

# ACTA CHIRURGIAE PLASTICAE



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INTERNATIONAL JOURNAL  
OF PLASTIC SURGERY

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14·2

1972

Acta chir. plast. 14, 1972, No. 2

AVICENUM - CZECHOSLOVAK MEDICAL PRESS  
PRAGUE

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Published four times (in 1959: two times) a year by Avicenum — Czechoslovak Medical Press, Malostranské nám. 28, Praha 1. Editor in Chief Prof. Dr. H. Pešková; Deputy of Editor in Chief Prof. Dr. V. Karfík. — Address of the editorial office: Acta chirurgiae plasticae [R. Vrabec, M. D. — Secretary] Legerova 63, Praha 2, Czechoslovakia. — Orders through ARTIA, Smečky 30, Praha 1. — Press: Středočeské tiskárny, n. p., provoz 01, Hálkova 2, Praha 2

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## STUDIES ON THE VARIABILITY OF THE MAXILLA

V. MICHÁLEK

Studies on the varieties of the maxilla and on the incidence of microforms of cleft (Burian 1961) are of importance for solving the problem of cleft formations.

Data already previously worked out by the Institute of Anatomy at the Faculty of Medicine in Brno were used for studies of the variability of maxilla. The results of these observations disclose a considerable variability of the maxilla. The incidence of cleft microforms in our previous generations can be — as far as some signs are concerned — compared with the data by Tolarová (1967) which follow up microforms in the present generation.

### MATERIAL AND METHODS

Our report is based on two kinds of data. The data on our own observations and those compiled by authors who already previously studied the varieties of the maxilla. They were gained from reports by Augier (1931), Bardeleben (1896) and Martin and Saller (1959). The entire conception and division was taken over from the monograph by Augier (l.c.) on skull bones and it was supplemented by some measurements according to Martin and Saller (l.c.). The studies were carried out on 465 skulls originating from the charnel house of the church in Mikulov; skulls of adult individuals of both sexes originating from the 17th century which now form part of the osteologic collection at the Institute of Anatomy, Faculty of Medicine in Brno.

Because some skulls were damaged, it was not possible to study a specific sign in all of them; for this reason it was stated with each sign in how many cases it was studied.

#### The Metric Signs Are:

- length of the palate
- width of the palate



- distance of foramen infraorbitale from the edge of the apertura piriformis and the lower border of orbita.

The Morphologic Signs Are:

I. *Facies anterior*:

1. Type apertura piriformis
2. Fossa- sulcus praenasalis
3. Foramen infraorbitale
4. Spina nasalis anterior
5. Fossa canina

II. *Palatum durum*:

6. Torus palatinus
7. Type sutura palatina transversa
8. Sutura incisiva
9. Sutura paramedialis (palatina longitudinalis lat.)
10. Sutura endomesognathica
11. Sutura intermaxillaris

III. *Clefts of the jaw and palate and their microforms*:

12. Incidence of cleft
13. High, gothic palate
14. Assymetry of apertura piriformis
15. Cleft of spina nasalis anterior
16. Cleft of spina nasalis posterior

Observations and Results of Studies of Maxillary Varieties

Similarly to other bones, maxilla undergoes different varieties. These varieties are either caused by malformations of the facial rudiments or by changes of osteogenetic origin (Augier, l.c.). The following varieties caused by malformations of the embryonic face were observed:

A. Clefts of genetic group I. and II. according to Fogh-Andersen (1942) were not ascertained in our material (456 skulls) even in a single case. Of cleft microforms were observed: cleft spina nasalis anterior, spina nasalis posterior, high gothic palate and assymetry of apertura piriformis.

Cleft spina nasalis anterior was ascertained in our group in 14 cases, i.e. 3,01%. Martin and Saller (l.c.) report doubling in 4,7% (tubercula nasalis). Fig. 1.

Cleft spina nasalis posterior (Fig. 2) was observed in 19 cases, i.e. in 4,08%. Simultaneous cleft of spina nasalis anterior and spina nasalis posterior was observed in 5 cases i.e. 0,93%.

High and gothic palate, i.e. a palate with index height of less than 2 was observed in a group of 387 skulls in 12 cases, i.e. in 3,1%.

Tolarová (l.c.) reports and incidence of high and gothic palate in 10,1% in the present generation of adults aged 18—21 years, this being considerably

more than in our material. This fact may lead to the belief that simultaneously with the increasing number of individuals affected with clefts, the number of microforms of cleft rises too.

Congenital assymetry of the apertura piriformis was ascertained in the group of 387 skulls in 5 cases, i.e. in 1,2% (Fig. 3).

#### B. The shape of apertura piriformis

According to Martin and Saller [l.c.] the apertura piriformis was divided into five types. In the first type, spina nasalis anterior is not marked. In the second type it protrudes slightly (1 mm). The third type forms a tip protruding approx. 2 mm. The fourth type protrudes up to 4 mm and the fifth type protrudes by more than 4 mm.

The individual types occurred in the following incidence: Of 382 skulls there were of type

I. 83 i.e. 22,0%	III. 88 i.e. 23,0%
II. 171 i.e. 45,0%	IV. 30 i.e. 7,5%
V. 10 i.e. 2,5%	

Martin and Saller [l.c.] quote the statement by Hamy on the length of spina nasalis anterior:

orthognathic Europeans . . . . .	5,5 mm	Mongols . . . . .	4,0 mm
prognathic Europeanas . . . . .	4,0 mm	Negroes . . . . .	2,6 mm

C. According to the same authors, regio praenasalis was divided into four forms:

- the anthropinic form has no depression on the bottom rim of apertura piriformis (Fig. 4)
- the infantile form has an insignificant depression — width up to 2 mm (Fig. 5)
- form III has a visible fossa, fossa praenasalis (Fig. 6)
- form IV. manifests two grooves, sulci praenasales, which descend alongside into the bottom edge of apertura piriformis (Fig. 7).

Tab. I

	I.	II.	III.	Irregular
Germans from Eastern Prussia	19,3 %	65,8 %	10,8 %	4,0 %
Melanesians	40,3 %	47,3 %	5,5 %	6,0 %
Chinese	50,0 %	32,0 %	15,0 %	—
Italians	20,4 %	72,2 %	7,4 %	—
Ancient Egyptians	37,5 %	50,0 %	12,5 %	—
Eskimos	6,2 %	54,2 %	20,8 %	—
Germans from Bavaria	8,6 %	73,2 %	18,2 %	—
In our material there was the following incidence	28,5 %	45,7 %	16,2 %	8,3 %

The individual forms occurred at the following incidence:

— infantile form . . . . .	12,6%	— fossa praenasalis . . . . .	21,8%
— anthropic form . . . . .	50,6%	— sulcus praenasalis . . . . .	15,0%

Martin and Saller (l.c.) state the following incidence of fossa praenasalis:

— Germans from the region of Bavaria . . . . .	5,5%
— French . . . . .	4,0%
— Urals from the Altai region . . . . .	18,7%
— Europeans I. series . . . . .	12,0%
— Europeans II. series . . . . .	5,0%

Fossa praenasalis occurred in the skulls from Mikulov at the relatively high number of 21,7%. Even a small deepening of greater width than 2 mm was considered as a fossa.

Sulcus praenasalis occurs in 15,0%, i.e. much more frequently than 5,6% stated by Mingazini (as quoted by Martin and Saller, 1959). Even marks of sulcus were considered as actual sulcus.

D. Fossa canina was divided according to size into five groups:

- I. missing altogether
- II. indeterminately formed
- III.—V. degrees according to depth

On the skull of the Asiatic-American races and in the Neanderthal man, we find shallowness up to a condition when fossa canina is altogether missing (quoted Dzierzykray-Rogalski T., and Modrzewska 1955, Roginskij and Levin 1955). Measurements were carried out on 473 skulls.

I. — 1 . . . . .	0,2%	III. + 84 . . . . .	17,7%
II. ± 15 . . . . .	3,1%	IV. ++ 291 . . . . .	61,6%
		V. +++ 82 . . . . .	17,4%

E. Foramen infraorbitale was studied on 465 skulls. The shape was either oval or slit or varied between both (312 cases i.e. 67,8%). Circular shape was observed in 153 cases, i.e. 32,2%. Multiple orifice canalis infraorbitalis occurred in the following incidence (Fig. 8):

- double orifice: 23 cases on the right
- 19 cases on the left
- 11 cases bilateral
- triple orifice: 2 cases (one bilateral one leftsided).

We measured the distance of foramen infraorbitale from the lower end of orbita and from the nearest edge of incisura nasalis by means of dividers. Both these edges are palpative on alive man.

The following results were obtained: the smallest distance of foramen infraorbitale from the lower edge of the orbita was 3 mm, the largest 16,0 mm.

This is a rather wide span. Most often however, the following distances occurred:

7 mm	118 cases i.e.	30,1%	6 mm	64 cases i.e.	16,3%
8 mm	106 cases i.e.	27,0%	10 mm	53 cases i.e.	13,5%
9 mm	51 cases i.e.	13,1%			

of the total number of 392 skulls.

Distance from incisura nasalis:

the smallest distance from incisura nasalis was 11 mm, the greatest 25 mm.

The following distances occurred most frequently:

17 mm	110 cases i.e.	31,7%	20 mm	76 cases i.e.	21,9%
18 mm	98 cases i.e.	27,6%	19 mm	68 cases i.e.	18,8%

of the total number of 352 skulls.

It may be summed up that foramen infraorbitale is mostly placed at a distance of 7 or 8 mm from the lower orbital rim and 17 or 18 mm from the incisura nasalis.

Studies were furthermore carried out on the position of the foramen infraorbitale in consideration of the maxillary teeth. From 452 skulls the following results were obtained:

P <sub>1</sub>	108 cases i.e.	24,0%
P <sub>2</sub>	338 cases i.e.	75,0%
M <sub>1</sub>	6 cases i.e.	1,0%

Most often foramen infraorbitale was in P<sub>2</sub> or less frequently above P<sub>1</sub> and only very rarely above M<sub>1</sub>.

These data are of special significance for regional anaesthesia of n. infraorbitalis. Šícha (1962) quotes Černý and Neuwirt and states the distance of foramen infraorbitale below margo infraorbitalis at 5—7 mm on the line connecting the mesial corner of the central incisor with sutura zygomatico-frontalis. In consideration of the teeth he states the position of the foramen infraorbitale in line above the first praemolar. Švejda (1967) states that foramen infraorbitale is placed approx. 5 mm below the lower border of the orbita, approximately in its center.

The following varieties caused by changes of osteogenetic origin were observed:

A. Sutura infraorbitalis as the remainder of the original plurality of the maxilla protrudes upwards from foramen infraorbitale over pars orbitalis maxillaris aditus ad orbitam and proceeds towards facies orbitalis corporis maxillae. It consists therefore of two parts, the facial and the orbital part. Either both are maintained and form an uninterrupted rest of the suture passing from the facial part into orbita or only some part remains intact. Martin and Saller (l.c.) report 20—40% of the rest of this suture on the facial part and 40—60% on the orbital part.

The results gained in Mikulov also agree with these measurements: 30,0% in the facial part, 48,0% in the orbital part.



In the total number of studied skulls (469) sutura infraorbitalis irrespective of its part, was intact in 37,0%. Thus sutura infraorbitalis is quite frequent in Europeans. According to Martin and Saller (l.s.) it is especially frequent in Eskimos.

B. Sutura incisiva (the incisor suture) proceeds from the frontal palatal channel to the internal edge of the alveolar arch (to the canine tooth or between the canine tooth and the first buccal tooth according to Schuhmacher quoted by Augier (l.c.). In the adult the rest of this suture on the from part of the maxilla is dubious.

Its rests on the palate were proved however. The incisor suture may be normally observed even on the palate in children. It disappears with adolescence.

Martin and Saller (l.c.) report the following incidence:

Europeans . . . . .	47,0%	Melanesians . . . . .	15,0%
Germans from Bavaria . . . . .	73,0%	Negroes (Cameroon) . . . . .	12,0%
Ancient Egyptians . . . . .	52,0%	Orang-outang . . . . .	8,0%

This suture occurred in our material in 57,0%. 465 skulls were studied.

C. Sutura endomesognathica in its course, deviates from the incisor suture and reaches the external edge of the lateral incisor. It is usually bilateral, but it may be unilateral.

Matiegka (1928) and Le Double (1906) report an incidence of 9—10%. On the skulls from Mikulov (450) sutura mesognathica was present in 71 cases, i.e. 15,0%.

D. Sutura palatina transversa was according to Martin and Saller (l.c.) divided into three types:

1. both arms of sutura palatina transversa are straight and form an angle of 180°. Thus they are vertical to sutura intermaxillaris;

2. both arms are straight but they are connected at an angle of less than 180°, dorsally opened. The point where both arms meet is thus shifted more forward;

3. the arms are arch-shaped, aiming ventrally by convexity. They form two arches meeting at a point on the line connecting their beginnings.

The individual types show the following incidence reported by Martin and Saller (l.c.):

E. Torus palatinus (Exostosis mediopalatina) — Fig. 9 — is a bilateral and paramedian spindleform relief on the bone palate, more or less wide and protruding (Augier, l.c.).

The authors rather differ very much in their data on incidence. It depends whether the sunken torus palatinus was included in the counting or not. Tarnetzky (quoted by Augier, l.c.) reports 50,0% on Slav skulls. The relation to syphilis is also mentioned. Martin and Saller (l.c.) report the following incidence of torus palatinus:

Italians . . . . .	52,0%	French . . . . .	33,6%
Poles . . . . .	46,0%	Czechs . . . . .	22,8%



On the skulls from Mikulov, torus palatinus occurred in 32,8% and this is a higher value than reported by Martin and Saller (l.c.) but it does not reach the frequency of torus palatinus in Slavs as reported by Lissauer and Stiedy (l.c.), i.e. 50,0%.

#### SUMMARY

The report points out the considerable variability of the maxilla.

Two groups were established: 1. malformations of the facial rudiments, 2. changes of osteogenetic origin.

On the maxillas in 465 skulls of adults of both sexes 3 metric and 16 morphologic signs were studied. The obtained results were compared with the data reported by other authors. We attempted to establish more precise localisation of the foramen infraorbitale. The distance from the lower orbital edge was mostly 7 mm, the distance from the edge of incisura nasalis was mostly 17 mm. Palate and maxillary clefts were included in the studied signs. Microforms of clefts were studied simultaneously. Not a single case of cleft of genetic group I. or II. was found in the entire group. Of microforms there were found: clefts of spina nasalis anterior in 3,01%, spina nasalis posterior in 4,08% and simultaneous incidence of spina nasalis anterior and posterior in 0,93%. Congenital asymmetry of apertura piriformis was observed in 1,2%. High and gothic arch was found in 3,1% and this is considerably less than reported by Tolarová (l.c.) in the present generation of adults (10,1%); this could speak for an increase of microforms of clefts.

This report was intended to aid the studies of varieties of the maxilla and the incidence of microforms of cleft as carried out by the Clinic of Plastic Surgery in Prague and by the Burian Laboratory of the Czechoslovak Academy of Sciences.

#### RÉSUMÉ

##### Les données touchant la variabilité de la mâchoire supérieure

V. Michálek

Le travail montre une variabilité très remarquable de la mâchoire supérieure. La variabilité se divise dans deux groupes: 1ère — celle causée par les malformations du fondement de la figure, 2ème — sortant des changements d'origine ostéogénétiques.

Sur les os maxillaires des 465 crânes des adultes les auteurs ont examiné 3 signes métriques et, en relation, 16 des signes morphologiques. Les résultats obtenus ont été comparés avec ceux d'autres auteurs. Les auteurs ont entrepris de fixer plus précieusement la localisation du foramen infraorbitale. Le plus souvent il a été éloigné 4 mm du contour inférieur de la cavité de l'oeil, tandis que de l'incision palpable du nez l'éloignement était celui de 17 mm. Dans les signes examinés les auteurs ont enregistré même les fentes du palais et ceux des os maxillaires. En même temps les microformes des fentes ont été mises en examination. Dans toute la groupe il n'y avait pas d'un seul cas de fente de la 1ère ou 2ème forme génétique. Des microformes, on a trouvé les fentes de spina nasalis anterior dans 3,01 pour cent des cas, spina nasalis posterior dans 4,08 pour cent des cas et la présence simultannée

de la fente du spina nasalis anterior et posterior dans 0,93 pour cent des cas examinés. Une asymétrie innée d'apertura piriformis se présentait dans 1,2 pour cent tandis que la palais gotique haut se trouvait dans 3,1 pour cent ce qui présente un pourcentage assez différent de celui trouvé par Tolarová (l.c.) chez la génération adulte contemporaine (10,1 %). Ce fait parlerait en faveur de l'apparition accrue des microformes des fentes.

Ce travail avait pour but compléter les études des variabilités des mâchoires supérieures de même que l'apparition des microformes des fentes telles qu'elles sont pratiquées par la clinique de la chirurgie plastique à Prague en collaboration avec le laboratoire de l'Académie des Sciences du nom de feu prof. Burian.

