclue l'individu une fois grandi. Cette intervention chirurgicale possède en certain sens un caractère de prévention et doit être réalisée en une cession, car l'excision partielle répétée n'est qu'une traumatisation inconvenable et même nuisible. Cette excision totale en une cession est réalisable à l'aide des méthodes de la chirurgie plastique.

## ZUSAMMENFASSUNG

### Die radikale chirurgische Beseitigung eines riesigen Junktionsnaevus am Rücken

V. Kubáček

Die vorliegende Arbeit beschreibt den Fall eines siebenjährigen Knabens, dem ein riesiger Pigment-Junktionsnaevus am Rücken durch totale Exzision in einer Sitzung beseitigt wurde. Die Notwendigkeit der rechtzeitigen totalen Exzision eines derartigen Naevus vor der Pubertät wird kurz diskutiert, wobei im Auge zu behalten ist, dass nach der Pubertät eine maligne Degeneration möglich ist. Der chirurgische Eingriff hat also sozusagen prophylaktischen Charakter und soll in einer Sitzung durchgeführt werden, da die partielle Exzision eine unangebrachte und schädliche Traumatisierung zur Folge hat. Die totale Exzision in einer Sitzung wird durch die Behelfe und Methoden der plastischen Chirurgie ermöglicht.

## RESUMEN

### Un enorme nevus spilus en la espalda, eliminado quirúrgicamente en forma radical

V. Kubáček

El trabajo trata sobre un caso de solución quirúrgica de un nevus spilus pigmentado en la espalda de un niño de 7 años por una excisión total en un solo tiempo. — Se discute concisamente la necesidad de una total excisión a tiempo antes de la pubertad, ya que es posible su malignidad en la edad adulta. — El procedimiento quirúrgico tiene en cierto sentido un carácter preventivo y debe ser efectuado de una sola vez, porque la solución parcial representa una traumatización dañina e inadecuada. La excisión total de un solo tiempo facilita los medios de trabajo y los procedimientos de la cirugía plástica.

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### The American Cleft Palate Association

The American Cleft Palate Association announces it plans to sponsor an International Congress on the subject of Cleft Palate.

The Congress will be held April 14 through April 17, 1969 at the Shamrock — Hilton Hotel in Houston, Texas, USA. Further information relative to this Congress may be obtained by writing to: Betty Jane McWilliams, Ph. D. Cleft Palate Research Center. The University of Pittsburgh, 320, Salk Hall, Pittsburgh, Pennsylvania 15213, USA.

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## TYPES OF GRANULATIONS IN TRAUMATIC SKIN DEFECTS AND THEIR SYSTEMIZATION

J. SAMOHÝL

Correct appreciation of the appearance of granulation tissue in traumatic skin defects is of great importance in both the conservative and surgical treatment of these wounds. Only defects filled with "healthy" granulation tissue epithelize well and can be successfully covered with skin grafts. In differentiating and estimating the types of granulations much variance and confusion exists both in the literature and in clinical practice. The author believes that this is one of the causes why granulating skin defects are still quite often transplanted unsuccessfully, so that the healing is protracted and post-traumatic ulcers develop in some cases.

The variance and confusion is due, in the first place, to contrasting and often inaccurate observation and description of the appearance of the granulations, further to incorrect evaluation of changes in their appearance, i.e. the question of types of granulations is not clear and, finally, to incorrect classification of granulations in groups requiring specific treatment, i.e. the question of system is not clear.

With regard to the considerable practical importance of the mentioned problems the author has decided to deal more closely with these questions and to try to go into some questions of variance and confusion.

### METHODS

As a working method for his investigation the author has chosen, on the one hand, clinical observation of changes in the appearance of granulations in post-traumatic skin defects (in otherwise quite healthy subjects) and, on the other hand, confrontation of the macroscopic appearance of these granulations with their microscopic and partly also histochemical picture.

Granulating wounds such as the author met with in the Clinical Department of Plastic Surgery in Brno (they were, in the first place, defects following thermic or mechanical injuries and partly defects following some plastic operations) were regularly described and evaluated, photographed and examined



bacteriologically. At the same time, some granulations were removed for histological and histochemical examinations which were carried out in the First Institute of Pathological Anatomy in Brno. In some cases the defects were excised in toto.

The author studied more than 100 granulating defects out of which 70 were examined histologically.

## RESULTS

The obtained experience has shown us, in the first place, that if we want, in clinical practice, to diagnose correctly the type of granulations, we must always consider the individual components of their appearance. These are, above

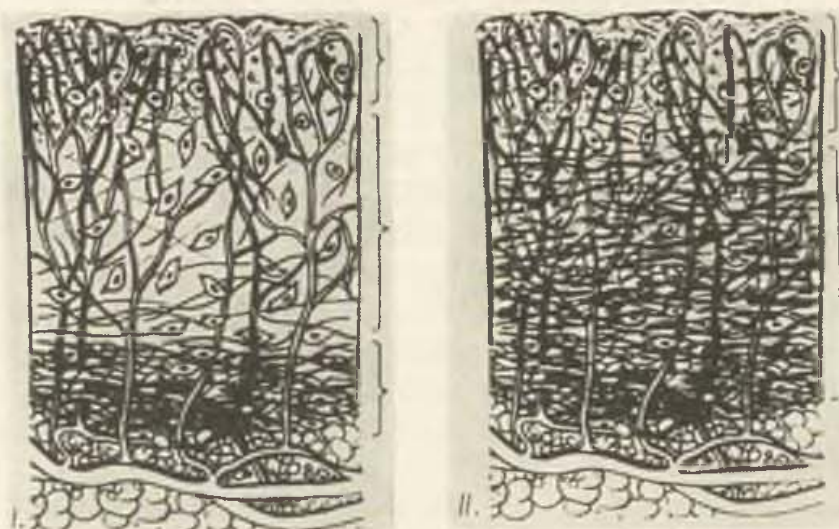
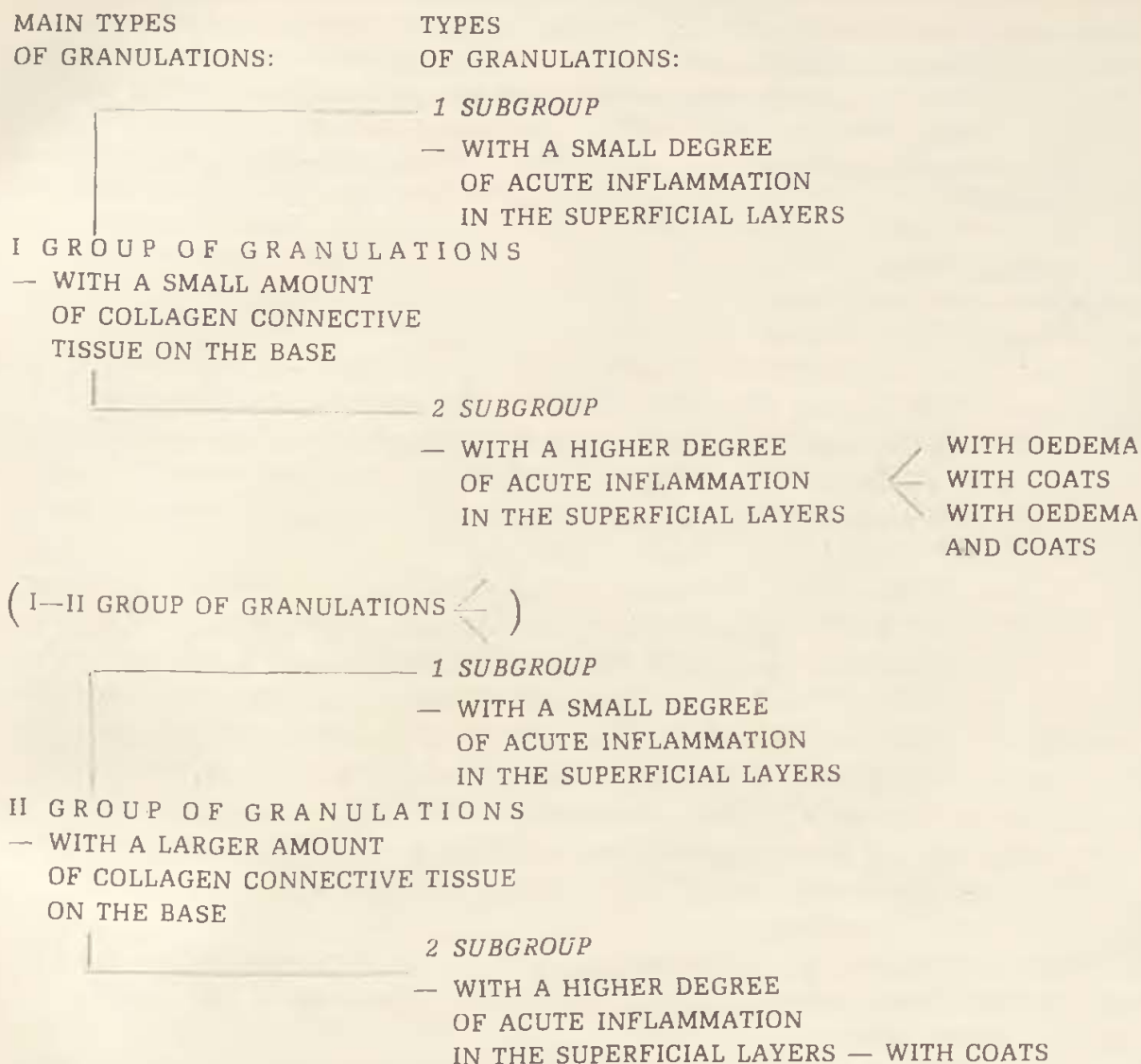