## ZUSAMMENFASSUNG

### Untersuchung der Variabilität des Oberkiefers

V. Michálek

In der Arbeit wird auf die beträchtliche Variabilität des Oberkiefers hingewiesen.

Die Varietäten sind in zwei Gruppen eingeteilt: 1. verursacht durch Malformationen der Gesichtsanlage, 2. verursacht durch Veränderungen osteogenetischen Ursprungs.

An den Maxillen von 465 Schädeln von Erwachsenen beider Geschlechter wurden drei metrische und 16 morphologische Merkmale untersucht. Die gewonnenen Ergebnisse wurden mit Angaben von anderen Autoren verglichen. Wir versuchten das foramen infraorbitale genauer zu lokalisieren. Die Entfernung vom unteren Orbitalrand betrug in meisten Fällen 7 mm, die Entfernung von der tastbaren Naseneinbuchtung war meist 17 mm. Unter die zu verfolgenden Merkmale wurden auch Gaumen- und Kieferspalt aufgenommen. Gleichzeitig wurden auch die Spaltenmikroformen verfolgt. In der gesamten Aufstellung ist kein einziger Fall der Spalte der I. oder II. genetischen Gruppe gefunden worden. Von den Mikroformen wurden Spalten der spina nasalis in 3,01 % der spina nasalis posterior in 4,08 % und gleichzeitiges Vorkommen der spina nasalis anterior und posterior in 0,93 % der Fälle vorgefunden. Angeborene Asymetrie der apertura piriformis ist in 1,2 % der Fälle beobachtet worden. Hoher und gothischer Gaumen ist in 3,1 % der Fälle entdeckt worden, also beträchtlich weniger, als von Tolarová (l.c.) für die zeitgenössische Generation der Erwachsenen angegeben wird (10,1 %). Dies würde einen Anstieg im Vorkommen der Spaltenmikroformen anzeigen.

Das Ziel der vorliegenden Arbeit war, zum Studium der Varietäten des Oberkiefers und des Vorkommens der Spaltenmikroformen beizutragen, so wie es an der Klinik der plastischen Chirurgie in Prag und vom Burians Laboratorium der Tschechoslowakischen Akademie der Wissenschaften vorgenommen wird.

## RESUMEN

### Observación de la variabilidad del maxilar superior

V. Michálek

El trabajo muestra la variabilidad considerable de la mandíbula superior.

Las variantes se dividen en dos grupos: 1. Las ocasionadas por las malformaciones de los fundamentos de la cara. 2. Las ocasionadas por los cambios del origen osteogénico.

En los maxilares de los 465 cráneos de los adultos de ambos sexos fueron comprobados tres rasgos característicos métricos y 16 rasgos característicos morfológicos.

Los resultados obtenidos fueron comparados con las indicaciones de otros autores. Intentamos determinar la localización más preciosa del foramen infraorbitale. La distancia del borde inferior de la órbita era con mucha frecuencia 7 milímetros, la distancia del corte palpable de la nariz era lo más frecuentemente 17 milímetros. En los rasgos característicos fueron incluidas también las grietas del paladar y las del maxilar. Al mismo tiempo fueron observadas también las microformas de las grietas. En toda la colección no se encontró ni un caso de la grieta del primer o la del segundo grupo genético. De las microformas fueron encontradas las grietas de la spina nasalis anterior en 3,01 por ciento, las de la spina nasalis posterior en 4,01 por ciento y la presencia de la spina nasalis anterior y posterior en junto en 0,93 por ciento. La asimetría congénita de la apertura piriformis fue observada en 1,2 por ciento. El paladar alto y gótico fue encontrado en 3,1 por ciento lo que es considerablemente menos que indica Tolarová (l. c.) en la generación contemporánea de los adultos (10,1 por ciento). Eso demostraría el incremento de las microformas de las grietas.

La aspiración de este trabajo fue la asistencia en el estudio de las variantes del maxilar superior y el de la presuecia de las microformas de las grietas como lo practica la Clínica de Anaplastia en Praga y el laboratorio de Burian de la Academia Checoslovaca de Ciencias (ČSAV).

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Acknowledgement. May I be permitted to express my thanks to Doc. M. Dokládál, M. D., CSc. of the Institute of Anatomy at the Medical Faculty, J. E. Purkyně University in Brno for his expert guidance in the anatomic part.





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## RECONSTRUCTION OF EYE BROWS WITH FREE SKIN GRAFTS

N. I. YARCHUK, P. V. TERTSIONAS

Reconstruction of the eye brows is of great significance for the restoration of normal appearance of the face. This can only be realized by the transplantation of hair-bearing skin, i. e., of skin covered with long hair. The aim of the operation is to transfer hair-bearing tegumen to a new site, which means not only to achieve a good take of the transplanted skin, but also to preserve growing hair. The bulbs of long hair lie in the lowest layer of the true skin at the border between skin and subcutaneous tissue or even in the subcutaneous tissue itself. In order to save the hair bulbs, it is necessary to transplant the skin together with a layer of subcutaneous fat. This impedes the take of a free graft of hair-bearing skin, and most surgeons, therefore, prefer transplantation of hair-bearing skin as a flap on a nutritive pedicle, using either a tube pedicle flap (Filatov, 1927; Parin, 1931) or a flap on a subcutaneous pedicle including the superficial temporal artery (Blokhin, 1955; Mukhin, 1965; Kazanjian et Converse, 1959, and others), or on a adipo-dermal pedicle (Kabakov, 1962).

The method of transplantation of free hair-bearing skin grafts, which has been known since Krause (1893), is little used by surgeons, because most of them are of the opinion that it does not reliably ensure growth of the hair. This is borne out by the absence of reports in the literature about a sufficient number of clinical observations on the employment of free skin grafts in the reconstruction of eye brows. However, the method possesses the indubitable

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This paper is a suitable supplement to the communication of V. Karfik et J. Šmahel "Further Experiences on Free Transfer of Hair Bearing Skin", which was published in *Acta Chir. plast.*, 12, 4: 227, 1970.



advantage in its simplicity and in that the operation may be repeated several times.

At the Facio-Maxillary Clinic of the Leningrad Scientific-Research Institute of Traumatology and Orthopaedics, transplantation of free hair-bearing skin grafts has been practised since 1928. Up to 1970, a total of 84 grafts were transplanted to 57 patients. The causes of the loss of eye brows were thermal burns in the face in 42 patients, mechanical injury to the skin of the scalp in eight patients, excision together with the removal of pigmented or vascular moles in four patients, irradiation in two patients and congenital aplasia in one patient. Eye brow plasty was carried out in 31 women and 26 men.



Fig. 1. Eye brows reconstructed by using free hair-bearing skin grafts from anterior aspect of thorax: prior to and after operation.

The free grafts of hair-bearing skin were taken from the temporal region, the borderline between occiput and nape of neck, and the crown of the head. In one patient who lost his eye brows due to a burn in the face, the hair-bearing skin grafts were taken from the anterior aspect of the thorax, where there was a rich growth of hair. The bulbs of these hairs lay quite superficially, which permitted transplanting the skin with but a thin layer of subcutaneous tissue, and achieve a good take of the grafts with growing hair on them. However, as can be seen from Fig. 1, the hair on the eye brows of this patient is growing sparsely. Thoracic skin, therefore, has never been used again at the Clinic for free transplantation.

There are different opinions about the question concerning the influence of the width of the graft on the subsequent growth of hair. Many authors (Bunnell, 1931; Vallis, 1967) maintain that hair grows better on narrow grafts. Bunnell, for instance, recommended reconstruction of the eye brows by several-stage transplantation of a few narrow strips of skin, each 1.5 mm in width. Kolen (1950) preferred to transplant wide grafts, 1.5 to 2.0 times wider than the required width of the eye brows, and subsequently excise the surplus brows. At the Clinic, grafts of a 5 to 20 mm width (most frequently 8 to 10 mm) have been used, and no regular relation between width of the graft and preservation of growing hair could ever be ascertained. The length of the hair-bearing skin grafts for reconstruction of the whole eye brow was 65 to 80 mm.

It is important to determine exactly the thickness of the subcutaneous-tissue layer which must be taken together with the graft of hair-bearing skin; the thinner this layer, the better the chance of a good take. However, excessive thinning may lead to damage to the hair bulbs. The layer of subcutaneous

tissue should be taken so that the hair bulbs are not exposed. These bulbs show as black spots on the background of fatty tissue.

It is generally recognized that the take of skin grafts, particularly of thick ones, is greatly facilitated by a pressure bandage which ensures immobilization and close contact of the graft with its recipient bed. Since 1927, a bandage with controlled pressure of 27 to 28 mm Hg (Limberg, 1929) has been used for the purpose. Such bandages were applied after transplantation of a total of 60 hair-bearing skin grafts. In another 24 cases, the ordinary gauze pressure bandage was used with Stent inlays, plastic sponge or small gauze pads soaked in a solution of 1:5000 Rivanol.

The mode in which the hair-bearing skin grafts took to their recipient bed, was evaluated by the scheme which is used at the Clinic for appraisal of the incorporation of skin grafts of all thicknesses (Yarchuk, 1961):

1. Good take (complete incorporation of all skin layers with desquamation or small areas of superficial maceration of epidermis).
2. Medium take (small necrotic areas or deep maceration of epidermis).
3. Poor take (more than 30% of the area is necrotic).
4. No take at all.

Tab. 1 presents the results of take in 82 skin grafts. The results of two cases could no more be traced. Apart from this, Tab. 1 gives a comparative appraisal of the take when using a bandage with controlled pressure or an ordinary pressure bandage.

It can be seen that the take of hair-bearing skin grafts was good in 57 cases (69.5%). Although this is somewhat worse than in the transplantation of full-thickness grafts without subcutaneous tissue (81% good take according to Yarchuk, 1961 and Limberg, 1967), it still bears witness to adequate viability of hair-bearing skin grafts.

A decisively favourable influence of the bandage with controlled pressure on the mode of take of hair-bearing skin grafts — as can be seen from Tab. 1

Tab. 1. Take of Free Hair-Bearing Skin Grafts

Type of bandage	Good take		Standard error (in %)	Medium take		Standard error (in %)	Poor take or no take		Standard error (in %)	Total	
	abs.	%		abs.	%		abs.	%		abs.	%
With controlled pressure	39	67.2	±6.2	13	22.4	±5.3	6	10.4	±4.1	58	100
Without controlled pressure	18	75	±9.2	5	20.8	±8.5	1	4.2	±4.2	24	100
Total	57	69.5		18	22		7	8.5		82	100

— could not be ascertained. Evidently, the immobility of tissues in the region of the eye brows and the smooth surface of the frontal bone permit fixing the skin graft firmly enough with an ordinary pressure bandage.

The growth of hair can only be evaluated several months after operation. Independently of the mode of take, the hair of the transplant, as a rule, gradually falls out. The new hair becomes apparent about one or two months after operation.

Tab. 2. Relation between Mode of Take of Skin Graft and Growth of Hair

Take of skin graft	Growth of hair		
	adequate	sparse	absent
Good	15	12	—
Medium	—	17	—
Poor	—	—	3
Total	15	29	3

Thirty-four patients, in whom transplantation of a total of 47 hair-bearing skin grafts had been performed, were re-examined at intervals from six months to ten years after operation.

In order to appraise the growth of hair on the skin grafts and the thus given shape of the eye brows, all checked-up patients were divided into three groups:

1. no growth of hair on the transplant,
2. sparse growth of hair with bald spots in between, which did not give an appearance to the eye brows satisfying the patient,
3. hair grow on the transplants, giving the eye brows an appearance which satisfied the patient.

The first group comprised three patients who had a total of three transplants grafted. When confronting the growth of hair with the mode of take, it could be seen that all three grafts had had areas of deep necrosis (poor take).

The second group comprised most patients, i. e., 19 in whom a total of 29 hair-bearing skin grafts had been transplanted. The grafts bore hair, but it was either sparse or grew only on the lateral part of the eye brows, which did not satisfy the patient. True, all patients of this group admitted that the implanted skin grafts, though with sparse hair growth, facilitated the make-up of eye brows and, apart from that, improved the insufficiency of the upper eyelid, which is often found in patients who require reconstruction of the eye brows. When confronting the growth of hair with the mode of take in this group, it was found that twelve grafts had taken completely, with but small





Fig. 2. Result of eye brow reconstruction with free hair-bearing skin grafts, which satisfied the patient Left half of picture: prior to operation, right half of picture: after operation.

areas of maceration of epidermis (good take), and 17 grafts had taken with small areas of necrosis or deep maceration of epidermis (medium take).

The group of patients in whom transplantation of free hair-bearing skin grafts had resulted in a satisfactory appearance of the eye brows, is the most interesting one. This group comprised eleven patients to whom a total of 15 hair-bearing skin grafts had been transplanted. It should be stated that even in this group there was not a single case in which the hair grew as richly as on the donor site or as after transplantation of hair-bearing skin flaps on vascular pedicles. The results of eye brow reconstruction which satisfied the patients, are registered in Fig. 2.

All the 15 grafts of this group took without complication (good take) and on 13 of them, there was not even a small area of maceration. The relation between the mode of take and the growth of hair is given in Tab. 2.

Thus adequate growth of hair was observed only after a perfect take of the skin grafts, without the slightest maceration of epidermis. However, even



in these cases did most of the hair bulbs undergo necrosis, and the number of hairs which actually grew was much smaller than that of those which had died.

Necrosis of most hair bulbs even in a good take of the skin graft indicates that the bulbs hardly survive the period of interrupted blood supply.

In recent years, reports have appeared in the literature about preparation of the recipient bed and the graft itself for shortening the period of plasmatic circulation and accelerating the development of vascular links between the graft and its bed (De Haan et Stark, 1964; Karfík et Šmahel, 1968 and 1970).

In 1968, a reconstruction of an eye brow was carried out at the Clinic, using a free hair-bearing skin graft after preceding preparation of both the recipient bed and the graft itself (according to the procedure recommended by Karfík et Šmahel). The preparation consisted in incising the skin and subcutaneous tissue at the site of the missing eye brow and closing the wound again with sutures, placed wide apart from each other. At the same time, a free hair-bearing skin graft together with a layer of subcutaneous tissue was prepared in the right parietal region, but was left connected with the donor

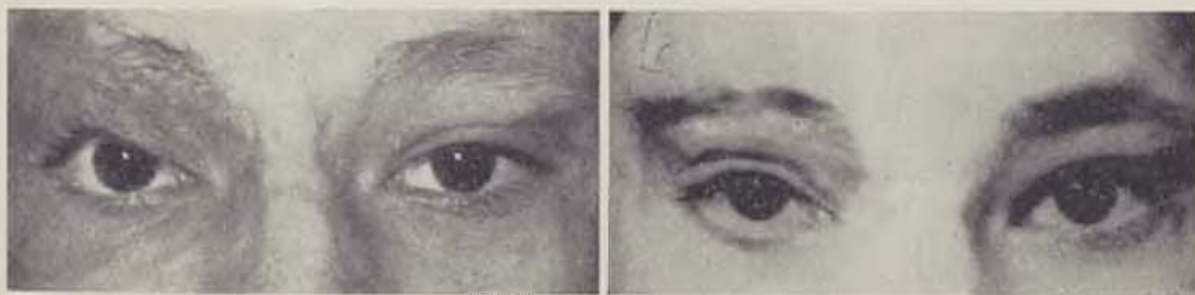


Fig. 3. Reconstruction of right eye brow (lost after burn) with free hair-bearing skin grafts after preliminary preparation of graft and bed: a) prior to operation, b) one year after operation

site by two pedicles. Three days later, the second stage of the transplantation was carried out: The edges of the wound at the eye brow site were again separated with a blunt instrument, the skin graft in the parietal region also lifted with a blunt instrument, and the two pedicles divided sharply. Then the graft was transferred to the wound surface prepared at the site of the eye brow, and its edges carefully sutured to the wound edges. Afterwards a gauze pressure bandage was applied.

This graft took completely. One year after operation, hair grew on it in sufficient amount to ensure the apperanace of a proper eye brow (Fig. 3).

At present, the research in the influence of preparation of the recipient bed and the hair-bearing skin graft on the final result of the plasty continues both on experimental and clinical material. It is possible that such a preparation may help to preserve enough hair on the graft and thus make reconstruction of the eye brows with free hair-bearing skin grafts more successful.

## SUMMARY

The paper presents a report on the clinical experience with the reconstruction of eye brows from free hair-bearing skin grafts in 57 patients, in whom a total of 84 grafts were used for transplantation. In spite of the good take of 69% of the grafts, the hair did not regenerate in most cases. When checking up on the late results in 34 patients, it was found that only eleven, in whom a total of 15 free skin grafts had been implanted, were satisfied with the appearance of their eye brows. A study has been started at the Clinic about the influence of preliminary preparation of the recipient bed and the skin graft on the preservation of growing hair on the transplant.

## RÉSUMÉ

### **La reconstruction des sourcils à l'aide du transplant cutané chevelu libre**

N. I. Iartchouk, P. V. Tercionas

Le travail s'occupe de l'expérience de clinique avec la reconstruction des sourcils par les transplants chevelu libres chez 57 des malades, ayant reçu 84 des transplants. Malgré le fait que 69 pour cent des transplants étaient bien guéri, les cheveux n'ont jamais donné signe de régénération. Au cours de révision des résultats chez 34 des malades les auteurs ont trouvé qu'il n'y en a que onze, ayant en somme reçu 15 transplants, qui se sentaient content avec la forme des nouveaux sourcils. La clinique a maintenant commencé avec des expériences touchant l'influence des préparations divers des transplants cutanés et du récipient pour conserver les cheveux du transplant.

## ZUSAMMENFASSUNG

### **Wiederherstellung der Augenbrauen mit losen Pfropfen behaarter Haut**

N. I. Jartschuk, P. V. Tercionas

Die Arbeit berichtet über klinische Erfahrungen mit der Wiederherstellung der Augenbrauen mit losen Pfropfen der behaarten Haut bei 57 Kranken, denen insgesamt 84 Pfropfen implantiert wurden. Obwohl 69 % von der Gesamtzahl der Pfropfen gut zugeheilt haben, fiel die Haarregeneration in meisten Fällen aus. Bei der Überprüfung der Sätergebnisse bei 34 Kranken wurde ermittelt, dass lediglich 11 Kranke, denen insgesamt 15 Hauttransplantate implantiert wurden, mit der erzielten Augenbrauenform befriedigt waren. An der Klinik begannen jetzt Untersuchungen über den Einfluss der entsprechenden Bereitung von Hautpfropfen und des aufnehmenden Bettes auf die Erhaltung der Haare.

## RESUMEN

### **Reconstrucción de las cejas por los injertos libres de la piel peluda**

N. I. Yarchuk, P. V. Tercionas

El artículo presenta la noticia sobre la experiencia clínica con la reconstrucción de las cejas por los injertos libres de la piel peluda en 57 enfermos a los que fueron implantados 84 injertos en total. A despecho de eso, que 69 por ciento de los injertos se encicatrizaron bien, el pelo en la mayoría no regeneró. En la revisión de los resul-

tados tardíos fue comprobado que solamente 11 en los que se emplearon 15 injertos de la piel en total, fueron contentos con la forma alcanzada de las cajas. En la clínica comenzaron ahora la investigación sobre la influencia de la preparación conveniente de los injertos de la piel y la de la placenta de recepción para la conservación del pelo.

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#### Bone regeneration in maxillary defects

Erik Engdahl: Almquist & Wiksell, Stockholm, Sweden, 1972, 79 pag. Supplementum 8 Scand. Journal of Plast. and Reconstr. Surgery.

In this report the author points out the significant share played by the preserved mucoperiosteal graft in bone regeneration after partial resection of maxilla in rabbits. He compares the course and results of regeneration in relation to the material, blood, synthetic Surgicel, bone marrow and costal bone autotransplantate which, he used for filling up the artificially formed defect. The report is excellently documented.

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## THE TAKE OF MESH GRAFT IN EXPERIMENT

J. ŠMAHEL, N. GANZONI

The mesh graft as proposed by Tanner et al. in 1964 is a most convenient form of expanding the free skin graft and it has become very popular namely in treatment of burns. In order to afford a complete historical survey it ought to be mentioned that the idea to expand the graft by alternate incisions, is of considerably older date (Lanz, 1908).

Although considerable experience has been already gained in the application of mesh grafts (Stone and Hobby 1965, DiVincenti et al. 1969, MacMillan 1970) we only rarely find histologic data on the processes in its take and this makes it difficult to understand some of the events in clinical practice. The publication by Dobrkovský et al. (1968) establishes a certain exception, the authors included histologic data along with clinical experiences.

Methodic as well as ethic reasons prevented us from trying to study the take of the mesh graft in clinical practice at greater detail. The meshgraft is mainly applied in extensive burns where the possibility of removing the graft are limited and where the condition of the patient is serious. It is difficult under these circumstances to bother the patient still further with numerous and repeated biopsies. It appears to be a methodic complication that the areas formed after the burns are not standard, they manifest histologic and bacteriologic differences, the healing is significantly affected by the general condition of the patient. For this reason we decided to work out a phantom experiment in animal first and to study the take of the mesh graft on the skin defect formed by excision.

### MATERIAL AND METHODS

The animals used for the experiments were 6 pigs of 30 kg mean weight which were kept separately. The operations were carried out under Halothane anaesthesia after premedication with Thiopental (8 mg/kg, i. p.). Each animal had 4 defects 8×8 cm on the sides, formed by excision of skin and part of



the subcutaneous layer. The defects were covered with light bandage fixed with steristrips. On the fourth day after infliction the grafting was carried out. The grafts — thickness approx.  $\frac{1}{4}$  skin — were removed in the gluteal region by normal air dermatome. The meshing of the graft was carried out on the "mesh skin graft expander". The grafts were carefully spread on the bed and fixed by stitches in the corners. The field of operation was covered

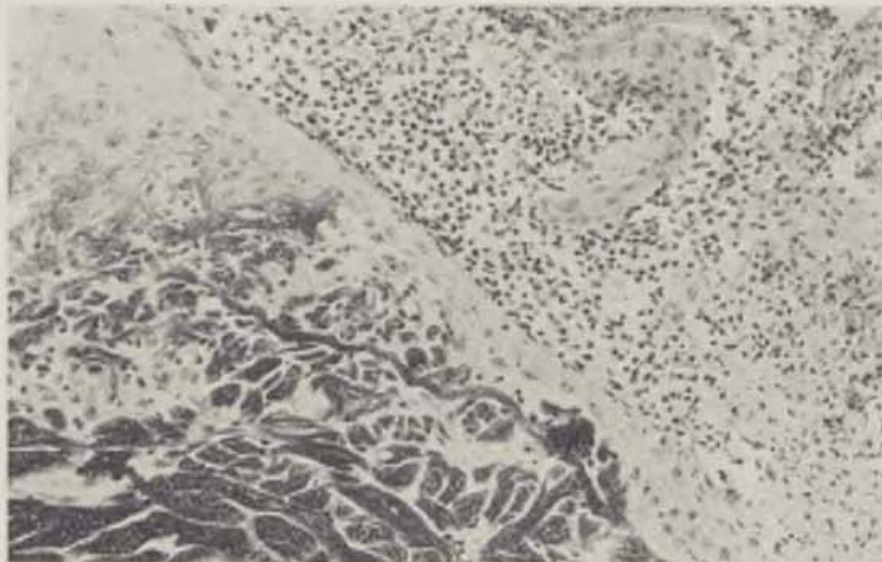


Fig. 1. Cross-section through meshgraft fiber (left half of Fig.) with the epithelial process descending on its side. The epithelium is covered by fibrin mass with numerous polynuclears. Second day after grafting, stained according to WG, 300X

by a sheet of "Biogaza" a layer of mull moistened with saline solution and a layer of dry mull. The bandage was fixed by adhesive elastic tape. The grafts were clinically evaluated, photographed and the biopsies removed at two-day intervals. The biopsies usually containing 4 meshes of the graft were excised in three animals on the odd and in three animals on the even days. The examination was terminated on the 16th day after grafting. The excised material was fixed in 10% formalin and embedded in paraffin in the usual method. The sections — 8  $\mu$  thickness — were stained with haematoxylin-eosin and by the method according to Weigert-van Gieson (further WG).

## RESULTS

In the initial experiments the decision on the time interval between forming the defect and grafting, appeared to be important. On the fourth day the fatty tissue in the defect base was covered by a very thin layer of granulation tissue. The grafts carried out at this stage of the repair process were successful. In the further course, the growing granulation tissue was covered with a layer of fibrin permeated by necrotic cells and detritus. During the second week the necrotic edge formed clearly. Clinically the granulations were strikingly smooth, dry and shiny. The grafts carried out in this stage terminat-



ed usually in dry necrosis of the graft. In order to make the grafting a success it was essential to remove the superficial layer of granulations by scraping them off. After this interference the take of the graft proceeded as successfully as when the grafting was carried out on the fourth day. For the study itself we selected the first, more simple and less time consuming variant of grafting on a 4 days old bed.

We shall at first report the findings when the take of the mesh graft was absolutely successful.

On the first day after the grafting the graft was oedematous and acquired pink colour. In the histologic picture the graft was somewhat immersed into a thin layer of granulation tissue. The tissues of the graft were soaked — espe-

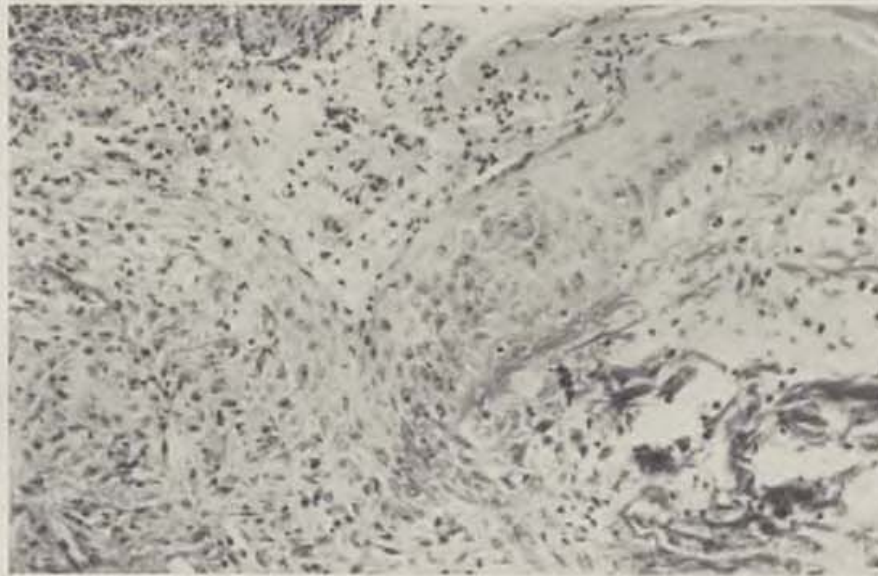


Fig. 2. Proliferation of the epithelium from the graft fibers (right half) to the granulation tissue (left half). Adjacent to epithelium mass of fibrin with detritus. Third day after grafting, stained according to WG, 300X

cially the papillary layer and epidermis in which the horny layer became separated. The graft vessels were dilated and contained single erythrocytes. We met with the first signs of epithelium activation already after 24 hours. The differences between the cylindrical and the spinose layer disappeared at rims of the epidermis. The cells were enlarged and light. Some of them were localised on the lateral side of the graft fiber as the continuation of the malpighian layer of epidermis. The spreading of the epithelium on the side of the graft to the granulation tissue was usually ascertained on the second day after grafting (Fig. 1). The epithelial processus was formed by a few layers of cells without basal membrane. Isolated mitosis was observed. The edges of the graft fibers were covered by a mass of fibrin and cellular detritus. In the clefts under the fibrin were numerous migrating cells, mainly polynuclears.

On the second or third day after grafting the graft was red and its removal was accompanied by capillary bleeding. The granulation tissue penetrated into

the clefts at the contact area with the graft. The papillary layer of the graft and epidermis were significantly soaked. Between the collagen fibers of the corium were numerous nuclei of fibroblasts and migrated mononuclears. The graft vessels contained erythrocytes. At epidermis the horny layer separated in places even with the part of the spinose layer. During this time period the

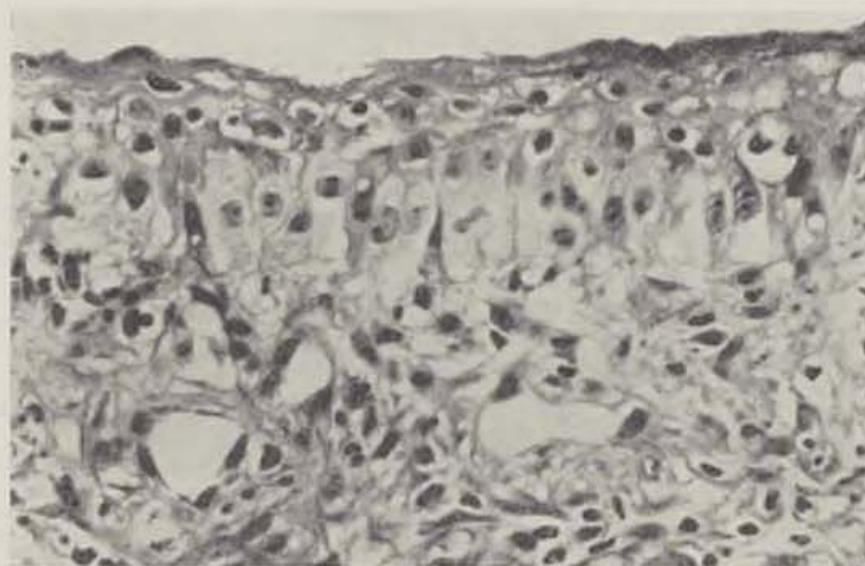


Fig. 3. Proximal part of epithelial wedge on granulation tissue. Fourth day after grafting. Stained according to WG, 600X



Fig. 4. Distal part of epithelial wedge on granulation tissue, Fourth day after grafting. Stained according to WG 600X

epithelium began to cover the granulation tissue (Fig. 2). The proliferating epithelium spread in form of a wedge. In the proximal part which is alongside the graft, the epithelium had several layers. The cells were not arranged in the way typical for epidermis and numerous mitosis was found. There was a signi-



ficant decrease in the layers in direction to the tip of the wedge on the granulation tissue. The basal membrane was not formed and the border between epithelium and granulation tissue was indistinct. As previously the epithelium was covered by fibrin and detritus mass.

On the fourth or fifth day the red colour of the graft was less striking. The fibers of the mesh were immersed into the granulation tissue which

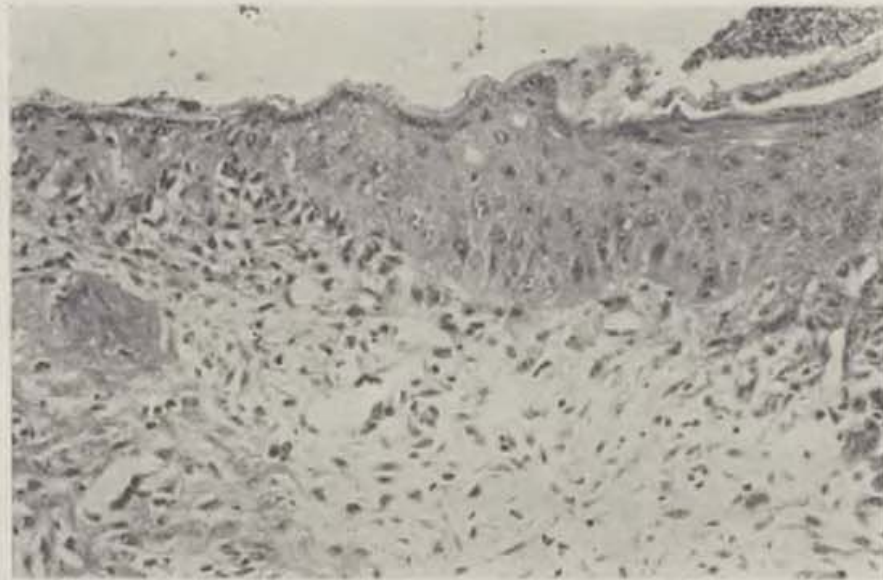


Fig. 5. View of the epithelial wedge on the granulation tissue. Fifth day after grafting. Stained according to WG, 300X

surround it closely on three sides. The corium oedema receded and the papillary layer was rather narrowed. The epidermis was flattened and passed at the edges of the fibre into the epithelial wedge on the granulations. Only on the graft the basal membrane was distinct. The proximal part of the wedge was formed by stratified epithelium which in places took on the character of pseudostratified one (Fig. 3). Its cells — especially the basal cells — were large, they were light and manifested striking polymorpha. In the epithelium were numerous dividing cells. In distal direction there was a decrease in the layers, at the tip of the wedge were 2 — 3 layers of cells (Fig. 4): the basal cells were of polygonal shape, the superficial cells were flat and darker. In this part of the wedge mitosis was rare. Under the epithelium remained tiny fibrin foci in places.

On the sixth to eighth day after grafting the mesh graft assumed skin colour and the proceeding epithelisation in the meshes could be clinically well distinguished. The granulation tissue was less cellular in the places covered by graft or epithelium, fibroblasts predominated and fine collagen fibers appeared reaching in some places to the graft corium. The epithelial wedges protruded to the center of the meshes and became connected in form of a coherent epithelial cover. At this stage there were differences in the construction of the epithelium (Fig. 5). The epithelium was most mature at its perimeter



and by its arrangement it corresponded to the spinose layer. Its border with the granulation tissue was clearly visible. The differences existing rather towards the center had been already described when characteristics of the epithelial wedge were given.