Fig. 1a. Schematic representation of developed granulation tissue with a small quantity of collagen connective tissue at the base and a small degree of acute exudative inflammation in the uppermost layer (Group I, subgroup 1). — Fig. 1b. Schematic representation of developed granulation tissue with a largest quantity of collagen connective tissue at the base and a small degree of acute inflammation in the uppermost layer (Group II, subgroup 1)

all, the following: *colour of the granulations, their consistence, degree and character of secretion and appearance of the coating film, if any, size and form of the granulations*; the *epithelial border* at the periphery of the defect is also of importance.

Further we have made sure that the appearance and the properties of granulations and, at the same time, their classification into a certain type of granulations depend on the degree of accumulation of collagen connective tissue on their base and on the degree of development of acute exudative inflammation in their uppermost layers. The amount of collagen tissue determines the two main types, i.e. groups of granulations (Fig. 1a, 1b). The degree of acute inflammation divides these two groups into subgroups (Fig. 1c). In this way a sort of system of granulation tissues arises.

Fig. 1c. Systemization of the most important types of granulation tissues in traumatic skin defects



*Granulations with a small amount of mature collagen connective tissue on the base and a small degree of acute inflammation in the superficial layers (Group I, subgroup 1)*

Granulation tissue of this type grown to such an extent that it can be well seen with the naked eye is about 3—6 mm high and always consists of a number of layers which correspond to its successive growth.

Right on the surface there is a narrow border of cellular detritus, underneath is a layer of capillary loops, further down a layer of ascending capillaries, and the base consists of ripening connective tissue with a reduced capillary net (Fig. 1a). In the cellular detritus a small amount of microbes is always present which, together with the products of cell destruction, constitute a permanent source of a certain degree of acute inflammation in the layer of capillary loops situated beneath. For this reason an abundance of leucocytes, some serofibrinous exudate, can be observed here, the topmost located capillaries are filled with granulocytes penetrating into the interstitium in many places and their walls show inflammatory oedema. Besides the

vessels, this layer contains numerous histiocytes (polyblasts), scarce fibroblasts, the ground substance with a large quantity of acid mucopolysaccharides (AMP), reticular fibres, and a small number of very fine collagen fibres. The largest amount of the ground substance and AMP can be found in the section of ascending capillaries situated lower down (Fig. 8). At this level, we meet already with collagen fibres which are fine at first and become thicker and more numerous towards the base while polyblasts are replaced by fibroblasts. (These findings are in keeping with the latest ideas about the origin of collagen. According to them fibroblasts send out molecules of tropocollagen into the ground substance and through polymerization these molecules give rise to thin collagen fibres which by aggregation under cooperation of AMP change into mature collagen fibrils [7, 8]. In the lowest layer we find already developed connective tissue with numerous fibrocytes and collagen fibres.

The thickest and most developed layer is that of ascending capillaries with a large quantity of gel substances. For this reason this granulations are of a macroscopically solid gelatinous. At the same time they are markedly red with only moderate purulent secretion because the upper layer of cellular detritus is quite thin and the degree of acute inflammation is consequently also relatively small (Fig. 7).

Wounds filled with such granulations epithelize readily from the edges, they rapidly become smaller and heal up. In cases of extensive defects they are suitable for transplantation using even thick continuous skin grafts so that a good cover results (Figs. 2, 3, 4). These granulations thus represent biologically valuable tissue and are usually termed "healthy granulations" in literature. On other occasions they are described as fresh, young non-infected granulations.

Under various unfavourable circumstances the acute inflammation in the uppermost layer of these granulations increases and, according to its degree and character, the appearance of the granulations changes too and granulations of the second subgroup arise.

*Granulations with a small amount of collagen connective tissue on the base and a larger degree of acute inflammation in the superficial layers*

[Group I, subgroup 2]

We have observed three main forms of these granulations, viz.: either their consistence is impaired (oedema develops) or coats develop on them, or the oedematous changes are combined with the development of coats and with considerably increased purulent secretion.

Oedematous granulation tissue can be diagnosed by the consistence of the soft, "liquid" jelly (Fig. 11); it is usually hypertrophic and, in some cases, it would "overflow" the margins of the wound. As a rule, there is more purulent secretion and the red colour of the tissue has a greyish tint (Fig. 9).

The surface of the coated granulation tissue is whitish grey, occasionally greenish, and only after the removal of the coats do we discover granulation tissue underneath the appearance of which need not be conspicuously changed (Fig. 5).

In the granulation tissue of the mixed type we find both changed consistency and coats but both signs are less pronounced than in the first two groups. At the same time, a considerable degree of purulent secre-



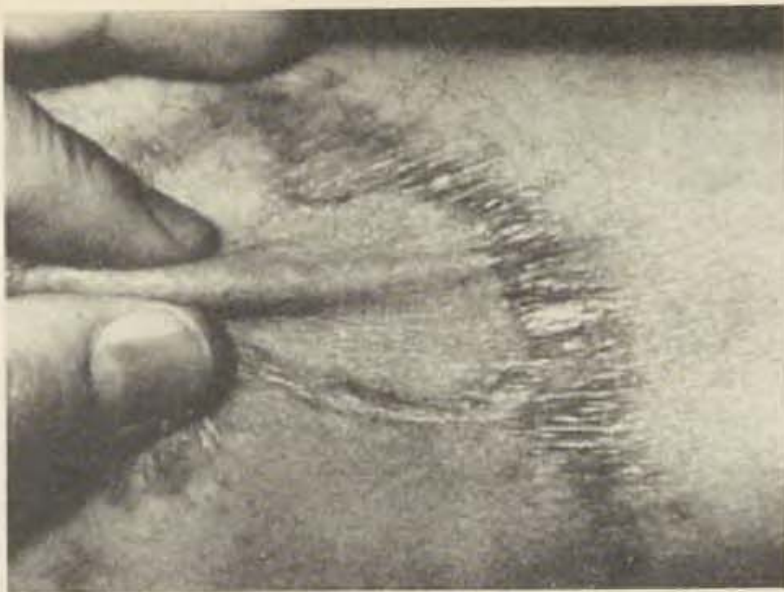


Fig. 2. Skin defect in the leg which developed after the removal of a necrotic skin flap. The flap was of traumatic origin occurring during a motor-cycle accident. Developing granulations of I. group. — Fig. 3. The same defect after transplantation of continuous thick skin graft. (The defect was prepared for transplantation by means of dressings soaked in boric acid applied alternately with dressings soaked in physiological saline with chymotrypsin. Granulations were not removed before transplantation, the graft was attached by means of fine sillon suture.) — Fig. 4. Detail: a good skin cover

tion is always present. In some cases this purulent secretion becomes the most important characteristic sign and we may speak of fresh granulation tissue with purulent secretion.

In extensive defects we may quite often find all the mentioned types of granulations simultaneously.