During the second week after grafting, the granulation tissue gradually matured into connective tissue. There was a decrease of cells and of wide thin-



Fig. 6. Epithelial wedge, descending from the graft fiber (right edge) covered the field of granulation tissue and grows into the slit between the taking layer and the necrotic layer of the neighbouring fiber (left edge). Sixth day after grafting, stained according to WG, 100X

walled vessels and fine collagen fibers reaching even into the graft appeared in greater numbers. In the new-formed epithelium the layers of cells increased, the differentiation typical for epidermis, started. The border between the epithelium and the base was still smooth in places, elsewhere papillas formed.

On the sixteenth day after grafting when we terminated our observations, the new-formed epithelium was rather higher than the epidermis of the graft, the layers and the connective tissue papillas were well differentiated. The connective tissue contained dense collagen fiber meshes which were finer on the surface and coarser in the deeper part, with still numerous fibrocytes. The vessels were less numerous, but with a more differentiated wall. The differences between this connective tissue and the collagen bundles of the graft corium were still significant. Biopsies obtained in clinical practice disclosed that this difference only adjusts itself after several months.

Disturbances in the take of the mesh graft and in epithelisation were predominantly of local character and often only affected individual fibers of the grafted mesh.

The most frequently observed phenomenon ended in necrosis and separation of the epidermis as well as part of the graft corium. On the first day after

grafting the fiber was in the usual condition. On the second and third day the epidermis was significantly flattened and there were pyknotic nuclei. The papillary layer of the corium was narrowed by a dense entanglement of fine fibers. The strong collagen bundles at its lower surface were closely adjacent and



Fig. 7. Rest of the graft fiber, infiltrated and overlaid by granulation tissue covered with epithelium. Twelfth day after grafting, stained according to WG, 100X

of homogenic appearance. The greater part of the reticular layer of the graft was infiltrated by poly- and mononuclears and granulation tissue protruded into the slits between the collagen bundles. On the subsequent days the superficial layers of the graft were demarcated by a leucocytic edge and they were separated as a disintegrated mass. Granulation tissue with the vessels infiltrated into the space between the collagen bundles of the remaining corium part and later matured into connective tissue. The rest of the graft was usually covered by an epithelial wedge which proceeded from the neighbouring well taken mesh fibers (Fig. 6). At other times we ascertained the rest of graft fiber infiltrated and overlaid with granulation tissue, the epithelium being well differentiated (Fig. 7). It is probable that both demonstrated findings represent the gradual stages of the same process.

From the point of biology, the variant was interesting in which at partial necrosis of the graft reported above, the epithelium descended on the side of

the fiber to the granulation tissue (Fig. 6). It is questionable whether possibly the source of the epithelium was in such cases the skin adnex of the graft as on Fig. 8 on the left. The epithelial wedge with the zone of mitosis on the granulation tissue (Fig. 9) continued to grow on its surface independent of the fate of the fiber. We ascertained this variant comparatively often. After separation of the necrotic layer the rest of the graft was retrogradely epithelialised.

In some graft fibers the above reported process of disintegration occurred in all layers. At the contact area of the granulation tissue and the graft, polynuclears accumulated and in the end the entire fiber separated.

In a few cases on the fifth day after grafting, the epithelial wedge shifted to the granulation tissue without spreading further. The granulation tissue was oedematosely soaked and infiltrated intensive by polynuclears.

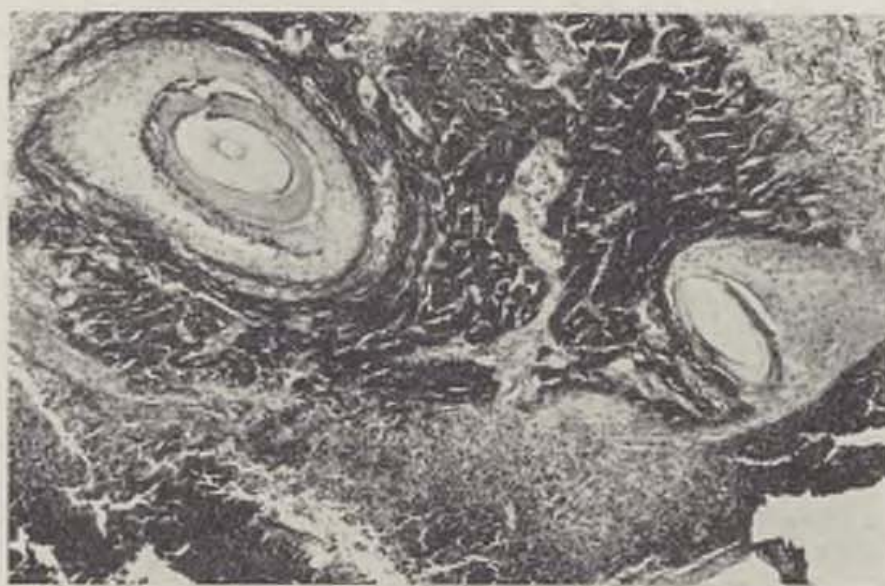


Fig. 8. Cross-section of graft fiber, in which the superficial layers were lost. At both edges of the fiber the epithelium proliferated to the granulation tissue. Two hair follicles in the graft. Third day after grafting, stained according to WG, 120X

#### DISCUSSION

It is essential to distinguish between two processes in the take of the mesh graft: 1) take of the mesh itself and 2) epithelisation of the not grafted areas of granulation tissue.

Ad 1) The take of the dermoepidermal mesh occurred according to the same principles as in other types of skin grafts on granulation tissue. At take per primam the vessels of the bed contact the vessels of the graft already after 24 hours. The blood circulation and nutrition of the graft are restored within a few days already. In such a case there occur no significant changes in the histologic structures of the graft and the relief of the mesh was well visible after complete take. The mesh grafts were inclined to dry up and this may be explained by the relatively large cut surfaces of the narrow fibers. Hagstrom et al. (1966) verified this property of the mesh grafts in their experiments.



In the take of mesh fibers per secundam [Šmahel. 1969] the vessels of the bed do not find contact with the graft vessels in time and grow in the further course with the granulation tissue into the graft. Revascularisation of the graf by the growing in of new vessels starts later and takes a slower course. For this reason it is accompanied by degeneration and necrosis of the superficial layers of the graft. After desquamation and re-epithelisation the graft fibers were less striking.

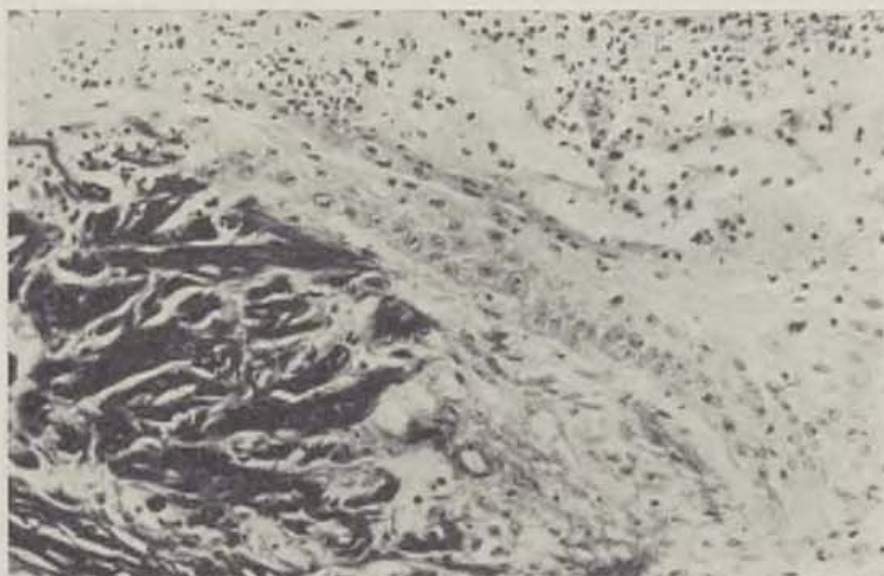


Fig. 9. Detail of the right edge of the graft fiber from the previous figure, with epithelial process on granulation tissue. Third day after grafting, stained according to WG, 300×

The usual cause of the complete failure of the grafting was — in our experiments — insufficient immobilization or slow and inflammatory changed granulation.

Ad 2) The processes leading to epithelisation of non-grafted areas of granulation tissue began at successful take of the mesh between the first and second day. In this time the proliferating epithelium descended in form of a wedge along the side of the graft fibers to the granulation tissue. The epithelial wedges spread on the granulation tissue and connected into a uniform epithelial cover between the 7th and 8th day. In the proximal part of the wedge were numerous dividing cells. In the distal part migration of cells predominated. When the epithelial wedge descended to the granulation tissue, the zone of mitosis was on the graft. The progress of epithelisation depended mainly on the mitotic activity of the graft epidermis. In the further course the zone of mitosis shifted behind the migrating cells and on the 4th or 5th day it was on the granulation tissue. In that time the epithelial wedge gained proliferating autonomy on the granulations and epithelisation did not depend any more on the graft activity. The mesh fibers — if we evaluate them only as the source of epithelium — fulfill their biologic task since the 5th day after grafting.



After this period the fate of the graft fibers is of no importance for the further epithelisation of the grafted area.

The analysis discloses that in disorders of take of the grafted mesh it is decisive for epithelisation, to what extent this course threatens the shifting of the epithelium upon the granulation tissue.

No bacteriologic examination was carried out in our experiment. Some histologic findings disclosed however that the spreading of the epithelial wedge is significantly delayed after inflammatory changes of the granulations.

We compared the course of the take of the mesh graft with the findings obtained in orientative biopsies in clinical practice and with the findings by Dobrkovský et al. (1968). The comparison suggests that the obtained results are of more general validity. We reported the experiences with mesh graft in clinical practice in another publication (Ganzoni and Šmahel, 1971).

#### S U M M A R Y

The course of the take of mesh graft was studied in experiment in pig. The take of the mesh went in principle along the same lines as in other types of skin grafts on granulation tissue. Epithelisation of the not grafted fields began on the second or third day when the epithelial wedge proliferated from the mesh fibers on the granulation tissue. A complete epithelial layer was formed the seventh or eighth day. The spreading of the epithelial wedge over the granulations was at first determined by the mitotic activity of the graft epidermis. On the fourth or fifth day after grafting the epithelial wedge gained proliferating autonomy on the granulation tissue. In disorders of take of the grafted mesh it was decisive, for epithelisation whether such a course threatened the proliferation of the epithelium on the granulation tissue.

#### R É S U M É

##### **La prise du transplant criblé dans l'expérience**

J. Šmahel, N. Ganzoni

Les auteurs ont examiné la course de la prise du transplant criblé sur le porc. Cette prise ne différait pas de celle des autres types des transplant cutanés sur le tissu granuleux. L'épithélisation des parties pas transplantées commençait dès la deuxième ou troisième journée. À cette date un coin fin passait des fils fins du transplant criblé sur le tissu granuleux. Une épithélisation compacte a eut lieu entre la septième et la huitième journée. Ce coin épithélial se répandait sur le tissu granuleux tout au commencement à l'aide de l'activité mitotique de l'épiderme du transplant. De la quatrième à la cinquième journée suivant la transplantation ce coin épithélial sur le tissu granuleux a gagné une autonomie proliférative. Au cas des altérations de la prise du transplant criblé le fait décisif pour l'épithélisation était celui d'empêchement du transit de l'épithélisation sur le tissu granuleux.

## ZUSAMMENFASSUNG

### Heilung des Netztransplantates im Experiment

J. Šmahel, N. Ganzoni

Im Versuch am Schwein wurde der Heilungsverlauf des Netztransplantates untersucht. Die Heilung des Netzes verlief im Grundsatz ähnlich, wie bei anderen Typen der Hautpfropfen am Granulationsgewebe. Die Epithelisierung der nicht transplantierten Felder begann am 2. bis 3. Tag, als von den Fasern des Netzes der Epithelkeil auf das Granulationsgewebe übertrat. Die Bildung einer kontinuierlichen Epitheldeckung war am 7.—8. Tag abgeschlossen. Das Verbreiten des Epithelkeiles über den Granulationen war anfangs durch die mitotische Aktivität der Pfropfenepidermis bedingt. Am 4. und 5. Tag nach der Transplantation gewann der Epithelkeil am Granulationsgewebe Proliferationsautonomie. Bei Heilungsstörungen des transplantierten Netzes war für die Epithelisierung entscheidend, ob derartiger Verlauf das Übertreten des Epithels auf das Granulationsgewebe gefährdet hat.

## RESUMEN

### Curación del injerto reticular en el experimento

J. Šmahel, N. Ganzoni

En el experimento con un cerdo fue seguido el transcurso de la curación del injerto reticular. La curación de la red pasó en el fondo de la misma manera como en otros tipos de los injertos de piel en el tejido de granulación. La epitelización de los campos no transplantados empezó el segundo hasta el tercer día, cuando de los filamentos de la red transpasó la cuña de epitelio al tejido de granulación. La cobertura continua de epitelio se formó el séptimo hasta el octavo día. La expansión de la cuña de epitelio después de las granulaciones fue en el primer tiempo determinada por la actividad de mitosis de la epidermis del injerto. El cuarto hasta el quinto día después de la transplatación ganó la cuña de epitelio en el tejido de granulación la autonomía proliferativa. En los defectos de curación de la red transplantada fue decidiente para la epitelización, si tal desarrollo amenazó el paso del epitelio al tejido de granulación.

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## RECONSTRUCTIVE OPERATIONS FOR LEPROUS DISFIGUREMENT OF THE FACE

A. I. DAYKHES

Up to the present, leprosy has been the "white spot" in reconstructive surgery. Single attempts at rhinoplasty in leprosy patients proved unsuccessful, because the progressing leprosy process annihilated the results previously achieved. The marked success in the treatment of leprosy with sulfonamides and other modern drugs has dispersed the ancient myth of its incurability; the cure of these patients has become a real fact. Leprosy patients have been transferred from places of life-long isolation to establishments for temporary hospitalization. However, disfigurement of their appearance compels many who have overcome leprosy to continue staying in leper camps. According to approximate calculations, every third out of the eleven millions of leprosy patients all over the world require reconstructive surgery (WHO Committee of Experts on Leprosy, 1970). Thus the urgent need to rehabilitate these patients and return them to their families and the society, has arisen.

The first communications dealing with reconstructive operations in the face of leprosy patients have shown that the known methods of reconstructive surgery and their modifications can well be applied to the repair of disfiguring sequelae of leprosy (Farina, 1957; Brand, 1959; Daykhes, 1967, and others). However, many problems of surgery in the face after leprosy still require special solutions. The exchange of experience with reconstructive operations in leprosy patients will improve the qualified aid rendered to them, and promote further research in the problem.

Leprosy is but little spread in the Soviet Union, and all premises and conditions have been created for its final liquidation in the near future.

The present study is based on the author's experience with 380 reconstructive operations for manifold deformations and defects in the face on 146 patients (108 men and 38 women) with residual leprosy, aged between 18 and 58 years. The number of 380 does not include the numerous operations carried out at the many stages of one reconstructive treatment.





Disfigurement of the face was the consequence of nodular leprosy in the majority of patients (140), and only in a few (6) was it caused by palsy of the facial nerve due to non-differentiated leprosy. The most extensive damage to the organs of the face were ascertained in patients who had developed



Fig. 1. Shape of cartilage grafts for the repair of combined deformations of the nose.

leprosy prior to the introduction of modern anti-leprosy treatment, or in patients in whom the treatment with sulfonamides had been started too late.

The problems presented by leprous disfigurement of the face and the extent of reconstructive treatment cannot be solved without classifying the most frequent deformations and defects met with as sequelae of leprosy.



Fig. 2. Combined deformations of the nose: a) prior to and b) after operation.





Fig. 3. Defect in cartilaginous component of nasal skeleton: a) prior to and b) after reconstruction of nose with Filatov pedicle flap and eye brow plasty with arterialized flaps on subcutaneous pedicles.



Fig. 4. Defect in cartilaginous component of nasal skeleton and obliteration of nasal cavity: a) prior to and b) after reconstruction of inner lining with flaps from cheeks on subcutaneous pedicles and chondroplasty.



Fig. 5. Paralytic lagophthalmos, impossibility of closing palpebral fissure, Bell's phenomenon: a) prior to and b) after myofascial plasty; eyelids can be closed actively by slight contraction of masticator muscles.

Meanwhile, such a systematization of leprous defects in the face, which would be complete enough to meet the requirements of reconstructive surgery, does not exist. The deformations and defects in the face developing after absorption and disintegration of lepromas, as well as the sequelae of facial and trigeminal nerve palsy, and the severe trophic changes in the facial skin and its appendices have been arranged into the following groups: 1. deformations and defects of the external nose; 2. obliteration of the nasal vestibule and cavity; 3. deformations and defects of the lips; 4. lagophthalmos, defects in and scar ectropion of the eyelids; 5. facial-muscle palsy; 6. atrophy and cicatricial degeneration of the facial skin, resulting in the formation of a multitude of wrinkles and folds; 7. absence of eye brows; 8. deformations of and defects in auricles.

In no other disease does one meet with so many variform defects and deformations of the face, as in leprosy, and a whole complex of many disfiguring changes may frequently be found in one single patient.

Reconstructive operations in the face are indicated at the stage of deep regression or in residual leprosy, when the process has become stationary and no recurrence has occurred for some period, and when repeated examination for *Microbacterium leprae* in skin biopsy specimens has proved negative for the last two or three years.

The following operations for the repair of leprous deformations and defects have been carried out at the Department: repair of saddle-nose (27 pa-

tients], and of deformations combined with it (58 patients), of obliteration of the nasal vestibule and cavity (32), of defects in the nose (40), of wrinkles and scars in the face (29), of defects in the lips (14), of facial-nerve palsy (54), reconstruction of eye brows (112), and repair of defects in and deformations of auricles (14 operations).

Rhinoplasty plays the leading role among the reconstructive operations in the face of leprosy patients. Combined deformations of the nose are met with most frequently, resulting from disintegration of the nasal mucosa and the cartilaginous skeleton as well as from absorption of bone. They are characterized by the multiple variants of dorsum nasi skin depressions and cicatricial distractions together with deformation and shrinkage of the alae and the tip of the nose. According to the author's experience, considerable destruction of facial bones can usually be ascertained in patients with defects in and deformation of the nose due to atrophy, osteoporosis and defects in the nasal bone, and the frontal and alveolar processes of the maxilla, the zygomatic, the vomer, the vertical lamella of the ethmoid, and the conchae nasi. Deformation of the nose is often combined with obliteration of the nasal vestibule and cavity.



Fig. 6. Diagram of operation for facial ptosis and lower-lip ectropion.

To treat a deformation of the nose, an incision is made across the alae and the tip, the subcutaneous scars are divided, the skin mobilized, the cartilaginous scaffolding reconstructed to the full, and the depression in the bony component of the nose corrected. Most surgeons-leprologists use both autologous bone grafts and plastmass for reconstruction of the nasal skeleton [Williams, 1959; Gross, 1959; Brand, 1959; Antia, 1969, and others].

The author has achieved good and stable results with using homologous cartilage for the purpose. The tissue was conserved in Ringer-Locke's solution,



but also lyophilized cartilage or tissue embedded in plastmass has been used. These latter cartilage grafts which may be received from tissue banks, transported over long distances and kept for long periods at ordinary conditions, are particularly valuable for those antileprosy establishments which are far from the large medical centres.

The shape of the cartilage grafts and the method of their fixation to each other (Fig. 1), as employed by the author, ensure firmness of the nasal skeleton, while the tip and alae remain sufficiently mobile, and pressure sores do not develop (Fig. 2).

In nodular leprosy, concealed defects of the outer nose, due to the total disintegration of the cartilaginous scaffolding, to considerable absorption of the bony skeleton, to necrosis of the mucous lining and its replacement by scar tissue, are most characteristic. The remaining skin of the outer nose undergoes cicatricial degeneration, shrinkage and displacement into the nasal cavity which has been obliterated by scars. It has thus become unsuitable for plastic-surgery purposes. The author, therefore, uses a Filatov pedicle flap for reconstruction of the nose in large defects. "Maturation" of the flap and the stages of its transfer to the defect usually proceed satisfactorily. Reconstruction of the nose from such a flap is carried out by the method of Khitrov (1949), with some modifications with regard to the distribution of subcutaneous tissue in the doubled-up flap. Preservation of subcutaneous fat in the middle length of the outer leaf of the skin duplication frequently ensures a sufficiently elastic dorsum nasi, which makes chondroplasty for the construction of a supporting skeleton superfluous (Fig. 3).

In several patients with concealed defects in the nose, mainly the cartilaginous frame and the mucous lining have been affected. The skin of the outer nose has been spared to a large extent, and participates like an inlay in filling the obliterated nasal cavity. The edges of the alae nasi, part of the tip and the columella are usually missing. In these defects, the following method has been employed. After removal of adhesions and mobilization of the spared tip of the nose, the inner lining, the edges of the alae and the columella are reconstructed from flaps on subcutaneous pedicles, swung in from the cheeks. The raw surface of the flaps on the outer aspect of the nose is covered with the skin of the nose, which has been freed from scars beforehand. Taking of these flaps to the recipient site and of the skin to the flaps usually proceeds quite satisfactorily. Subsequently, correction of the shape of the nose and a chondroplasty to give support to the transplanted tissue, are performed (Fig. 4).

In obliteration of the nasal cavity combined with deformation of the nose, a wide approach to the cicatricial adhesions may be ensured by separation of the columella from its base, or sometimes also by mobilization of the alae. The wound surface in the nasal cavity, left after removal of scars, is covered with free skin grafts which usually take well; the nasal apertures and ducts are thus reconstructed and nasal respiration is fully restored.

Defects and deformation of the lips, resulting from lepromas, are usually combined with disfigurement of the nose. The upper lip is affected most frequently. Combined defects in nose and upper lip are repaired with a tube





Fig. 7. Bilateral facial-nerve palsy and facial ptosis: a) prior to and b) after fascial plasty

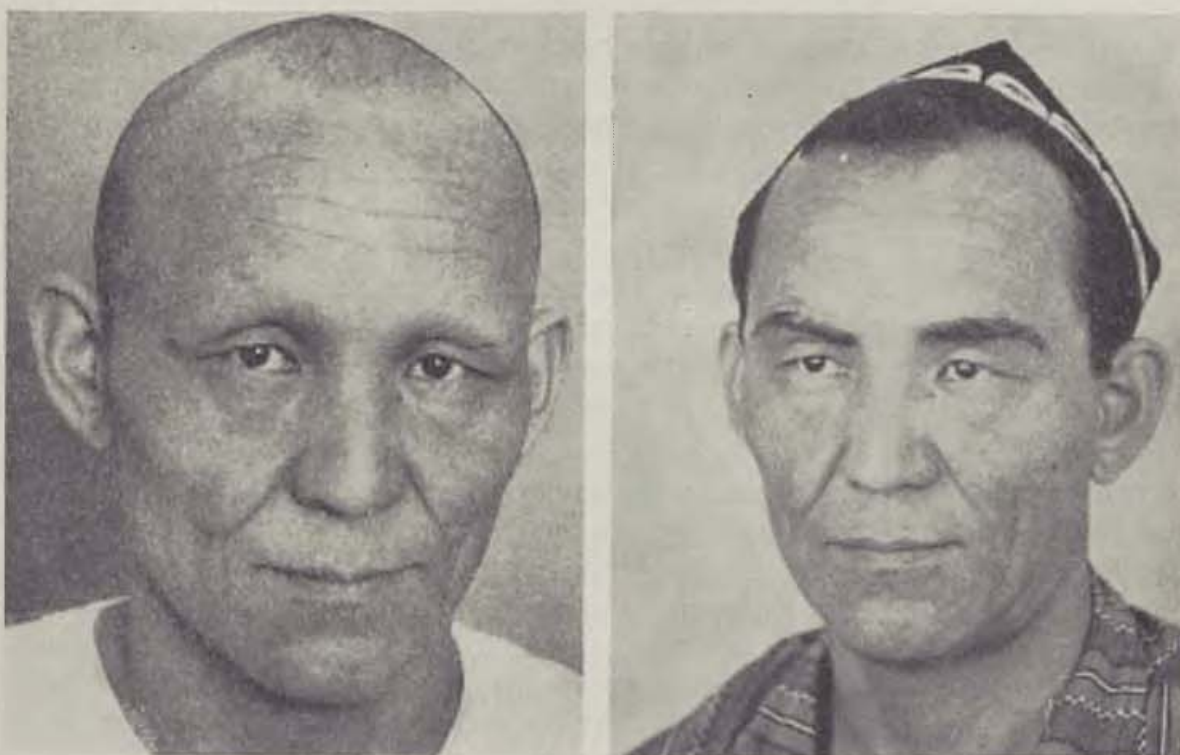


Fig. 8. Absence of eye brows: a) prior to and b) after reconstruction with arterialized flaps on subcutaneous pedicles

pedicle flap. However, opposing triangular flaps have also been employed in these plasties as well as a flap from the lower lip for reconstruction of the upper lip. The latter operation also improves the shape of the lower lip which is often ectropic due to atrophy of the orbicularis oris.

Repair of the sequelae of facial-nerve palsy and the complete fatty degeneration of facial muscles constitutes a complex problem in the reconstructive-surgical treatment of leprosy. In paralytic lagophthalmos, the shape of the palpebral fissure and active closure of the eyelids are restored by transplanting myofascial flaps from the temporalis to the eyelids (according to Gillies). The author has modified this operation by transferring to the eyelids not only bands of temporal fascia, but also muscle pedicles which may be extended as far as the middle of the lids, and thus ensure a good dynamic effect (Fig. 5).

The amyotrophic ectropion of the lower lip is repaired by means of autologous-fascia tapes which are introduced through a tunnel burrowed through the whole thickness of the lip, and whose ends are looped around the coronoid processes of the mandible and fixed there (Fig. 6). This stops the escape of saliva and food from the mouth and improves the speech of the patient (Fig. 7).

Hairless eye brows are one of the characteristics of nodular leprosy. Reconstruction of the eye brows is not only of cosmetic significance, but is important from a social point of view, because the absence of eye brows is well known to the population of the endemic regions as an indubitable sign of leprosy. Reconstruction of the eye brows is carried out with skin flaps taken from the temporo-parietal region and transferred on subcutaneous fascial pedicles which include the superficial temporal artery and vein. The thus formed flaps are threaded through tunnels burrowed under the skin of the temples, and then sutured into the recipient bed, formed in the region of the eye brows. Thanks to the good blood supply, the hair of the grafts does not fall out and grows normally. The eye brows can be reconstructed in any required shape, just as will correspond to the characteristic features of the patient's face (Fig. 8).

In nodular leprosy, the skin of the face becomes markedly atrophic with loss of elasticity and hypopigmentation. A multitude of wrinkles, folds and scars develop, which make the patient look much older than his age. Cosmetic operations capable of restoring the features of youth to the patient's face, are indicated.

The skin of leprosy patients possesses good regenerative capacity. Sutured incisions made in atrophic skin through areas with impaired sensitivity due to destruction of cutaneous nerves (which has been evidenced by histological examination), heal by first intention, and rapidly form linear scars which are quite inconspicuous. A morphological investigation of the process of wound healing in leprosy was not carried out earlier. By performing reconstructive and corrective operations in the face, the author was able to collect material for morphological studies. A total of 67 biopsies were thus carried out in 37 patients at periods ranging between seven days and five years after operation. Histological and histochemical methods were employed to study the features

of connective-tissue development at the different stages scar formation. It could be shown that, in leprosy patients, the process of skin wound healing proceeded very intensively. Already in the first week, oriented fibroblasts and collagenous fibres come into appearance, and acid mucopolysaccharides accumulate early both in the matrix and the fibrous structures and fibroblasts of the forming scar.

Based on a ten-year experience, the author feels justified to state that the results of reconstructive operations in the face of leprosy patients are satisfactory. The complications and failures which were encountered, could be traced to errors in surgical technique or post-operative treatment. However, the poor results of plasties were later corrected by re-operation, and the final results proved good.

A successful reconstructive operation in the face changes the psychical condition of the patient radically; it re-establishes his courage and belief in the future, and fortifies his consciousness of human dignity, although not long ago he had lost all hope in the possibility of starting a new life.

#### SUMMARY

The communication is based on the experience with 380 reconstructive operations in the face of patients at the residual stage of leprosy. A classification of the sequelae of leprosy in the face, which includes all types of disfigurement and facilitates selection of the most rational method of surgical treatment for each group, has been elaborated. In most patients who have overcome leprosy, a combination of all kinds of deformations and defects in the face can be observed, which requires a whole complex of plastic operations in order to "take off the mask of leprosy". Reconstructive operations in the face are indicated at the stage of deep regression or in residual leprosy.

The paper deals with the successful repair of deformations of the nose by means of dividing the subcutaneous scar contractures and of constructing a supporting cartilage scaffolding, of reconstructing the nose and lips with a Filatov pedicle flap, of repairing facial-muscle palsy with a tape of fascia and lagophthalmos with a myofascial-band plasty, of reconstructing the eye brows with arterialized flaps on subcutaneous pedicles, and of other reconstructive and cosmetic operations. The skin wounds have healed well in leprosy patients, and no hypertrophic or keloid scar formation has been observed.

#### RÉSUMÉ

#### **Les interventions réconstructives des mutilations de la figure en suite de la lèpre**

A. I. Daykhes

Le travail est fondé par l'expérience avec 380 des intervention chirurgicales dans la face chez les malades souffrant des mutilations résiduelles fautes de la lèpre. On a donné le schéma de classification des suites mutulatives de la lèpre dans la face; ce schéma comprend toutes les formes de ces mutilations et aide le chirurgien de



choisir la méthode la plus rationnelle de l'opération pour chaque groupe de mutilation. Chez la plupart des malades ayant souffert de lèpre on trouve des combinaisons de plusieurs formes des déformations et des défauts dans la figure, et, pour les faire supprimer cette „masque de la lèpre“ il faut entreprendre tout un complexe des opérations plastiques. Ces opérations réconstructives dans la face sont indiquées dans le stade de la régression exprimée ou dans la phase résiduelle de la maladie. Le travail nous présente la réparation de succès des déformations du nez à l'aide des incisions des adhésions cicatricielles sous-cutanées suivi de chondroplastie de support, des reconstructions du nez et des lèvres par la plastie du lambeau de Filatov, des reconstructions des muscles paralysés par la plastie du muscle fascial, de la plastie musculo-fasciale de lagophthalme, de la reconstruction des sourcils par le lambeau artériel à la base fermée et des autres interventions réconstructives et plastiques. Les plaies cutanées en suite de ces interventions chez les malades souffrant de la lèpre guérissent bien sans la formation des cicatrices hypertrophiques ou des chéloïdes.

## ZUSAMMENFASSUNG

### Wiederherstellungsoperationen bei leprösen Gesichtsdeformitäten

A. I. Dajches

Die Mitteilung beruht auf den Erfahrungen mit 380 Wiederherstellungsoperationen im Gesicht von Kranken mit residualen Deformationen nach der Lepra. Es wurde eine Klassifikation der deformierenden Folgen der Lepra im Gesicht erarbeitet, die alle Arten umfasst und die Wahl des rationellsten Operationsverfahrens für jede Gruppe ermöglicht. Bei meisten von der Lepra betroffenen Kranken ist im Gesicht eine Kombination mehrerer Deformationsarten und Defekte zu beobachten und zur Behebung der „Aussatzmaske“ wird ein ganzer Komplex plastischer Operationen benötigt. Die Wiederherstellungsoperationen im Gesicht sind eine Indikation im Stadium der tiefen Regression oder in der residualen Erkrankungsphase. Die Mitteilung beschäftigt sich mit der erfolgreichen Behebung der Nasendeformationen durch Spaltung der subkutanen narbenförmigen Adhäsionen und unterstützende Chondroplastik, ferner mit der Wiederherstellung der Nase und der Lippen mit Filatowschem Rundstiellappen, mit der Korrektur der gelähmten mimischen Muskeln durch Fascialplastik, mit der Muskel-fascialplastik des Lagophthalmus, mit der Wiederherstellung der Augenbrauen mittels eines arterialisierten Lappens am gedeckten Stiel und mit anderen Wiederherstellungs- und kosmetischen Operationen. Die Hautwunden nach den Operationen bei Leprösen heilten gut und es wurden keine hypertrophischen oder Keloidnarben beobachtet.

## RESUMEN

### Operación de reconstrucción en las deformaciones de la cara de lepra

A. I. Daykhes

El informe se basa en la experiencia con 380 operaciones de reconstrucción en la cara de los enfermos que sufren de las deformaciones de residuo después de lepra. Fue elaborada la clasificación de los efectos deformantes de lepra en la cara, la que contiene todas clases y hace posible elegir el más racional método de la operación para cada grupo. En la mayoría de los enfermos que pasaron la lepra puede observarse la combinación de muchas clases de las deformaciones y de los defectos en la cara y para eliminar „la máscara de lepra“ es necesario todo el complejo de las operaciones

plásticas. Las operaciones de reconstrucción en la cara son indicadas en el estadio del regreso profundo o en la fase de residuo de la enfermedad. El informe trata de la eliminación fructífera de las deformaciones de la nariz por entrecortar las adhesiones de cicatriz subcutáneas y por la condroplástica de apoyo, después trata de la reconstrucción de la nariz y la de los labios por el lóbulo de Filatov, de la forma de los músculos mímicos paralíticos por la plástica fascialis, de la plástica músculo-fascialis de lagofthlmo, de la reconstrucción de las cejas por el lóbulo arterializado en el pecíolo cubierto y de otras operaciones de reconstrucción y cosméticas. Las heridas de piel después de las operaciones en los enfermos sufridos de lepra se cicatrizaron bien y no fueron observados los costurones hipertróficos o los de keloid.