On histological examination of oedematous granulations we can observe accumulation of a serous to serofibrinous exudate pushing the individual cells apart. At the same time the amount of ground substance and AMP is reduced (Fig. 10). In the

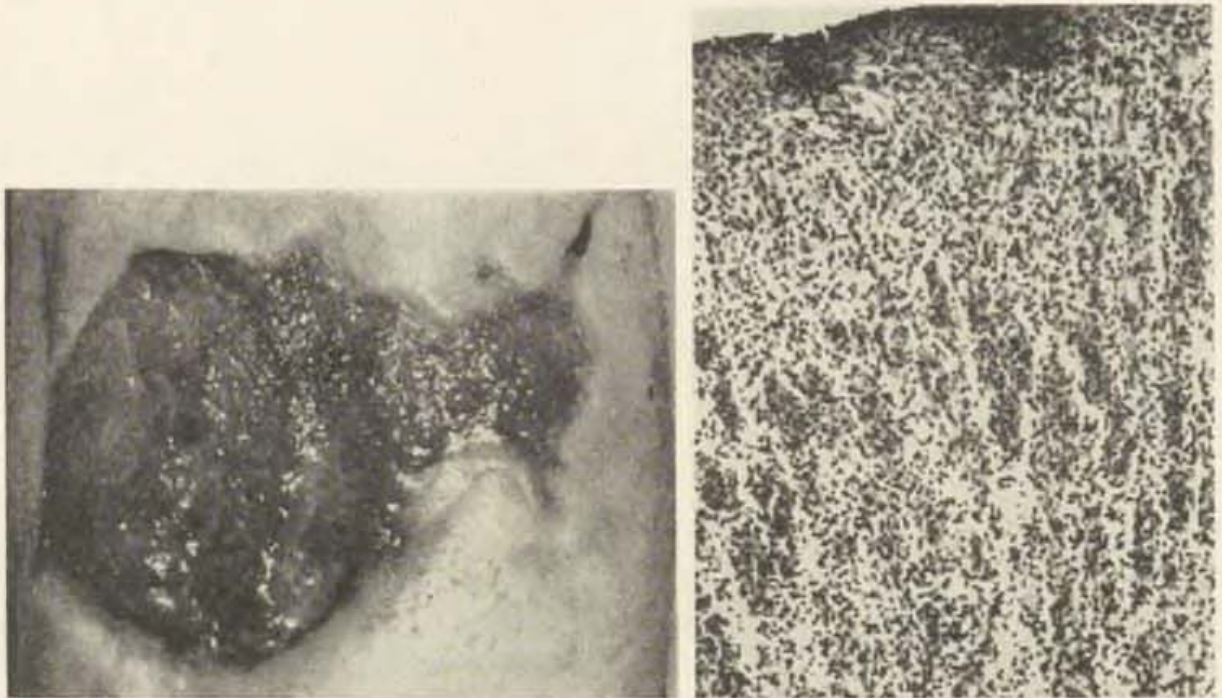


Fig. 5. Post-traumatic skin defect in the calf filled with granulations of the first group, second subgroup, coated. — Fig. 6. Micrograph: Haematoxylin-eosin, obj. x10, oc. x5. Abundantly infiltrated granulation tissue of the first group with a thicker layer of cellular detritus on the surface (Group I, subgroup 2). The vertical layer of capillaries is clearly visible. The capillaries are filled with numerous leucocytes penetrating into the interstitium in many places

coated granulations the most important histological change can be found in the thick layer of cellular detritus and fibrin and in the dense leucocytic infiltration (Fig. 6). In granulation of the mixed type with recent inflammatory changes we often find, besides the thicker layer of detritus and the dense leucocytic infiltration, a higher degree of inflammatory imbibition.

An unusually great oedematous change in the consistence could usually be observed in quite young granulations occurring in patients with extensive skin defects and a certain degree of cachexia. Thick coats were observed in granulations which histologically appeared to be older. In the microscopic picture chronic inflammatory infiltration was found in the upper layers while on the base there was a thicker layer of collagen connective tissue and the inflammatory imbibition of the vessels changed into thickening of the vessel walls in some places. Fibrinoid degeneration of the vessels was also frequently observed.



On bacteriological examination of the surface of all inflammatory forms of granulations numerous pyogenic microbes were always obtained by culture, most often pyogenic staphylococci.

Wounds filled with fresh inflammatory granulations healed badly and if an attempt at transplantation was made the grafts did not take. Coated granulations and those with purulent secretion could be favourably influenced by the wet method of treatment (most efficiently by application of fresh dressings

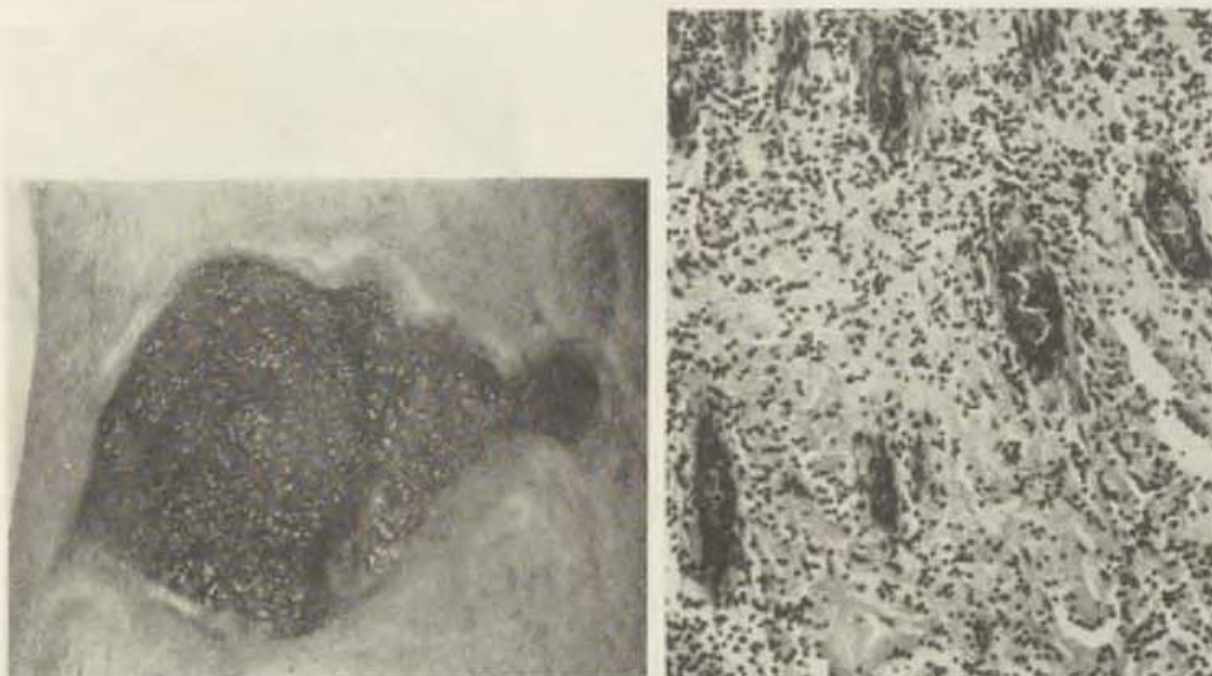


Fig. 7. Defect in the calf, as shown in Fig. 5, after treatment with wet dressings. Condition after one week's therapy. Granulations of the first group with a small amount of acute inflammation (thus subgroup 1.) prepared for transplantation. — Fig. 8. Micrograph: Alcian blue, obj. x10, oc. x5. A layer of vertically running capillaries in the granulation tissue of the first group with a small degree of acute inflammatory changes. A considerable quantity of intercellular ground substance staining positively for acid mucopolysaccharides

2—4 times a day). In oedematous granulations better results were sometimes achieved with tulle soaked in Vishnevsky's balsam, and in all cases it was necessary to control simultaneously the general condition of the patient.

Our experience thus shows that inflammatory changes of fresh granulations can be relatively easily influenced and need not permanently impair the properties of granulations.

On the other hand, accumulation of collagen connective tissue in the lower layers of granulations always involves their permanent and fundamental change, so that a new, quite different type of granulations arises, namely granulations of the second group.

*Granulations with a larger amount of collagen connective tissue at the base and a small degree of acute inflammation in the superficial layers*  
(Group II, subgroup 1)



In the clinical picture these granulations are always quite low, of firmer consistency, so that we cannot speak of a gelatinous character. They are markedly red, with moderate purulent secretion, and slowly epithelize from the edges which are thickened. Such granulations are suitable for transplantation but only with thinner skin grafts, usually in the form of stamps.

In the literature, these granulations, provided that they are diagnosed and differentiated, are termed old or chronic granulations.