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## OCCURENCE AND DEVELOPMENT OF PSYCHOPATHOLOGIC PHENOMENA IN BURNED PERSONS AND THEIR RELATION TO SEVERITY OF BURNS, AGE AND PREMORBID PERSONALITY

P. PAVLOVSKÝ

### INTRODUCTION

During the last years, burn disease with its frequency and severity is getting into a focus not only of plastic surgeons, but also specialists of other fields, mainly specialists for internal diseases, pediatricians and neurologists. Together with the effort to assure the best possible care for the complex state of patient, there is growing the importance of special care for his mental state, so psychiatrist is gradually becoming a member of the team of specialists where each of them takes part in the complex treatment of burned patient.

Actual psychiatric observations carried out in this field are relatively rare for the present. There is quoted the classical work of Adler about the consequences of Coconut Grove fire in Boston describing the symptoms of anxiety neurosis. The emotional disorders are dealt with in the works of Hamburg, Arzt, Lewis and other; to the psychotic states (constituting 32.6 per cent in the sample of 316 persons) the attention is paid by Bogachenko. The problems of children are recently taken up by H. Martin. The recent notions from the field of psychiatric care of burned patients were delivered on the IIIrd Congress for Research in Burns in September 1970 in Prague (Bernstein, Pennisi, Martin).

### SAMPLE AND PSYCHIATRIC FINDING

This paper deals with the description of psychopathologic phenomena occurring in the different stages of burn disease, their development and relation to the severity of injury, the age of patient and his premorbid personality. In the Burns Unit of the Department of Plastic Surgery of the Faculty Hospital in Prague 10, during the years 1967—70, there were examined and studied 200 patients, their age ranging from 18 to 75 years (132 men, 68 women, the aver-



age age of sample 38.6 years). This sample does not include the patients with light burns (hospitalization for less than two weeks) and those deceased from severe burns before they could be studied by the author.

In the first stage of burn disease, from the psychiatric point of view, we encounter the symptoms of immediate reaction to burns. Subjectively, the patients are complaining of pains in burned area, thirst and insomnia; to a large extent their attention centers around the milieu they are emotionally bound to and to the duties left unfulfilled. Objectively, there is evident the light psychomotoric agitation, sometimes rather slowing down of psychomotoric speed. The patients are evaluating their state of health mainly optimistically, even in many lethal cases. Considering the impairment of consciousness, during the first two days in the more serious cases somnolence is found, only in the very serious states coma with following death is appearing during several hours after injury.

The second stage represents the period of the most diverse psychopathologic symptomatology. In spite of the fact that the patient is mostly beginning to realize the severity of his injury, his attitude often stays optimistic. His attention is mainly centered around himself; from his subjective complaints, there are predominating the complaints of painful dressing changes, insomnia, anorexia, ergasthenia and lack of interest in his surroundings. Objectively, there are apparent disturbances of mood as apathy and depression with weeping, in 4 cases the hypomanic temper occurred. When the depressed mood occurred, its reactive nature was apparent — it could be dealt with and in any case there was not missing at least partly optimistic view of the future. In this stage, there are often occurring psychotic states characterized mainly by the impairment of consciousness; according to their nature they belong to the exogenous reactive type described by Bonhoeffer. From the specific types, we encounter most often amentia-delirium syndrome and amentia syndrome. The signs of delusional consciousness are most often appearing during the afternoon or evening of the second or the third day; patient is beginning to talk to himself, he is inadequately responding to external stimuli, he shows psychomotoric agitation and usually depressed mood; the busyness delirium also appeared. From the perception disorders, the visual and auditory hallucinations were the most frequent ones, the bodily hallucinations were rare, the elementary visual hallucinations were frequent and they were experienced mainly by the individuals burned with electric current. From the impairments of thinking, the delusional idea, nosognosia, occurred when the patient refused to believe in his injury and his inability to move with injured limb. In the successful cases, psychotic states observed in 20.5 per cent of cases in the sample have mostly the lytic ending with gradually extending lucid intervals; in the lethal cases, the psychomotoric agitation is slowly calming down, the impairment of consciousness is getting more profound and developing into coma. The longest observed amentia state lasted two months, but usually it was passing off after one to two weeks. Also in this stage the sleep disturbances showed, characterized by waking up during the night, superficial sleeping, ample hypnagogic

states and abundant dreams usually nightmares; the patients did not report dreams about fire.

During the third stage, the psychopathologic symptoms are mostly manifested as emotional disorders. This is the period, when the patient is getting better objectively, but painful treatment and rehabilitation procedures are going on and the hope of discharge is still distant. The patients report impatience, overirritation and hypersensitivity. They have difficulties to put up with

Tab. 1

Burn	Light	Severe	Together
Men	28	104	132
Women	38	30	68
Together	66	134	200

various restrictions, they are critical of the work of nurses and physicians. The emotional lability, the tendency to tearfulness and sometimes even to hypochondriacal complaints are found. The more permanent depressed state of mind does not come as a rule. In the unsuccessfully progressing cases, the second stage can bring on toxic cachexis characterized, from psychopathologic point of view, by severe apathy and abulia. The patient does not cooperate, he lacks the will to recover and he cares for nothing. This loss of interest in life seemed to aid to the lethal end of two patients.

The symptoms of exhaustedness, increased emotional irritability and lability are encountered in the fourth stage, too, but in a much less degree. In several patients with permanent consequences of burning such as the severe cosmetic defects and the impairments of mobility, there were observed changes in character towards increased introversion, that is taking the interest in one's own thoughts and feelings.

Among the factors with the immediate impact on the intensity and development of psychopathologic symptoms, there are reported severity of injury and age of patient; the actual observation also proves the importance of mental state at the time of injury and premorbid personality.

Considering the impact of severity of injury, the sample was divided into the group of patients with light burns (burns did not extend 15 per cent of body surface) and the group with severe burns.

In the second and the third stage, the lightly burned patients experienced insomnia, light depressive reactions and emotional lability, exceptionally hypochondriacal symptoms and negative attitude to cooperation. Only once there occurred the state of confusion of short duration and that was the case of 73-year-old male-alcoholic.

In the severely burned patients, the psychotic states occurred in 30 per cent of cases. The emotional disturbances appeared as depressive, apathetic

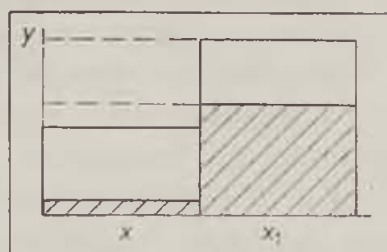
and rarely also hypomanic mood. The hypochondriacal states with exaggerated self-observation and demands for attention were relatively frequent, too. As to the differences between sexes, women showed more frequently depressive reactions and more distinguished symptoms of emotional lability.



Considering the age of patient, it follows from the general experience of physicians that the course of healing is much more complicated in the older patients and that the injury considered a light one in the younger patient, causes serious troubles in the older one. In the above mentioned sample, 24 patients are more than 70 years old. Those, compared with the patients of other age groups, showed more often apathy-abulia syndrome and psychotic states [graph] even with relatively small injured area [in the group of older patients 71 per cent vs. 33 per cent of the lightly burned patients in the whole sample].

Following paragraphs are dealing with the possible influence of premorbid personality on the development of psychopathologic symptomatology. To grasp this problem seems to be rather complicated, mainly for its difficulty to reconstruct premorbid personality and so the achieved results are to a large extent subjectively biased by the patients evaluation. From the personal traits we could deduce that the patients with the symptoms of higher sensitivity, tendency to excessive worries and the greater difficulty to overcome obstacles of life, have rather higher dispositions to develop depressive symptomatology in the afterinjury period. The immediate state of mind before the injury also has its importance — 6 persons has lost a near member of their family shortly before the injury; all of them showed tearfulness [nonexistent before the injury], increased emotional irritation and tendency to pessimistic evaluation of their state of health.

The obvious dependancy of the present symptomatology on the premorbid personality was evident in the case of patients with apparent anomaly in their anamnesis. In this sample, there were 2 female-patients who had suffered from the attack of paranoid schizophrenia. In spite of the increase of ataractic drugs, both of them suffered from the exacerbation of process. Similarly, in the case of 2 heavy psychopaths, their transportation to the Psychiatric Hospital was necessary.

This paper does not deal with therapy of the mentioned psychopathologic symptoms, but considering the gravity of this problem, several infor-



Graph. 1.  $y$  = occurrence of observed symptom (%). —  $x$  = apathy-abulia syndrome.  
 —  $x_1$  = psychotic state. —  = occurrence of symptom in the whole sample (%). —  
 = occurrence of symptom in the group of patients older than 70 years (%)



mative notes at least: the unfavourable symptoms were treated by means of psychoactive drugs and individual psychotherapeutic interviews. There were employed tranquilizers (Meproamat, Radepur, Seduxen) with favourable result in anxiety and depression states, psychoplegic drugs (Chlorpromazin, Levopromazin, Chlorprotixen) for the more severe states of agitation and severe insomnia, antidepressants (Nortriptylin, Amitriptylin, Melipramin) for deeper depressions and experimentally also psychomimetic drugs (Dexfenmetrazin) for heavy apathies. Present experiences are proving that the excessive worries over the side-effects of psychoactive drugs are unnecessary even in the case of such severe somatic patients as the burned patients are. Bringing mainly positive results, the possibilities for their greater use in this field of medicine have arisen. The individual psychotherapeutic interviews were mainly concerned with the optimism elevation, the planning of future life, in some cases also with the special problems of particular patients. The staff of Burns Unit welcomed the presence of psychiatrist in respect to his better feasibility to solve the possible conflicts between the patient and the nurse. As an unparticipating party he could better cope with the threatening misunderstanding in the particular cases.

#### DISCUSSION AND CONCLUSION

Our own results in the description of psychopathologic symptoms occurring in the course of burn disease differ slightly when compared with the data of other authors. The occurrence of psychotic states was insignificantly lower than in the Bogachenko's sample, where there were included more premorbidly organically alternating individuals. In the described sample the endurance of amentia-delirium states several times exceeded 20 days reported as an upper limit by Bogachenko; exceptionally amentia state lasting 2 months occurred. During the third stage the occurrence of psychotic symptoms was not observed, compared with the Bogachenko's sample, the disagreement could be caused by differences in the classification of various stages in burn disease.

Compared with the other authors, the anxiety symptoms were rather rare, on the other hand the hypomanic temper was diagnosed somewhat more often.

Among the relations of psychopathologic symptoms to various factors, it is necessary to consider the degree of severity of injury to be the most important one. The lightly burned patients showed the symptoms of neurotic nature with the relatively low intensity and controlled by small doses of hypnotics and tranquilizers, while the psychotic states and grave emotional disorders were not exceptional in the severe burns.

Considering the impact of age factor, in the patients older than 70 years the state of confusion was caused by the burns covering much smaller area of body surface than in the younger patients. This is probably due to the lower resistance of their CNS often suffering from arteriosclerotic process.

The impact of personal traits characterized premorbidly as normal ones is less clear. Preliminary results are indicating that the patients with the premorbid asthenic traits are more often developing psychopathologic symptomatology than distinctly syntonically personalities. There depends a lot on their previous experiences and their immediate mental state before the injury. The severe mental anomalies develop more easily decompensation, in the case of paranoid schizophrenia we must face the exacerbation of process.

In the equipping of new Burns Units, the treatment of those distinctively psychiatric patients should not be forgotten so that their transportation to the special hospital, where it would be difficult to obtain highly specialized surgical treatment, would not be necessary. In this connection there stands out the demand for nursing staff to learn the bases of treatment of mentally ill patients.

#### SUMMARY

There is described the sample of 200 patients examined and observed in the course of their hospitalization in the Burns Unit. In the particular stages of burn disease, the symptoms of neurotic and psychotic nature occurred. Besides the description of those symptoms, attention is paid to the relation between the clinical psychiatric picture and the severity of burn, the age of patient and the premorbid personality.

The graver psychopathologic symptoms as amnesia-delirium states and heavier emotional disorders are found almost exclusively in the individuals with severe burns. In the older patients with the symptoms of arteriosclerotic impairment of CNS, the states of disorders are developing more easily and with relatively lighter injury than in the younger patients. The premorbidly asthenic personality types are developing more frequently the psychopathologic symptomatology as their reaction to burns. The distinctive mental anomalies are tending to decompensation, in paranoid schizophrenia the exacerbation of process must be faced. The immediate mental state before the injury and the anamnesis experiences of patients have their importance, too.

The burned patients with serious mental impairment in their anamnesis must be given the additional care including the psychiatric one. Those patients should be remembered in building of new Burns Units so that there would not be necessary to transport them to the psychiatric hospitals, where it is more difficult to obtain the specialized surgical care.

#### RÉSUMÉ

**L'apparition et le développement des phénomènes psychopathologiques chez les brûlés et leur rapport à l'importance de la brûlure elle-même, à l'âge du malade de même qu'à la personne praemorbide**

P. Pavlovský

L'auteur nous présente un groupe de 200 des malades ayant subi un traitement psychiatrique au cours de leur hospitalisation dans le département des brûlés. Dans les périodes respectives de la maladie des brûlés l'auteur a trouvé des syndromes

neurotiques de même que psychotiques. A part de leur description l'auteur a étudié leur rapport à la manifestation psychiatrique en clinique, la profondeur de la brûlure, l'âge du malade et la personnalité praemorbide.

Les symptômes psychopathologiques graves sous forme des états de délirium amentaux de même que les déformations graves de l'émotivité se manifestaient exclusivement chez les brûlés graves. Les personnes âgées aux signes d'artériosclérose du système nerveux centrale se trouvent désorientées plus facilement que celles jeunes. Les personnalités aux traits praemorbido-asthéniques réagissent aux brûlures beaucoup plus souvent par des symptômes psychopathologiques. Les abérations exprimées du caractère présentent des décompensations, la schizophrénie paranoïde exacerbe presque toujours. Il y a même un rapport important entre l'état mental du malade avant la brûlure et entre les expériences anamnestiques du malade.

Les malades dont l'anamnèse découvre une maladie mentale, doivent être surveillés minutieusement avec l'aide du psychiatre. Au cours de l'organisation des nouveaux centres des brûlés on devrait penser à ces malades, pour qu'il n'y aurait pas la nécessité de leur transport dans les centres psychiatriques ou le traitement spécial chirurgical est très difficile.

#### ZUSAMMENFASSUNG

#### **Das Vorkommen und die Entwicklung psychopathologischer Phänomene bei verbrannten Personen und die Beziehung derselben zu der Folgeschwere der Verbrennung, zum Alter und zu der prämorbidem Persönlichkeit**

P. Pavlovský

Beschrieben wird eine Aufstellung von 200 Kranken, die während ihrer Hospitalisierung an der Abteilung für Verbrennungen psychiatrisch untersucht und verfolgt wurden. In den einzelnen Phasen der Verbrennungskrankheit erschienen Symptome neurotischen und psychotischen Charakters. Neben ihrer Beschreibung wird auch der Beziehung zwischen dem klinischen psychiatrischen Bild und dem Verbrennungsgrad, dem Krankenalter und der prämorbidem Persönlichkeit Aufmerksamkeit geschenkt.

Schwere psychopathologische Symptome in Form von ament-deliranten Zuständen und schwereren Emotivitätsstörungen begegnet man fast ausschliesslich nur bei schwer verbrannten Individuen. Bei älteren Personen mit Zeichen einer arteriosklerotischen Erkrankung des Zentralnervensystems kommt es zu Verwirrheitszuständen bei verhältnissmässig leichteren Verletzungen leichter als bei jungen Individuen. Persönlichkeiten mit prämorbid asthenischen Charakterzügen reagieren auf die Verbrennung durch einigermassen häufigeres Vorkommen der psychopathologischen Symptomatologie. Ausgeprägte Charakterdeviationen zeigen Tendenz zur Dekompensation, bei paranoïder Schizophrenie muss mit einer Exazerbation des Prozesses gerechnet werden. Es kommt an auch auf den augenblicklichen Geisteszustand vor der Verbrennung und auf die anamnestischen Erfahrungen der Kranken.

Verbrannten, die in ihrer Anamnese eine schwere Geistesstörung haben, muss erhöhte Pflege einschliesslich der psychiatrischen gewidmet werden. Bei der Errichtung neuer Abteilungen für Verbrennungen sollte auch an diese Patienten gedacht werden, damit sie nicht in psychiatrische Heilanstalten transportiert werden müssen, in welchen die spezialisierte chirurgische Betreuung schwer erreichbar ist.



## RESUMEN

### Presencia y desarrollo de fenómenos psicopatológicos en las personas quemadas y su relación a la importancia de la quemadura, la de la edad y la de la personaje premórbida

P. Pavlovský

Es descrito un grupo de 200 pacientes, que fueron examinados de un alienista y seguidos en el transcurso de la hospitalización en el departamento para las quemaduras. En las fases particulares de la enfermedad de quemadura aparecieron los síntomas tanto del carácter neurótico como del psicótico. Además de su descripción se presta el cuidado a la relación entre el cuadro psiquiátrico clínico y el grado de la quemadura, la edad del paciente y la personaje premórbida.

Con graves síntomas psicopatológicos en la forma de los estados de demencia y delirio y la de los defectos más graves de la emotividad nos encontramos casi exclusivamente solo en las personas gravemente quemadas. En las personas más viejas con las señales de la afectación arteriosclerótica de CNS se encuentran los estados de demencia más fácilmente también en la herida relativamente más ligera que en las personas jóvenes. Las personajes con los caracteres premorbidamente asténicos reaccionan a la quemadura con la presencia más frecuente de la sintomatología psicopatológica. Las divergencias expresivas del carácter manifiestan la inclinación a la decompensación, en la esquizofrenia paranoidea es necesario contar con la exacerbación del proceso. Depende tanto del estado instantáneo mental antes de la quemadura como en las experiencias anamnéticas de los pacientes.

En los quemados, los que tienen en la anámnesis un trastorno mental grave, es necesario poner esmero elevado con inclusión del psiquiátrico. Al instalar nuevos departamentos para las quemaduras tendría pensarse también en estos pacientes, para que no tengan que transportarse en los establecimientos sanitarios de psiquiatría, donde el cuidado especializado quirúrgico es peor asequible.

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## URETHRA RECONSTRUCTION IN HYPOSPADIACS BY FLAP FROM PREPUTIUM

F. MARIŠ

Reconstruction of the urethra in hypospadias is carried out by means of free skin graft (Nové-Josserand — 1898), skin flaps from more distant parts of the body (abdominal wall, femur) or skin from the immediate vicinity, from preputium, penis or scrotum (Duplay 1874, Marion 1922, Chocholka 1923, Denis Browne 1936, 1949, Ombrédanne 1937, Thiermann 1954).

The methods of urethra reconstruction as well as literature have been augmented by different modifications of these basic principles (Borchers 1928, Zemker 1934, Benjamin and Young 1948, Bogoraz 1948, David Davis 1951, Serfling 1956, Demjén 1960, Farkaš 1967 and many others).

In this report we should like to point out the method according to Thiermann, which is suitable for the reconstruction of urethra in coronary and penile form of hypospadias, especially if the hypospadiac orifice is localized in the distant half of the penis. Literature affords data on the application of this method of urethra reconstruction even in other forms of hypospadias (Serfling 1956). Thiermann (1954) applied the method himself even at penoscrotal and scrotal form of hypospadias in combination with the operation according to Duplay or Denis Browne.

Considering the length of the urethra which may be formed from the preputium, we applied the method till the present however — with the exception of one patient — in forms in which the orifice is placed at greater distance from the center of the penis.

### METHOD

The reconstruction of the urethra is mainly performed by means of the internal layer of the preputium. The cross incision is made at a distance of 3 mm from sulcus coronarius and on both sides distally continued so as to make an incision in form of U. (Fig. 1). If a longer part of the urethra need be reconstructed, the incision is also continued on the external layer (Fig. 2). Thus a skin flap of rectangular shape is obtained and a tube formed from it by suturing its edges so that the epithelial area is directed towards the lumen

and wound area outwards (Fig. 3). By means of trocar or scissors and scalpel a tunnel is formed from the apex of the glans to the hypospadiac orifice. It is suitable to dilate the tunnel by means of Pean's forceps through which the prepared tube is then pulled from the preputium into the tunnel (Fig. 4). The end of the pulled-in tube is sutured to the edges of the tunnel opening at the hypospadiac orifice. The new urethra is fixed on the apex of the glans

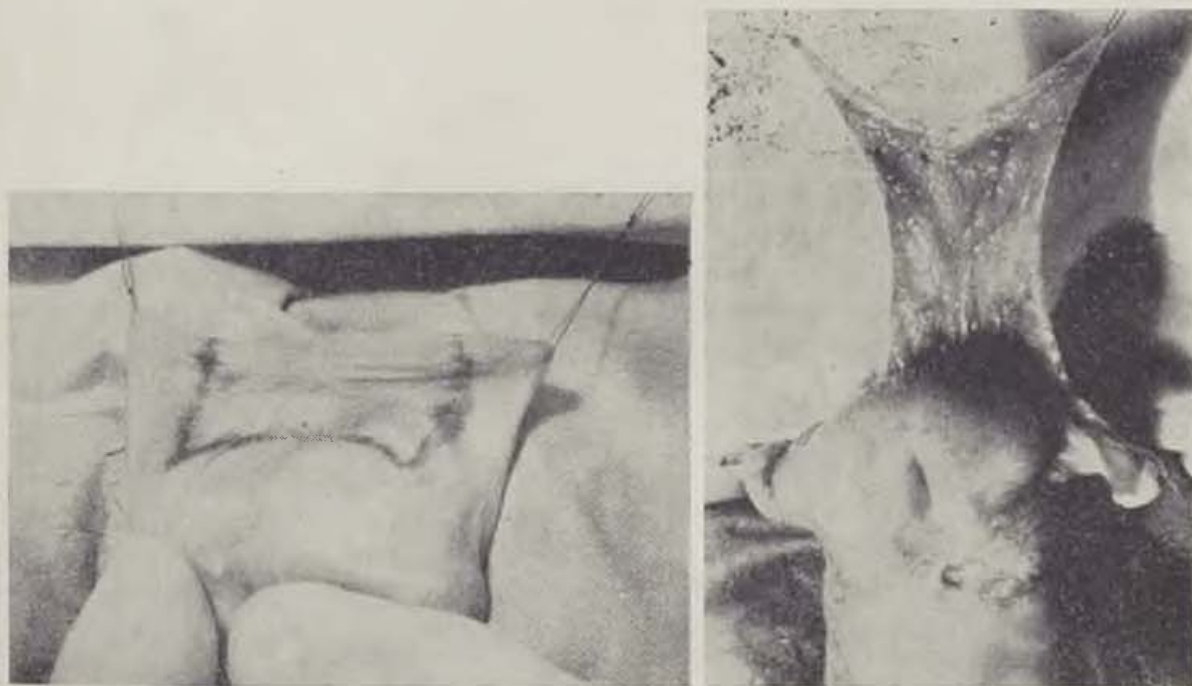


Fig. 1. The incision from which the internal layer of preputium is separated. — Fig. 2. Unfolding of the preputium forms a rectangular flap

by suturing the wound area of the tube to the edges of the opening on the glans. The tube is left in the tunnel at sufficient length without stretching it so that it suffices for the length of the penis during erection. A rubber tube is left as dilator and slipped into the formed urethra for 10—12 days and then intermittantly at intervals of several weeks until both parts of the urethra become connected. It is often unnecessary to introduce the dilator until the connection is formed.

The connection between the new formed tube and the proximal part of urethra is made 2—3 months after the first operation. In this operation the preputium is also disconnected from the orifice of the tube on the apex of the glans.

Due attention must be paid to the forming of the external orifice, so as to leave no unevenness on the apex of the glans. The edge of the new urethra is sutured by fine stitches with atraumatic nylon to the edges of the opening on the glans. Already during the first operation when the tunnel is being formed, the external orifice is placed into the dorsal part of the formed





groove on the glans, provided it is not too much shifted to the ventral area of the glans. If so, the opening is located on the apex of the glans (Fig. 5).

The connection between both parts of the urethra is produced by the method according to Duplay (1880) or Thiersch (Serfling 1956). In the last operations the following method was used by us. The internal lining of the urethra in the place of the connection is formed by suturing the skin of the



Fig. 3. Suturing of the flap edges through the epithelial layer into lumen, forms a tube. — Fig. 4. The tube is slipped into the tunnel reaching from the apex of the glans to the hypospadiac orifice

vicinity along the catheters by continued chromcatgut everted stitches. The thus formed wound area is covered by rotating flap from the lateral part of the penis, possibly from the rest of the preputium. This method has proved more satisfactory to us because we obtain sufficient material for the covering without the suture being strained.

In two patients the connection was already formed in the first phase by suturing the new tube to the original proximal part of the urethra. Fistules formed in the place of connection in both patients. This is the reason why we now carry out the operation in two phases.

The rest of the preputium is left as a reserve for application should the take become complicated and remove it unless the rest of the preputium is formed after the take was completed.

#### DISCUSSION

We consider the material from the internal layer of preputium in form of a flap to be suitable for the reconstruction of the urethra. If the preparation is carried out carefully, the vessel supply to the flap remains intact. This is

the reason why we proceed differently in the technique than the author of the method. We even make the side incisions for the forming of the flap on the internal layer of the preputium at the start of the operation so as to be able to remove the internal layer precisely under direct visual control. Thiermann removed the internal layer in form of a sac from the horizontal incision parallel with sulcus coronarius, whereby the vessel supply may be damaged.

We never observed a complication due to insufficient vessel supply into the tunnel of the tube which was slipped in. The first dilator which we use



Fig. 5. The formed orifice on the apex of the glans after disconnecting the preputium and removing the stitches

after the operation has a smaller lumen than the maximal dimension of the tube so as to prevent the pressure on the tubulized preputial layer to cause pressure necrosis during the first stage after the operation and during the take.

We also differ from Thiermann in the solution of details of the first phase of reconstruction. We suture the end of the tube formed the preputium to the edges of the cavity which we form in the immediate vicinity of the hypospadiac orifice so that the suture is not circular and rather forming an ellipse lying in oblique position. In this way we try to prevent later constrictions in this part of the reconstructed urethra.

In contrast to the free skin grafts used for the reconstruction of the urethra, this method causes no contraction of the used material and no narrowing of the lumen. This has further advantages. It does not usually require long-term dilation of the reconstructed tube as in the operation according to Nové-Josserand and thus the patients need not undergo the unpleasant procedure for half a year or longer. For this reason we are able to make the connection between both parts of the urethra earlier. This shortens the period of the complete reconstruction of the urethra considerably.

The new formed tube is usually not disconnected from the preputium earlier than when reconstructing the connection. We thus avail ourselves of the tension of the preputium for straightening the penis mainly in the region of sulcus coronarius where even after removal of the rest of the chordae and after straightening, there sometimes remains a tendency to bending.

Before reconstructing the urethra by the mentioned method we carry out operations at earlier age made necessary by the local situation. If necessary we carry out meatotomy already in the first period after birth or later ac-



Fig. 6. In a patient with penile form of hypospadias the urethra was reconstructed from the preputium. The mixture is a normal stream of urine from the external orifice localized on the tip of the glans

cording to necessity. We also have patients in which we carried out meatotomy simultaneously with the first phase of reconstruction of urethra by this method. Straightening in penile forms we carry out by extirpation of the chord and Z-plasty on the skin, thus securing sufficient skin on the ventral area of penis.

The operation according to Thiermann is usually carried out in 8—10 year old boys. This method can of course also be applied in older patients.

It is very suitable from the esthetic point of view that the orifice of the reconstructed urethra is on the glans especially as it leaves no hint of the former deformation.

Growth of the urethra thus reconstructed is no smaller than growth of the membrum and the elasticity of the applied preputional layer complies even in the first period after the operation with the demand for change of length of the membrum during erection.



## SUMMARY

The author reports on a method used at the Clinic of Plastic Surgery, Medical Faculty, Komenský University, Bratislava in the reconstruction of the urethra in hypospadiacs.

The original proposition for the operation was supplemented by some changes in the operational procedure which afford a more exact performance of the operation, evading complications during the operation and during the postoperational period and even later after reconstruction.

The method is mainly applied in penile forms of hypospadiacs when the hypospadiac orifice is situated distally from the membrum center. The operation is carried out in boys aged approximately 8 years.

Some important phases of the operational technique and the results achieved by this method are reported in detail and documented by operational figures.

## RÉSUMÉ

### **La reconstruction de l'urètre à l'aide du lambeau de préputium chez l'hypospadias**

F. Mariš

L'auteur nous présente une méthode employée à la clinique de la chirurgie plastique à Bratislava — la Faculté médicale de l'Université de Komenský — pour reconstruction de l'urètre chez l'hypospadias.

La forme originale de l'opération a été modifiée par les changements des phases opératoires respectives, qui permettent de réaliser plus exactement l'opération elle-même et de supprimer les complications opératoires, postopératoires et dans la période immédiatement après la reconstruction.

La méthode est employée surtout chez les formes péniles des hypospadias, quand l'orifice hypospadique est situé inférieurement du milieu du membrum. L'intervention est entreprise chez les garçons de l'âge de 8 ans.

Le travail cite et par les images explique les phases les plus importantes de la technique opératoire de même que le résultats obtenus par cette méthode.

## ZUSAMMENFASSUNG

### **Wiederherstellung der Urethra mit einem Lappen aus dem Präputium bei den Hypospadikern**

F. Mariš

Der Autor berichtet in der vorliegenden Arbeit über eine Methode, die an der Klinik der plastischen Chirurgie der Medizinischen Fakultät der Komenský-Universität in Bratislava zur Wiederherstellung der Urethra bei Hypospadikern angewandt wird.

Der ursprüngliche Operationsvorschlag wurde mit einigen Veränderungen des Operationsverfahrens ergänzt, die es möglich machen, die Operation mit grösserer Genauigkeit durchzuführen und Komplikationen während der Operation, in der Nachoperationszeit und später bei der Wiederherstellung zu vermeiden.

Die Methode wird hauptsächlich bei penilen Hypospadienformen angewandt, wenn sich die hypospadiasche Öffnung distal von der Gliedmitte befindet. Die Operation wird bei Jungen im Alter von ungefähr 8 Jahren vorgenommen.

In der Arbeit werden einige wichtigeren Phasen der Operationstechnik und das mit dieser Methode erzielte Ergebnis erörtert und mit Operationsbildern dokumentiert.

#### RESUMEN

### Reconstrucción del uréter en los hipospadicos por el lóbulo de praeputium

F. Mariš

El autor informa en la obra sobre un método que se emplea en la Clínica de Anaplastia de la Facultad de Medicina de la Universidad de Komenský en Bratislava para la reconstrucción del uréter en los hipospadicos.

La proposición original de la operación completaron con algunas modificaciones del método de operación las que les permiten hacer la operación más precisamente y evitar las complicaciones durante la operación en el tiempo después de la operación y más tarde después de la reconstrucción.

El método se emplea ante todo en las formas de pene de la hipospadia cuando la boca hipospadica está distante del centra de membrum. La operación se realiza en los muchachos de edad alrededor de ocho años.

En la obra se especifican y documentan con cuadros de operación algunas fases más importantes de la técnica de la operación y el resultado obtenido por este método.

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## THE RECONSTRUCTION OF VAGINA BY THICK SKIN GRAFT

M. FÁRA, K. VESELÝ, V. KAFKA

The reconstruction of the vagina does not restore health but it improves considerably the chances of the afflicted woman in life. The defect of the vagina is felt as a great personal drawback by the patient and she suffers by it far more, than by the simultaneously present — inferior or possibly absent — internal genitals.

Till quite recently, simple agenesis of the vagina in otherwise normally developed woman, was the only reason for operation. But with the extension of the science of medicine — in the first place in endocrinological diagnostics and in the psychiatricosexuological research on the question of transsexualism — this operation is indicated in a far greater number of cases. The new vagina is now being constructed normally in individual afflicted with the adrenogenital syndrome [6] or with the syndrome of testicular feminisation [8] and in individuals which — though of clearly male sex — suffer of transvestitism (psychosexual inversion, transsexualism) [3].

The Clinic of Plastic Surgery in Prague, cooperates in the reconstruction of the vagina with several Institutes in Prague and elsewhere. Recently however, most of the patients have been concentrated at the Clinic of Gynecology and Obstetrics of the Faculty of Pediatrics and at the Clinic of Gynecology and Obstetrics of the Medical Faculty of Hygiene.

Because in the past fifteen years the procedure has been quite uniform at both Institutes — the same gynecologist and the same plastic surgeon carrying out the operation and the post-operational treatment — we consider the material at these clinics to be suitable for the evaluation of results achieved so far.

### HISTORY OF VAGINAL NEOPLASTY

The history of this operation starts with the ascent of the modern trends in surgery 150 years ago when Dupuytren was the first to publish in 1817 [2] the construction of a new vagina. In 1872 Heppner [4] pointed out the cor-



rect way to vaginal neoplasty when he attempted to epithelialize the cavity by means of free skin graft. In the ensuing years several procedures were tried. Applied were free auto-, homo- and heterografts of different tissues (including thin skin grafts, hernial sacs, amnial membranes and peritoneum), skin with subcutum (in form of pedicle flap shifted from the near vicinity, or in form of tubulated flap prepared on remote parts of the body) and finally excluded and down-pulled parts of the small and large intestine (5).

As the technique of grafting developed in the period after the first World War, most of the surgeons were inclined to epithelialize the formed cavity by free skin autografts. The reason for this was the good ability of take (in contrast to skin or amnium homografts etc.) and furthermore the minimum risk for the patient (in contrast to operations on the intestine). Because of the simple removal and the easy take, thin epithelial membranes were used but their disadvantage is the forming of an inferior cover with a great tendency to shrinkage.