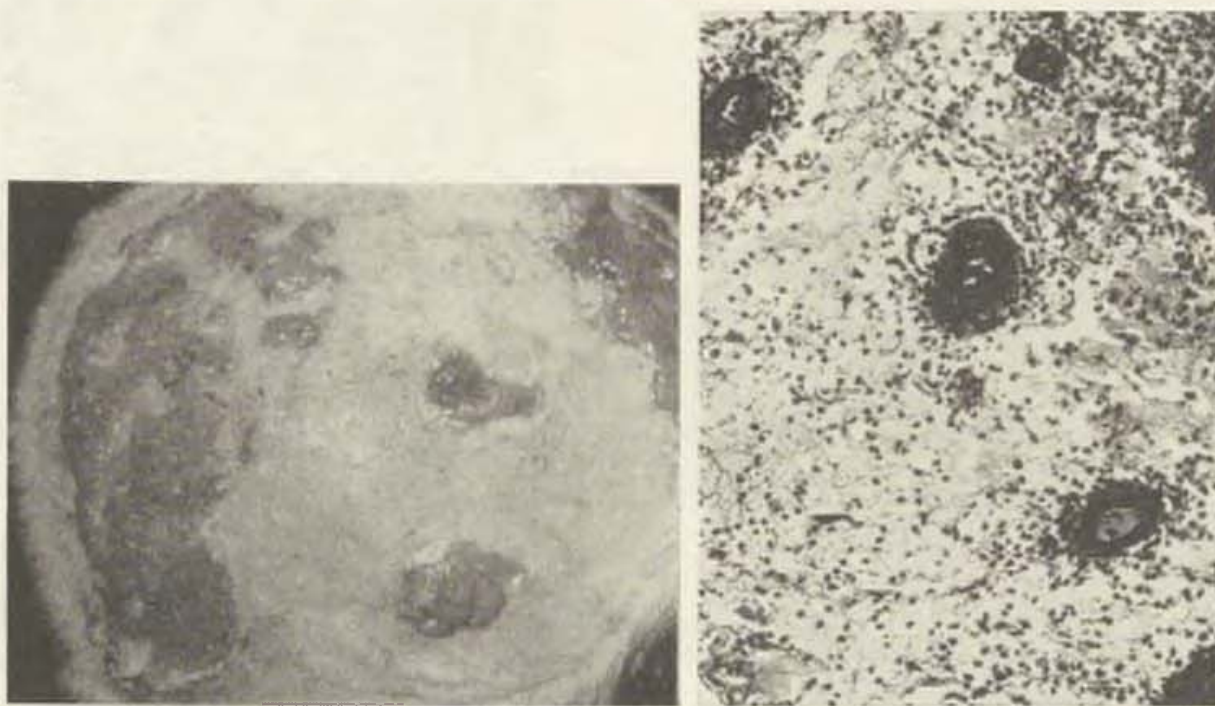


Fig. 9. Granulation tissue of group I, subgroup 2 — oedematous. — Fig. 10. Micrograph: Haematoxylin-eosin, obj. x10, oc. x5. Granulation tissue with oedematous imbibition. Strong inflammatory imbibition of the vessel walls is particularly well visible

In the histological picture we can observe that the layer of ascending capillaries is actually absent, and in its place there is an unusually hypertrophic lower layer of connective tissue. This layer contains a large number of coarse collagen fibres which sclerotize in some cases. At the same time, there are important changes in the vessels. We could observe the beginning of these changes already in the group of fresh granulations covered with thicker coats, as we have already mentioned. Here, in the granulations of the second group, the described thickening of the vessel walls changes into hyaline degeneration in some cases, which is often connected with an almost complete occlusion of the vessel lumen (Fig. 12).

*Granulations with a larger amount of collagen connective tissue on the base and a higher degree of acute inflammation in the superficial layers*  
(Group II, subgroup 2)

In the case of increased inflammation in the superficial layer a thicker coat develops most often on the granulations of the second group; the oedematous changes and increased purulent secretion are not quite so pronounced here. The treatment of granulations of the second group with inflammatory changes

is difficult and the wet method must be supplemented by additional supporting therapy, e.g. Vishnevsky's blockades applied at a convenient time.

In literature we have met with various, often quite contradictory descriptions and terms of the individual types of granulations with inflammatory changes. The first and the second group of granulations are seldom distinguished although it is very important and decisive. Thus, for example, the term of "feeble" or "atonic" granulations is used both in chronic post-traumatic ulcers and in quite fresh defects filled with granulations of the first group. At the same time, none of the authors defines the contents of these terms in any detail.

#### DISCUSSION

Our results show that two main types of granulations must always be distinguished in traumatic skin defects, granulations of the first group and granulations of the second group. The former are of biological value because they contain a large number of young, rapidly developing capillaries and connective tissue cells while the vitality of the latter granulations is substantially lower. This is due, on the one hand, to the fact that there is a thick layer of mature connective tissue at their base which, like a fine-meshed screen (Chvapil), restrains the penetration of the nutrient substances into the upper layers. The screen is formed by numerous thick collagen fibres and also by thickened walls of the vessels running through the layer of the connective tissue. On the other hand, in our opinion, this tough layer of connective tissue prevents a good proliferation of capillaries. In consequence of these factors the actual granulation tissue is quite scanty and atrophic.

Development of one or another main type of granulations does not exclusively depend on the duration of healing, granulating, as it would seem at first



Fig. 11. Granulations of group I, subgroup 1, obtained by cutting off. The character of solid gel is clearly visible (preparation on the left). Granulations of group I, subgroup 2. Considerable inflammatory imbibition — oedematus. Obtained by cutting off, too (preparation on the right)



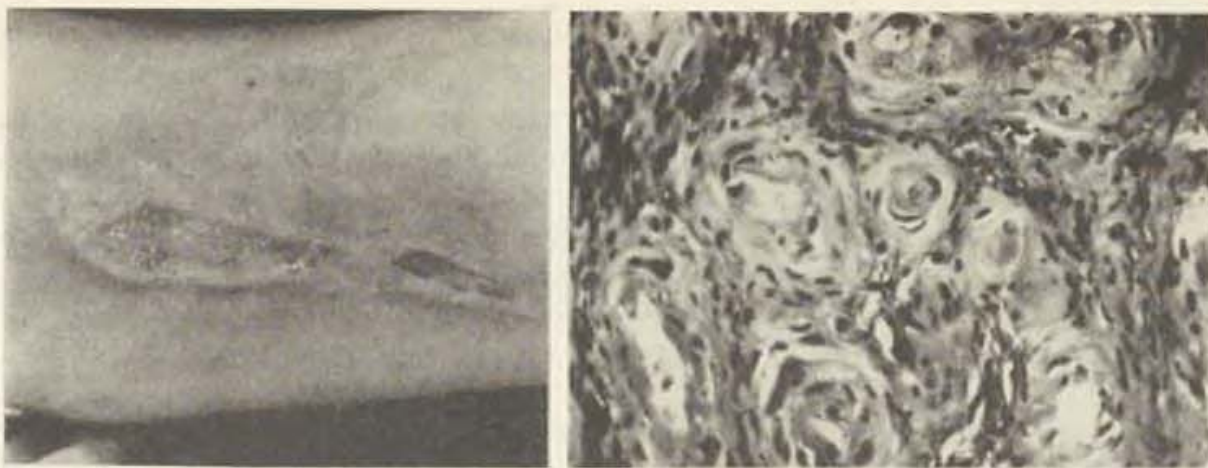


Fig. 12. Granulations of group II with a small degree of acute inflammatory changes (the larger granulation area on the left). Granulations of group II with a larger degree of inflammatory changes — coated (the smaller granulation area on the right). — Fig. 13. Micrograph: Haematoxylin-eosin, obj. x10, oc. x8. Detail of vessels from the granulation tissue of the second group (chronic old granulations). Thickened vessel walls consisting of concentric lamellae. Considerable multiplication of connective tissue. In single places strong hyalinization of vessels can be observed and their lumen is almost occluded

sight. *Other biological conditions* of the rise and development of granulations and of the production of collagen fibres play an important part too. Not even after six months can a more important increase in the collagen connective tissue can be seen at the base of granulations of extensive burns in cachectic patients. On the contrary, if the injury occurs in a place where the skin was cicatrized, the base of the defect is formed by mature collagen connective tissue from the very beginning of the existence of the defect. Granulations develop very slowly in such cases and have a chronic character from the very beginning (the second group).

Besides the amount of mature connective tissue at the base it is also the development of acute inflammation in the upper layers of the granulations that influences the appearance and the properties of the granulations as well as the actual course of the process of granulating.

On the surface of each granulation tissue there are always some exposed cells and for this reason a certain amount of cellular detritus arises under extrinsic influences. This detritus provides a very suitable medium for the growth of microbes. The products of cell destruction along with microbial toxins constitute a permanent source of the mentioned inflammation.

A small degree of acute inflammation does not impair the basic properties of granulations of either the first or the second group in any way. If the inflammation increases, however, their appearance and their advantageous properties, before all the ability to adhere to a free skin graft and the ability of the vessels to grow rapidly through the granulations into the graft are impaired; thus the type of granulations with inflammatory changes arises. In the first group we have observed three forms of granulations with inflammatory



changes. In the second group we have not met with so many variants. In our opinion, this is caused, in the first place, by their structure and their toughness [a large number of collagen fibres]. The character of acute inflammatory changes thus appears to be influenced, to a large extent, by the base, the terrain, in which these inflammatory changes develop.

From the point of view of our results it is wrong to classify granulations into healthy and pathological. This classification is too rough and does not give satisfactory information in which way the granulations are actually changed, pathological processes are taking place in them and in which way the fibroproductive inflammation, which in fact constitutes the process of granulating, is impaired and modified. In our opinion it is equally wrong to use such terms as "feeble granulations", "bacon-like granulations" and the like instead of an accurate analysis and description of the actual appearance of the granulations, because such terms are very broad and may be interpreted in many different ways. Our results confirm the opinions of some authors from this country as well as from abroad [1, 2, 3, 6, 10, 16, 20, 24], in whose works we already find in part the suggested system of granulations. It should be emphasized, however, that both factors, i.e. the accumulation of collagen fibres and the inflammatory changes, do not exhaust all important factors influencing the biological value of granulations but they represent the fundamental and, in traumatic wounds, the most frequent ones.

The diagnosis of the individual types of granulations is usually possible on the basis of a careful clinical observation when the individual properties of the appearance of the granulations are analysed. Classification of the granulations into this systemization informs us about their properties, gives directions for their treatment and suggests the possible results of this treatment. The propounded systemization includes only the main types of granulations. Using a suitable combination and a more detailed graduation of the influence of both factors, i.e. accumulation of collagen fibres at the base and development of acute inflammation in the superficial layers, other types of granulations, as they occur in traumatic defects of otherwise healthy subjects, can be included into the system, if necessary. Thus it is possible to create, e.g. a transitional group I—II of granulations with a small, medium or large degree of acute inflammatory changes (Fig. 1c), or a group of developing granulations of the group I with a larger or smaller degree of acute inflammatory changes and similar.

The suggested scheme of the method of classification and appreciation of granulations in traumatic skin defects is based, in the first place, on clinical observation, further on histological and histochemical findings. In the future, we intend to study the classification of granulations more in detail and support it by biochemical and electro-microscopic findings.

#### CONCLUSION

In traumatic skin defects two main groups, i.e. two main types of granulations should be distinguished in current clinical practice: I. Granulations with a small amount of ripe collagen connective tissue at the base and II. Gra-

nulations with a larger amount of collagen connective tissue at the base. Each of these two groups should be further divided into two subgroups according to the degree of acute inflammation in the superficial layers of the granulations (individual types of granulations). In this way a systemization of granulation tissues arises in which each group and each subgroup has its characteristic appearance and its properties requiring an individual method of treatment and giving different therapeutical results.

We wish to thank assistant pathologist Dr. J. Feit, C.Sc., from the First Institute of Morbid Anatomy, J. E. Purkyně Faculty of Medicine in Brno (Head: Prof. J. Švejda, M.D., D.Sc.), for histological and histochemical examinations of our preparations and for the photomicrographs.

#### S U M M A R Y

It is stated correct appreciation of the appearance of granulations in traumatic skin defects is of great importance for the treatment of these wounds. Much variance and contradiction exists, however, in the differentiation of granulations both in the literature and in clinical practice, which very often unfavourably influences their treatment.

On the basis of observation of more than 100 traumatic granulating wounds in otherwise healthy subjects, out of which 70 were also examined histologically and histochemically, a systematic classification of granulations into two groups according to the amount of collagen at their base is suggested: I. Granulations with a small amount of ripe collagen connective tissue on the base, and II. Granulations with a larger amount of ripe collagen connective tissue at the base. Each group should be further divided into two subgroups according to the degree of acute inflammatory changes in the superficial layers of the granulations, namely 1. Granulations with a moderate degree of acute inflammatory changes, and 2. Granulations with a larger degree of acute inflammatory changes. In this way a certain systemization of the basic types of granulation tissues and, along with it, a certain systemization of types of fibrinoproduktive inflammations in traumatic skin defects of otherwise healthy subjects arises.

Classification of granulations in this systemization gives information about their properties, determines the method of their treatment and suggests also the possible results of treatment. Determination of the kinds and types of granulations in clinical practice is nearly always possible if the individual properties of their appearance are analysed. Unclear terms such as "weak granulations", "bacon-like granulations" and the like should be avoided.

The individual types of granulations are described and discussed in detail.

#### R É S U M É

#### **Les types des granulations dans des défauts cutanés en suite des traumatismes et leur systématique**

J. S a m o h ý l

L'auteur signale l'importance d'une classification précise de l'aspect des granulations dans des défauts cutanés traumatiques quand à la thérapie de ces plaies. Et pourtant c'est cette classification des bourbons charnus qui montre des différences

et des incertitudes dans la littérature et dans la clinique ce qui exerce souvent une influence fatale à leur thérapie.

Grâce à l'examen de plus de 100 cas des plaies traumatiques en état de granulation chez des individus sains, dont on a pratiqué des épreuves histologiques et histochimiques dans 70 des cas, l'auteur propose la classification des granulations suivant la quantité du collagène dans leur lit en deux groupes:

I. Le tissu granuleux comportant une petite quantité du collagène mûr dans le lit de la plaie.

II. Le tissu granuleux comportant une grande quantité du collagène mûr.

Chacun de ces groupes doit en plus être divisé en deux sousgroupes quand au degrés des changements d'inflammation aiguë dans les couches superficielles du tissu granuleux.

a: les changements inflammatoires sont d'un degré peu exprimé

b: le degré des changements inflammatoires est considérable.

Voici comment une systématique certaine des types fondamentaux des tissus granuleux vient de se former et, en même temps, on obtient la classification des types des inflammations fibroproductives dans des défauts cutanés traumatiques des personnes autrement saines.

La classification des granulations dans cette systématique nous procure des informations sur leur caractère, montre la possibilité de leur thérapie et nous permet de prédire les résultats probables de cette thérapie. La classification des types et des sortes du tissu granuleux n'est point impossible dans la clinique du moment qu'on soumet à l'analyse les qualités respectives de leur apparence. Mais il faut éviter des termes inexacts tels que: «les bourbons charnus inertes, de consistance du lard» et autres.

Dans l'article on donne une description précise des types des granulations et on en discute largement l'apparence.

## ZUSAMMENFASSUNG

### Granulationstypen bei traumatischen Hautdefekten und ihre Systematik

J. Samohýl

Der Verfasser konstatiert, dass einer richtigen Bewertung der Granulation bei traumatischen Hautdefekten eine grosse Bedeutung für die Behandlung dieser Wunden zukommt. Beim unterscheiden der Granulationen gibt es jedoch in der Literatur und klinischer Praxis eine Reihe von Widersprüchen und Unklarheiten, was sich häufig sehr nachteilig auf die Behandlung auswirkt.

Auf Grund der Beobachtungen von über 100 traumatischen granulierenden Wunden bei sonst gesunden Personen -- 70 Wunden wurden histologisch und histochemisch untersucht -- schlägt der Verfasser eine konsequente Einteilung der Granulationen nach der Menge von Kollagen auf der Wundfläche vor: I. Gruppe -- Granulationen mit geringen Mengen ausgereiften kollagenen Bindegewebes auf der Basis der Wundfläche, II. Gruppe -- Granulationen mit grösseren Mengen ausgereiften kollagenen Bindegewebes auf der Basis der Wundfläche. Jede Gruppe ist weiterhin in zwei Untergruppen nach dem Grad der akuten entzündlichen Veränderungen in den Oberflächenschichten der Granulationen einzuteilen: 1. Untergruppe mit mässig akut-entzündlichen Veränderungen und 2. Untergruppe mit höhergradigen akutentzündlichen Veränderungen. So wird eine bestimmte Systematik der Grundtypen von Granulationsgewebe aufgestellt und zugleich damit eigentlich auch die Typen der fibroproduktiven Entzündungen in traumatischen Hautdefekten bei sonst gesunden Personen klassifiziert.