The results were greatly improved by the procedure taken by F. Burian who introduced in 1926 the application of skin in its full thickness, sutured on firm dilator. Work with such thick material requires careful operational technique, but after take of the skin it shrinks secondarily only little and becomes well adapted to new conditions. After the results of ten years were published in 1935 (1) the method of Burian was taken over by many surgeons all over the world.

#### PROCEDURE

The procedure practiced now at our Clinic is based on the principle of thick skin graft application.

In order to speed up the operation, it is carried out by two teams. The patient lies on her side under general anaesthesia and the surgeon removes with Humby's knife or by electrodermatome a very thick dermoepidermal graft from the right buttock. The size of the graft depends on the dimensions of the dilator, selected after careful local preoperational examination. At a separate table, the surgeon sutures the graft with thin catgut in uninterrupted suture to the thin-walled hollow dentacrylic dilator of cylindrical shape, fitted with a wire loop at the front end. Special attention is paid that the end of the dilator which will fill up the posterior vault of the vagina is covered by smooth skin without sutures.

In the meantime the patient is placed into gynecological position and the gynecologist separates the vesicorectal septum in its entire length from the X shaped transverse incision as far as the peritoneum. The thus formed cavity which is rather narrow is tamponated with moist longet in order to achieve a certain compression of the graft.

The dilator completely covered by skin, is moistened with saline and slipped by spiral motion into the preformed cavity so that the protruding wire loop is placed vertically without pressing upon labia minora. The operation which usually takes 30 minutes is finished by suture in two layers. A permanent

catheter is introduced for 3—4 days. The patient remains on her bed (performing gymnastics of the lower extremities and thorax) for 8—10 days.

On the 12th—14th day the sutures are removed, the introitus vaginae is opened and by a few catgut stitches, the minor dehiscences which may form between the edge of the taken graft and the cover of the fossa navicularis, are sutured. The dilator is removed, washed, placed for a short time into disinfecting solution and after the formed vagina is irrigated, the dilator is replaced and secured against slipping out by a bandage slipped through the wire loop and crosswise fixed around the hip and thighs of the patient.

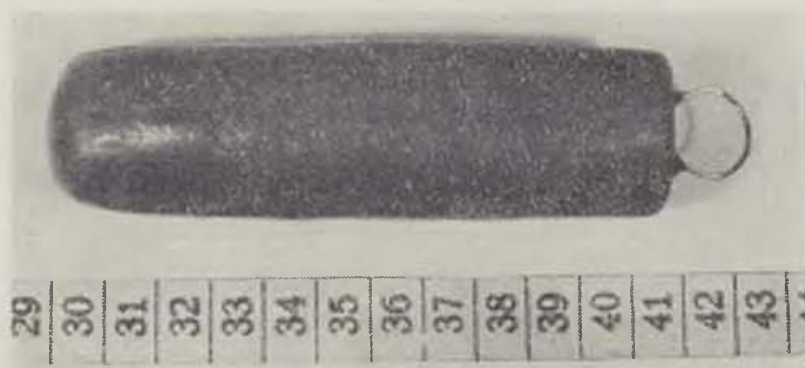


Fig. 1. The dilator usually applied in the reported procedure.

Further on the dilator is daily removed for disinfection and the vagina irrigated and as the tendency to shrinkage lessens, the period for wearing the dilator is shortened. After 6 months the dilator appears to be superfluous.

The secondary defect epithelialises usually within 3 weeks. Because the thickest dermoepidermal grafts are removed, the graft maintains most of the qualities of skin in its entire thickness and the healing of the secondary defect is sometimes somewhat retarded. In that case we cover — during the 3. and 4. week — the persisting granulating areas by a thin epithelial membrane from the other buttock. It takes within one week. The formation of hypertrophic scars is prevented by pressure massage.

#### OPERATED ON PATIENTS

Of the total number of 41, there were 38 patients operated on primarily and 3 secondarily. Re-operation was carried out 2X after Gambarov's operation (simple separating of the vesicorectal septum with subsequent long-period dilation) resulting in complete obliteration of the channel and 1X after an unsuccessful attempt of vaginal neoplasty by pulling pedicled flaps from the labia majora into the formed cavity.

The age of primarily operated on patients was between 17 and 24 years.

Reason for operation was defect of the vagina at its simple agenesis 34X, at adrenogenital syndrome 5X and at syndrome of testicular feminisation 2X.

In 8 out of 34 patients with simple vaginal agenesis (and of uterus usually as well), i.e. in 23,5%, the following associated malformations of the urogenital system were diagnosed: 2X solid uterine rudiment, 1X solitary kidney (localised sacally in the central line with one arteria renalis and one urether), 2X agenesis of one kidney, 2X doubled kidney and 1X cystic degeneration of one kidney.

In patients with adrenogenital syndrome the vaginal neoplasty was always carried out as the first surgical step and only then followed reconstruction of the external genitalia and augmentation of the breasts as a supplement to hormonal therapy.

In one patient with syndrome of testicular feminisation retroperitoneal reposition of the testicles was carried out besides vaginal neoplasty.

Secondary sexual signs in the feminine sense were very well developed in both individuals afflicted by this syndrome.

#### RESULTS OF TREATMENT

Peroperational complications such as perforation of surrounding organs (urethra, bladder, rectum, abdominal cavity) or impossibility to create the cavity corresponding to the dilator with graft which was prepared beforehand — thus making implanting impossible — were never encountered by us.

Postoperational complications occurred in 8 patients i.e. in 19,5% of the cases. Of these 4X the complications were of a slighter degree and caused by necrosis of part of the graft. In these cases we never waited long for spontaneous epithelisation, we sooner transplanted secondarily. Usually we did so 2—3 weeks after removing the dilator. More serious complications occurred 4X, i.e. in 9,7%.

In the first case it was a rectovaginal fistule, which formed on the 20th. postoperational day in a patient in which 3 months before the haematometra was extirpated per laparotomiam. We believe the complication to have been caused by pressure of the posterior edge of the dilator predominantly upon rectum, when the scar on the posterior and upper part of the cavity which was formed after previous hysterectomy, prevented regular spreading of the pressure of the dentacryl to all sides.

In the second case a vesicovaginal fistule appeared in a patient unsuccessfully operated on elsewhere already previously. The graft took per primam, the patient had been carrying the dilator already only for part of the day without any difficulties. 3 months after the operation the patient had been transferred to us from a therapeutic establishment for alcoholics with a fresh fistule — the origin of which she was unable to explain.

In the third and fourth case it was an urethrovaginal fistule which appeared in one of the patients after removal of the acrylic dilator on the 10th day after the operation and in the other patient on the 24th day when the dilator was already being removed regularly every day. In both cases the inducing



moment could have been the pressure of the permanent catheter left in the patient for an exceptionally long period (7 and 9 days) pressing against the urethra wall from the inside against the dilator.

The formed fistules were closed by the usual plastic method applied especially in perforations in the palate. The lining (of urethra, bladder, rectum) was reconstructed by a flap based at the edge of the opening, with the epithelium of the vaginal wall turned inside the perforated formation whereas the respective cover from the vaginal side was formed by turning the flap from the opposite edge of the defect.



Fig. 2. Vagina reconstructed by the described procedure. Appearance and consistency of the lining as well as spaciousness of the vagina approach normal condition.

In two patients with take per primam but without sexual intercourse for a long time there was late narrowing of the vaginal entrance caused by slow contraction of the circular scar at the anterior margin of the taken skin graft. In both cases we succeeded by Z-plasty.

There were no complaints by the other patients. The vaginae were controlled and found to be sufficiently spacious and serving their function well. Their elastic lining looses dryness of the skin epithelium, it is sufficiently moistened by the glands maintained at the edge of the mucosa and it got in some cases quickly the character of the normal vaginal mucosa.

#### DISCUSSION

We consider the reported procedure to be the simplest and most effective in the construction of a new vagina. We arrived at this conclusion after comparison with the other methods of operation with which we either have personal experience or about which we learned when treating complications formed after such operations.

Several questions may be discussed. First of all whether a hard or a soft dilator should be used and furthermore whether it is better to open the formed



cavity after take of the graft and to use the dilator only for interrupted dilation or to leave the dilator in the closed cavity for the whole period of potential shrinkage of the graft, i.e. for about 6 months.

We prefer the dilator made of dentacryl instead of other material for several reasons. For one, it is quite smooth, it can be well cleaned and disinfected and furthermore it is very light and can be easily introduced. Condomes on the other hand, filled with any type of filling may change their shape after suture and become strangulated. Their rubber packing is far more irritating to tissues of the human body than dentacryl. Dilators made of elastic plastics are either porotic or they are easily damaged if used for some time and their surface becomes rough. Stent begins to crumble after several days already and for this reason we have not been using it for many years, not even when it was most suitable because of the possibility to carry out sterile modelling during the operation (for ex. in reconstruction of orbita).

In order to evade excessive pressure upon the urethra we ordered in some cases dilators with a groove deepened in their upper side. But we became convinced that pressure necrosis of the urethral wall can be evaded even if the usual cylindrical dilator is used, provided that sufficient care is taken.

One of the authors (a plastic surgeon) applies long-term implanting of the dilator with the graft, when operating on at Institutes distant from Prague. The reason for it is the fact that it becomes superfluous to carry out frequent controls of the patients and postoperational treatment in form of daily exchange of the dilator and irrigation. This makes it easier for Institutes where they have no sufficient experience with neoplasty of the vagina. This procedure has however several drawbacks.

Firstly the applied dilators are always smaller so as to exclude — repeated visual control being impossible — excessive pressure upon the surrounding organs in walking and working patients and to afford an approx. 15 mm suture of the individual tissue layers, which prevent the dilator from being pushed out.

The implanted grafts are thinner than those which we are using in our routine operations because the probability of their take is greater although the final result is worse. Because control as well as postoperational treatment is impossible, we have to decide on this way. It is most practicable because it leads to primary take of the graft. Only skin in its entire thickness (as originally reported by F. Burian) or nearly as thick (used by us in order to facilitate the removal) secures a maximum quality of the lining in the formed vagina.

A further disadvantage is the necessity of a second operation when opening the new vagina and removing the dilator. A circular defect forms in front in size of the discised tissue layer and unless we shorten the vagina by the mentioned 15 mm, we have to cover it by graft.

Finally we consider it a disadvantage that there is half a year delay in the phenomenons of transformation by which the graft slowly transforms the mucosa margin in dorsal direction to a normal vaginal mucosa.

All the patients clean the dilator and irrigate the vagina conscientiously every day even when at home, but it must be pointed out to them that the dilator must be pushed inside completely and fixed firmly — best by a sanitary towel. We control the condition of the vaginal lining at the regular visits and shorten the period of dilation.

The advantages of physiologic dilation by sexual intercourse are doubtless. This is why we like it best to carry out the operation 2—3 months before the planned marriage. But we consider it important to explain to the future husband the actual condition of the treated woman. Most of the marriages are then happy ones. Two marriages ended badly, the women married before the vagina was formed. In both cases there was the primary disappointment of the not informed partners and then the prolonged take of the repeatedly formed and not healing granulation areas. Both marriages were divorced within one year.

We consider the reconstruction of a new vagina from the intestinal bowel to be a quite unnecessary burden to the patient. Even at the best possible technique of operation and the most effective prevention of complications, a regular percentage of mortality is reported in facultative indication of vaginal neoplasty. This fact alone already speaks against the decision to carry out such a risky operation. We found that vagina reconstructed from small or large intestinal bowel often maintains secretion from the surviving glands, thus molesting the operated on woman by its quantity as well as smell. V. Šnajd (7) proved histologically that intestinal glands never lose their secretion. The wall of this vagina maintains a certain ability of resorbing substances with which it comes into contact so that the irrigation carried out because of the above mentioned difficulties, must not contain disinfectants which might intoxicate the patient.

We consider it superfluous to discuss Gambarov's method as a possible method of operation. We could never agree to a procedure which leaves the formed defect to heal per secundam. The infected granulation and the lengthy spontaneous epithelisation is harmful to the entire organism and the formed heavily scarred cover is of no good quality and can be easily injured.

It is absolutely essential that each woman in which vaginal neoplasty is intended, should undergo a thorough medical examination whereby many aspects must be considered. In the first place we search of course for concealed manifestations of the adrenogenital syndrome and syndrome of testicular feminisation and for associated malformations of the urogenital system. Thus functional complications from unrecognised defects in the post-operational period are prevented and at the same time the complete prognosis for each patient can be better worked out.

We may say in conclusion that the reported method for treating vaginal agenesis which is based on the 45 years old original procedure by F. Burian appeared to be of great advantage in our conditions. The surgery itself is not too difficult for the operators, nor does it burden the patient and the post-operational treatment is simple.



## SUMMARY

Analysis of 41 cases of vaginal neoplasty in which a thick dermoepidermal graft was implanted on a dentacryl dilator. The indications for the operation, post-operational treatment and complications as well as the advantages in comparison to the other procedures taken, were discussed.

## RÉSUMÉ

### La reconstruction du vagin à l'aide du transplant cutané épais

M. Fára, K. Veselý, V. Kafka

Les auteurs ont examiné les 41 des cas de la néoplastie vaginale, où un transplant dermoépidermique très épais d'origine de la fesse soutenu par un porteur dentacrylique a été employé. La discussion des indications à l'opération, de la mode de thérapie postopératoire, des complications postopératoires de même que des avantages respectives de cette méthode en comparaison avec d'autres interventions est faite.

## ZUSAMMENFASSUNG

### Wiederherstellung der Vagina mit einem starken Hautpfropfen

M. Fára, K. Veselý, V. Kafka

Analysiert wurden 41 Fälle der vaginalen Neoplastik, bei welchen ein sehr starker dermoepidermaler Pfropfen vom Gesäss am Dentacrylträger implantiert wurde. Diskutiert werden die Operationsindikationen, die Nachbehandlungsmethode, die postoperativen Komplikationen und die Vorteile gegenüber anderen benutzten Verfahren.

## RESUMEN

### Reconstrucción de la vagina por un injerto robusto de piel

M. Fára, K. Veselý, V. Kafka

Se realizó la análisis de 41 casos de la neoplástica de la vagina en los que se implantó un injerto dermoepidermal muy robusto de las nalgas en el soporte de dentacril. Se discutieron la indicaciones para la operación, el modo del tratamiento siguiente, las complicaciones después de la operación y las ventajas en comparación con otros procesos usados.

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## 2nd International Congress on Cleft Palate

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V. Michálek  
STUDIES ON THE VARIABILITY OF THE MAXILLA



Fig. 1. Cleft of spina nasalis anterior.

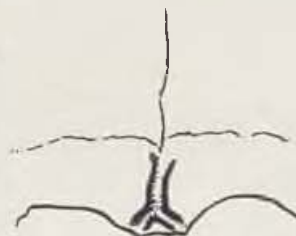


Fig. 2. Cleft of spina nasalis posterior.



Fig. 3. Distinct assymetry of apertura piriformis.



Fig. 4. Regio praenasalis — anthropic form.



Fig. 5. Regio praenasalis — infantile form.

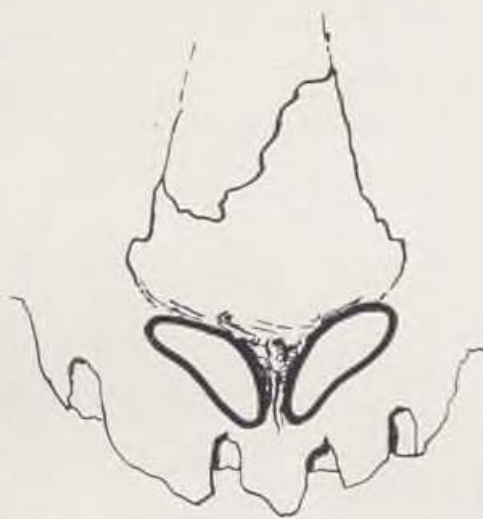


Fig. 6. Regio praenasalis — Fossa praenasalis.



Fig. 7. Regio praenasalis — Sulcus praenasalis.





Fig. 8. Doubled foramen infraorbitale on the right.

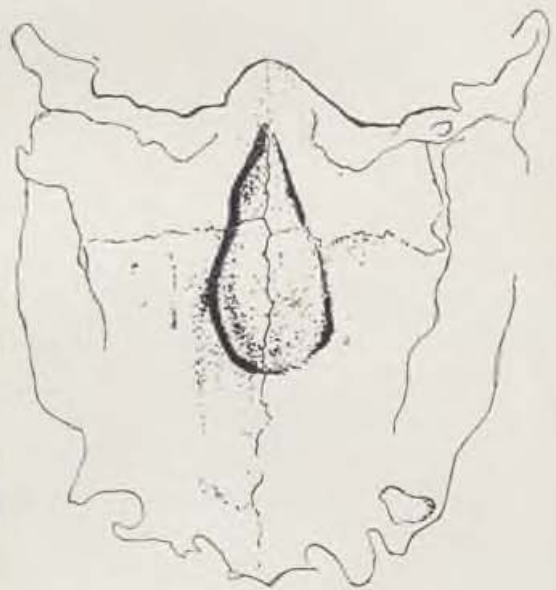


Fig. 9. Torus palatinus.

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