Die Einordnung der Granulationen in diese Systematik informiert über ihre Eigenschaften, weist auf die richtige Art der Behandlung hin und deutet auch das eventuelle Behandlungsergebnis an. Die Bestimmung der Granulationsarten und — typen ist in der klinischen Praxis nur möglich, wenn die Einzelheiten ihres Aussehens analysiert werden. Es sollten jedoch unklare Termine vermieden werden, wie „schwache Granulation“, „speckartige Granulation“ usw.

Die einzelnen Granulationstypen werden in der vorliegenden Arbeit eingehend beschrieben und diskutiert.

## RESUMEN

### Los tipos de granulación en los defectos cutáneos por accidentes y su sistemática

J. Samohýl

Se hace constar que la correcta valorización del aspecto de la granulación en los defectos cutáneos por accidentes, tiene un gran valor en el tratamiento de estas heridas. En la diferenciación de las granulaciones existe, sin embargo, en la literatura y en la práctica clínica, una serie de diferencias y de incertidumbres, que muchas veces tienen una influencia desfavorable sobre su tratamiento. —

En base de la observación de mas de 100 heridas por accidentes en personas sanas, de las cuales 70 fueron examinadas histológica — y histoquímicamente, se recomienda una división adecuada de las granulaciones por la cantidad de colágena en su base, en dos grupos: I. la granulación con pequeña cantidad en su base de tejido conjuntivo colagenoso maduro, II. la granulación con mayor cantidad en su base de tejido conjuntivo colagenoso maduro. Cada grupo es necesario dividirlo seguidamente en dos subgrupos, según el grado de los cambios inflamatorios agudos, en las capas superficiales de la granulación: 1. con poco grado de cambios inflamatorios, 2. con mayor grado de cambios inflamatorios agudos. Así surge una sistemática que determina los tipos básicos de tejidos granulatorios y al mismo tiempo especialmente los tipos de inflamaciones fibroproductivas en los defectos cutáneos por accidentes en personas sanas. —

La inclusión de las granulaciones en la sistemática informa sobre sus propiedades, determina el modo de su tratamiento y señala también los posibles resultados del tratamiento. La determinación de las especies y los tipos de granulación es posible siempre en la práctica clínica, si se analizan las propiedades específicas de su aspecto. Es necesario, sin embargo, evitar los términos no muy claros como que son „granulaciones flojas“, o „granulaciones como tocino“, etc. —

Los tipos específicos de granulaciones se explican y discuten detalladamente. —

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## XV. Congress of Czechoslovak Surgeons

The XV. Congress of the Czechoslovak Surgeons, with international participation organized by the Surgical Section of the Czechoslovak Medical Society, J. E. Purkyně will be held on September 3 through September 6, 1968 in Prague, Czechoslovakia.

Themes of the Congress: 1. Pathophysiology and Therapy of Post-operative Period. — 2. Portal Hypertension.

The Congress includes the Symposium of the Czechoslovak Association of Plastic Surgeons with the following program: 1. Pathophysiology of Free Skin Grafting. — 2. Pathophysiology of Flap Grafting.

For any further information write kindly to: Czechoslovak Medical Society, J. E. Purkyně, Sokolská 31, Prague, Czechoslovakia.

## The Yugoslav Association for Plastic and Maxillofacial Surgery

On May 18th through May 19th 1968 in Maribor, Yugoslavia will be held The Third Yugoslav Congress for Plastic and Maxillofacial Surgery — with International Participation.

The program of the Congress includes: Scientific Symposium on Cleft Lip and Palate, Scientific Symposium on Burns, Reconstructive Surgery of Extremities, Free Themes, Assembly of the National Association.

All information at the General Secretary of the Congress: Dr. Zora Janžekovič, Splošna bolnica, Maribor, Yugoslavia.

Clinic of Radiology, Medical Faculty, Charles University, Prague (Czechoslovakia)

Director: Prof. V. Šváb, M.D., D.Sc.

Clinic of Plastic Surgery, Medical Faculty of Hygiene, Charles University,

Prague (Czechoslovakia)

Director: Prof. V. Karfík, M.D., D.Sc.

Clinic of Dermatology, Medical Faculty, Charles University, Prague (Czechoslovakia)

Director: Prof. J. Obrtel, M.D., D.Sc.

## BONE CHANGES IN OCCUPATIONAL RADIODERMATITIS

J. KOLÁŘ, R. VRABEC, L. JIRÁSEK, V. BEK, H. PEŠKOVÁ

The task of specialists, in the first place plastic surgeons and dermatologists, who take care of patients with occupational skin changes caused by ionizing radiation is not finished by making a diagnosis and treating the damaged skin. In these patients the tissue damage is usually more complex and not confined to the skin alone. The subcutaneous tissues are always changed as well. There are changes in the vessels running through the irradiated region and bone changes are not rare, either. In their detection, in the first place, systematic cooperation with a roentgenologist is of importance. The attention of the radiologists has already been drawn to the fact that chronic occupational skin changes may be accompanied by bone changes too (Kolář et al. 1965). Before the present authors only Grinberg and Orlova (1961) complemented the examination of 100 patients with skin damage caused by radiation of occupational origin by roentgenograms of the hands. Changes were found in 32 of them. Their first manifestations were detected after at least 5 years' exposure; this number, however, increased more markedly only after 10 years' exposure. They were all cases of hypertrophic osteoporosis. It is of interest that only 14 subjects showed skin changes of some importance as well; in the others the finding was a minimum. This finding is in keeping with the results of our studies on the effect of radiation on the skeletal system (Kolář et al. 1965) showing that bone changes produced by radiation may be often found in cases of intact skin. The resistance of bones to repeated irradiation by small doses of ionizing radiations is thus obviously smaller than the tolerance of the skin in the same region.

In the actual systematic studies of bone changes in those working with radiation sources we used the abundant clinical material of the Department of Plastic Surgery and the Second Department of Dermatology, Charles University in Prague, in which the treatment of patients with occupational skin changes is concentrated. Directed examination of all patients suffering from at least the second or a higher degree of radiation skin changes was carried out. In this way we obtained a survey of a whole range of roentgenologically detectable



bone changes which enabled us to suggest their classification (Kolář, Jirásek and Vrabec, 1965). In this communication we present an estimation of the importance of individual forms of bone changes for therapeutic procedures in patients with occupational radiodermatitis.

Up to this day we have examined a total of 84 patients with positive findings in the bones. They are physicians and laboratory technicians working with different kinds of ionizing radiation (in most cases X-ray apparatuses). All of them showed chronic radiation changes in the skin, i.e. atrophy, teleangiectasia, fissures, erosions and ulcerations, hyperkeratosis, and in more than 80% of the patients there were even malignant changes. All findings without exception were verified histologically. In our patients physicians predominate who worked with radiation sources only occasionally (surgeons, internists, phthisiologists, stomatologists). Only 4 of them are radiologists and 6 of the laboratory technicians worked with open radioactive emitters. Most of the patients have been in contact with radiation for more than 20 years. The shortest time of exposure was 7 years in one of the surgeons.

The study showed, in correspondence with general radiobiological knowledge, that practically no differences exist between bone changes as far as the kind of ionizing radiation provoking them is concerned (X-rays, isotopes, natural radioactive elements). The findings may be classified as follows:

#### *1. Rebuilding of the Bone Structure*

It is the basic finding occurring in all the other forms. It does not differ in any way from the rebuilding changes caused in the patients by therapeutic irradiation. It is accompanied by osteoporosis (Fig. 1) which is more marked at the ends of the tubular bones of the hand, especially in the phalanges. The proper rebuilding changes occur, according to our experience, first in the distal and medial phalanges, then in the basal ones and only in a considerably advanced stage also at the ends of the metacarpals. The progressive development from the periphery in the proximal direction is in agreement with the seriousness of skin changes in these patients which reaches its maximum at the periphery of the digits. The basic features of the rebuilding (Figs. 1 and 2) are those of hypertrophic osteoporosis: the compact bone in the phalanges is usually thinned out by planar retreat from the medullary cavity and even shredded up into foils in some cases. Some of the trabeculae of the spongiosa are pulled down, the remaining ones give the impression of being thickened against the rarified surroundings, or they are really thickened by apposition of the bone. In this way the framework is emphasized in the directions of the main mechanical load. Some trabeculae may be thickened by a more extensive active new-formation of the bone which may even result in the picture of focal sclerosis. The complex of these changes both clinically and roentgenologically resembles the changes characteristic of the atrophic stage of Sudeck's syndrome. Cystoid rarefaction and rebuilding have been found only with a few patients, along with arthritic changes (Fig. 2). These foci are localized beneath the cartilage in the articular ends of the phalanges. They are often reminiscent of the findings in sarcoidosis (ostitis multiplex cystoides Jüngling).

## *2. Osteolysis of the Phalanges*

This finding of insidiously progressive osteolysis has been found in nine patients. Finding in Fig. 3 shows an already considerably advanced example of this type of changes. It is not osteolysis resulting from osteomyelitis. In the less conspicuous forms the first manifestations occur in the ungual tuberosity of the distal phalanx of the digit which gradually narrows and finally results in concentric atrophy and drop-shaped narrowing of the phalanx towards the periphery or in its complete lysis. The atrophy gradually extends also to the middle phalanx. The general picture resembles the findings in Raynaud's syndrome and sclerodermia. In all patients this bone finding was associated with marked atrophy of skin damaged by radiation and with severe changes in the nail matrices with complete absence of nails. The patients usually show various degrees of disturbance in the blood supply of the digits, atrophy of the skin and the subcutaneous region. In the woman patient shown in Fig. 3 the maximum of these changes was observed in the III—V digit and they strikingly resembled Raynaud's syndrome. This disorder, however, was excluded by detailed clinical and laboratory tests while skin and vascular changes due to radiation were confirmed histologically.

## *3. Changes in the Joints*

These changes are not only interesting but also important for practical reasons. As a rule, they are found in cases of high degree occupational damage, i.e. those with advanced atrophy, ulcerations and hyperkeratoses of radiation origin. Radiation-conditioned arthritis was pointed at as early as in 1959 (Kolář and Vrabec) and still later an analysis of the observation of several tens of patients was published (Kolář et al., 1965). It is a slowly progressing eroding arthritis which in patients after therapeutic irradiation, usually affects one single joint, namely that one which was situated in the irradiated field. In occupational damage of the hands interphalangeal joints are affected, frequently polytopically. In the X-ray picture the first X-ray signs consist in marginal erosions on the edges of the articular surfaces (Fig. 2) which gradually become more extensive and finally reach the picture of advanced eroding arthritis with destruction of the articular surface, narrowing to extinction of articular spaces and secondary changes such as subluxations in the affected joints and the like (Fig. 4). It is an insidious process accompanied by pain in the affected joints but without suppuration. Only when infection passes to the affected joint (e.g. from a skin fissure or ulceration) may suppurative arthritis develop.

## *4. Bone Destruction*

They are the most serious finding. They may be conditioned by an inflammatory complication which usually originates from infected ulcerations and rhagades in the skin and leads to bone paronychia. Another cause may be invasion of the bone by a tumorous process conditioned by radiation. So far only two cases of occupational primary bone tumour of the digits from external

irradiation have been reported in world literature. Tumorous bone processes after ingestion of radioactive substances with internal contamination are more frequent. They do not belong, however, to the group of changes discussed here because they are not caused by radiation from the outside. For this reason they are not accompanied by radiation skin changes, or at least not always, and the bone changes are usually localized outside the upper extremities, i.e. in the axial and facial skeleton and the like. In our patients we could repeatedly confirm roentgenologically invasion of skin carcinoma into the bones of the hands on malignant change in X-ray dermatitis (Fig. 5). It manifests itself by osteolysis gradually progressing from the outside leading to complete destruction of the affected bone.

## DISCUSSION

The number of positive bone findings in patients with occupational X-ray and radiodermatitis is surprisingly large in our material. It is not only because they were selected patients with an advanced degree of skin damage (second and higher degree) but also because systematic X-ray examinations performed for several years made possible a correct diagnosis of the bone changes, follow-up of the dynamics of their development, detection of their relation to the occupational radiation load and thus also evaluation of their importance for the prognosis of the disease.

As to the etiology of these bone changes a decisive role is undoubtedly played by the direct effect of ionizing radiation. This is also suggested unambiguously by findings in the skin and the subcutaneous region. Of course, there may be a larger number of supporting factors and they may modify the course of the bone changes. The basic process of rebuilding is provoked by ionizing radiation although its doses may be small individual doses. The total dose absorbed in the bone, however, reaches high values in the course of the long years of work with radiation sources. Unfortunately, the character of the work does not permit even an approximate estimation of this dose in these patients. It may be presumed, however, that in a number of patients this load reaches values up to tens of thousands of R because the primary radiation evokes considerable additional secondary radiation in the bones. Ionizing radiation provokes gradual death of cells in the bones and in this way it induces atrophy of the bone tissue. This is also abundantly assisted by the restrained nutrition of the bone caused by the damage to its vessels. This mechanism is demonstrated by the fact that high degree bone changes can be found in patients with marked atrophy of the skin and the subcutaneous regions. Also in patients with osteolysis it is cyanosis, changes in the temperature of the skin and the degree of blood supply to the peripheral parts of the digits in radiodermatitis which suggest that a disturbance in the vascular supply has occurred affecting not only the skin but also the bone. The existence of vascular changes in these patients can be verified also histologically and intra vitam also by arteriography of the extremities.



In arthritis too, we suspect a common pathogenic radiation and vascular factor. In some cases of arthritis, however, also mitigated infection carried secondarily into deeper tissues and joint structures changed by radiation is probably a factor. The localization of the process is doubtlessly determined by the degree of alteration caused by radiation. For this reason the process is always limited to the joint which has been affected by a direct beam of radiation. Owing to the limited area of irradiation fields in X-ray therapy the process is usually monoarticular. On the other hand, in occupational damage polyarticular occurrence is not rare. A source of bacterial germs is not difficult to find in the surroundings of the joint in these patients. Fissures, rhagades and ulcerations are always contaminated with bacteria in radiodermatitis. On transmission of a virulent infection into the joint even suppurative arthritis may develop the clinical picture of which does not differ from arthritis of other etiology. In our series, however, this was not a frequent finding.

What is the importance of the described bone changes for the therapy of occupational damage induced by radiation on the skin? The complex of the above mentioned bone findings shows that examination of the condition of the bone system should be the rule in all patients before indication for treatment, especially a radical operation, is made. The described processes of rebuilding are a necessary concomitant process in the bones following the action of higher doses of radiation. In our opinion, they do not essentially change either the method of operation or the prognosis of the surgical treatment if they are uncomplicated. In acral osteolysis they greatly depend on its degree and on the condition of vascular supply of the affected digits. In less important and slowly progressing degrees it may be expected that healing of skin grafts will take a favourable course (Pešková, 1960) and that an improved skin cover will beneficially influence the nutrition of the deeper tissues. Such advanced findings as shown in Fig. 3 together with clinical signs of insufficiency of the arterial supply are usually a manifestation of a serious disturbance and the number of cases in which the plastic surgeon is obliged to perform amputation of heavily damaged phalanges is steadily increasing.

In arthritis too, the prognosis depends on the tendency of development and the advancement of changes. Extensive destruction of still uncomplicated arthritis does not require amputation and neither is it an obstacle to plastic substitution of the skin; on the contrary, this transplantation effects beneficially further development of skin and joint changes due to the removal of infected areas by excision. Of course, in more extensive destructions a complete relief of joint complaints of the patient cannot be hoped for even after a successful plastic skin operation; these complaints persist until stabilization — usually in the form of ankylosis. Specific therapy of joint changes is not known. In peripheral and continuously troublesome and painful arthritis with more extensive destructions amputation is the only method even in cases when the result of the skin operation was otherwise satisfactory.

In the last category of changes — the primary or secondary tumour in irradiated bones — amputation performed in the shortest possible time is the

only solution, because high malignancy, especially of spinocellular carcinomas on the basis of radiation damage to the skin is generally well known. A high tendency to malignant changes and metastases in advanced occupational dermatitis has repeatedly been confirmed from many sides (Kolář et al., 1964) and calls for a consistent preventive care of these patients.

Examination of patients with occupational skin changes of an advanced degree by a radiogram of the affected area (i.e. most often the hands) is thus considered to be inevitable in all patients as a part of pre-operative care and examination. The knowledge obtained by this investigation may sometimes fundamentally change the view of the situation in which the choice of the therapeutic method is decided upon.

#### SUMMARY

Bone changes in 84 patients with occupational damage to the skin caused by radiation were evaluated and their classification given. These bone changes induced by a direct effect of irradiation of the bone and secondarily by restriction of nutrition of the bones due to damage to the vessels by radiation may be of serious importance for therapy, especially for plastic surgical operations. Investigation of the condition of the bones in the damaged area should thus be considered an indispensable part of pre-operative examination in these patients.

#### RÉSUMÉ

##### **Les changements osseux en suite des radiodermatites professionnelles**

J. Kolář, R. Vrabec, L. Jirásek, V. Bek, H. Pešková

Les auteurs présentent la qualification des changements osseux chez 84 des malades atteints des endommagements de la peau par les rayons X et en donnent la classification respective. Ces changements osseux en tant que suite d'une irradiation directe de l'os lui-même et, en surplus, par la diminution secondaire de la nutrition faite de l'endommagement des vaisseaux par cette irradiation, peuvent influencer fondamentellement la solution par l'intervention surtout chirurgicale en plastie respective. Les données sur l'état général du tissu osseux de la région endommagée présentent alors une partie fondamentale des examens préopératoires des malades en question.

#### ZUSAMMENFASSUNG

##### **Knochenveränderungen bei professioneller Radiodermatitis**

J. Kolář, R. Vrabec, L. Jirásek, V. Bek, H. Pešková

Die Verfasser beurteilen die Knochenveränderungen bei 84 Kranken mit durch Strahlung hervorgerufenen professionellen Hautschäden und klassifizieren sie. Diese Knochenveränderungen sind einerseits durch direktes Einwirken der Strahlung auf das Skelett, andererseits sekundär durch Schädigung der Gefäße infolge Strahlung und dadurch hervorgerufene Verschlechterung der Knochenernährung bedingt und können für die Behandlungsweise, vor allem die plastisch-chirurgische, von grösser Tragweite sein. Die Beurteilung der Knochen im geschädigten Bereich ist daher als unerlässlicher Bestandteil der voroperativen Untersuchung dieser Patienten zu betrachten.

## RESUMEN

### Las modificaciones óseas en las radio-dermatitis de la profesión

J. Kolář, R. Vrabec, L. Jirásek, V. Bek, H. Pešková

Los autores aprecian las modificaciones óseas en 84 enfermos de afecciones de la piel producidas por las radiaciones y presentan su clasificación. —

Estos cambios óseos ocasionados por influencia de las radiaciones sobre los huesos y también secundariamente debido a la limitación nutritiva del hueso por el daño de las radiaciones sobre los vasos sanguíneos, pueden tener un grave significado para la solución curativa, especialmente plástico-quirúrgica. Por eso el examen del estado de los huesos en la región afectada es necesario considerarlo en estos enfermos como una parte indispensable del examen previo, antes de la operación. —

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### The Transplantation Society — Second International Congress

The Second International Congress of The Transplantation Society will be held in New York City in September 1968.

The Conference Organization Committee invites individuals and groups to submit abstracts of research concerning all problems of tissue and organ transplantation. The deadline for post-marked submission of abstracts to the Office of the Conference will be May 1, 1968.

The Address of the Congress Secretariat is as follows: Felix T. Rapaport, M. D. New York University Medical Center, 560, First Avenue, New York, N. Y. 10016, USA.

### Maytag - McCahill Fellowship for Postgraduate Training in Plastic Surgery

Doctor Ralph Millard announces the Maytag - McCahill Fellowship for postgraduate training in plastic surgery at the University of Miami School of Medicine. Any surgeon who has completed his formal training in plastic surgery at a recognized center and who can obtain a high recommendation from his Chief is eligible to apply. He must have a reasonably good command of the English language. The fellowship extends over a three — four months period with a monthly stipend of 500 US Dollars.

Signed: D. Ralph Millard, Jr., M.D., F.A.C.S., 2121, Biscayne Boulevard, Miami, Florida 33137, U.S.A.



J. Kolár, R. Vrabec, L. Jirásek, V. Bek, H. Pešková

BONE CHANGES IN OCCUPATIONAL RADIODERMATITIS



Fig. 1. Hypertrophic porosis, bone atrophy and focal sclerosis of an advanced degree in the digits of both hands, more pronounced on the left. Proximally, the changes reach up to the heads of the metacarpuses. — Fig. 2. Hypertrophic porosis of all phalanges with focal pseudocystic rebuilding changes in the region of the joints and with minute arthritic marginal erosions.

Fig. 3. Acral osteolysis of the III to V digit affecting the terminal phalanges

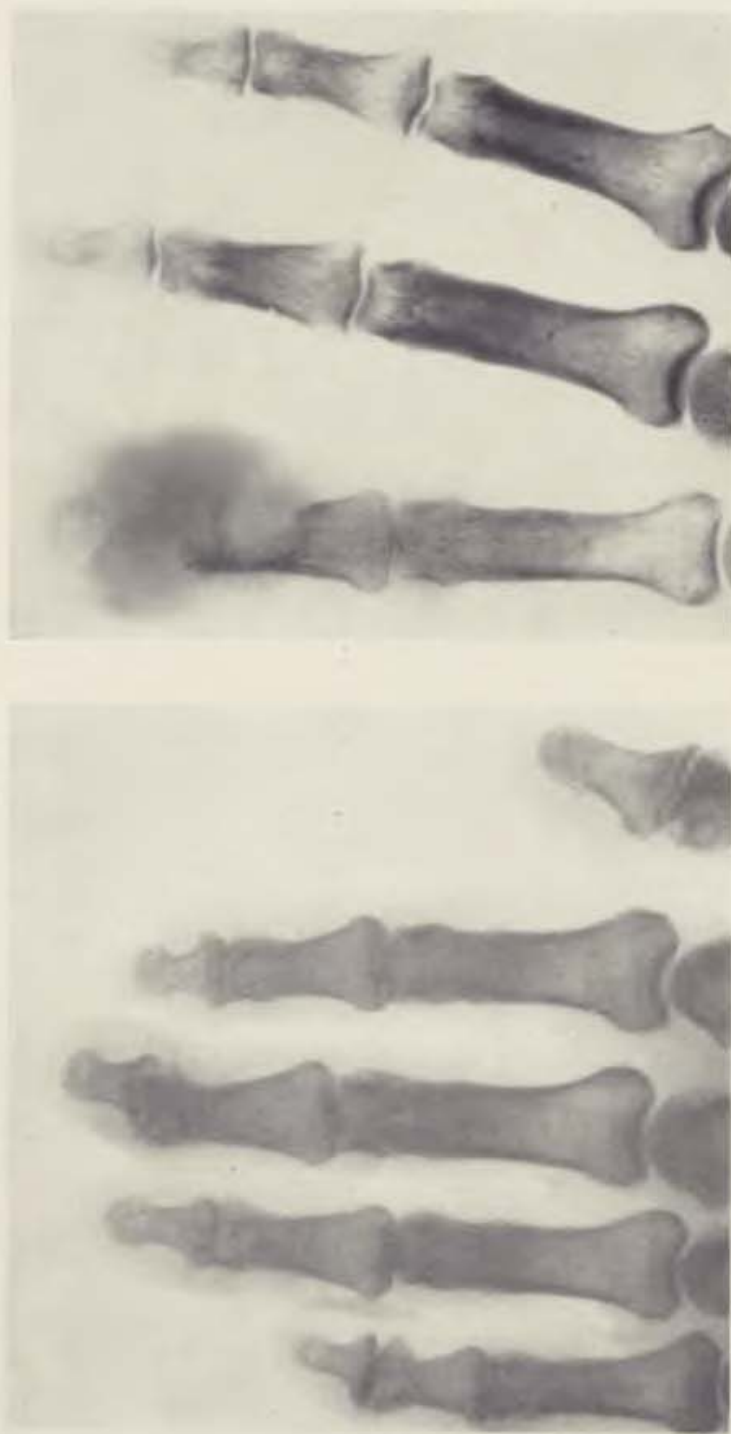


Fig. 4. Marked destructive arthritis of the terminal interphalangeal joints of the II to V digits with subluxation in the III digit. The other rebuilding changes are still of a limited degree. — Fig. 5. Destruction of the terminal and middle phalanx of the little finger in a patient with spinocellular carcinoma in X-ray dermatitis following invasion of the tumour into the depth

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