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“MALIGNANT HAEMANGIOMA” OF THE FACE

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INTRODUCTION

Tumours arising from the vascular structure — whether capillary, vascular or arteriovenous — which take their origin from an embryonic enclave of mesodermal tissue, have one sign in common: while the patho-histological picture is characterized by its multiformity it can rarely be a safe guide to the clinical picture of the tumour, its behaviour or prognosis. The clinical picture of vascular tumours is rarely stationary. There are signs of progression, proliferation, regression, even of spontaneous clinical healing. The very fact that these tumours are congenital and closely follow the development of the organism, i. e. grow proportionately with the affected parts, shows that there is, to a certain degree, a growth factor always present, which influences the further development of the tumour. In the clinical picture of the large majority of vascular skin tumours initial proliferation can be ascertained which is limited to a certain period, in most cases to the early period of life. Some pathologists as well as clinicians regard this growth potential as the basic property characteristic for a tumor in contradiction to the behaviour of a vascular naevus where this is lacking.

Even if this conception were a simplification of the whole problem, it is evident that the group of vascular tumours, showing initial growth, possesses an inherent activity which may result in malignant degeneration with all its manifestations.

Its close connection with the blood stream causes the vascular tumour to follow the changes in blood pressure and oscillation of blood filling, which in itself can cause a gradual widening of vessels by the increased flow and volume of blood within the tumour.¹⁾ This alone may manifest itself as enlargement of the tumour, but it also may become a stimulus for true growth of the tumour in its centre as well as its periphery.⁵⁾ Proof of this is the frequent enlargement of a tumour after partial obliteration by thrombosis. Since the supply vessels are unchanged, it may be estimated that the blood pressure inside the tumour will rise. This may also cause enlargement of a neighbouring capillary haemangioma hitherto quiescent.

The influence of the blood pressure on the growth of the tumour can, however, also be demonstrated in conditions where communications between the

venous and the arterial network have developed. This happens quite frequently. In such cases a sudden enlargement and actual growth of the tumour takes place even to extreme dimensions. According to the author's experience arteriovenous communications are usually formed simultaneously at many sites. Pulsation of the tumour becomes evident and is transmitted to the surrounding venous plexus which widens distinctly.

Histologically differentiated haemangiomata have a basic angiomatous structure. The differentiation of the various types is easy if no other pathological changes (such as the ulceration of the surface or a concomitant skin disease) are present, which may blur the typical picture.⁵⁾

In a "growing haemangioma" mitoses and cellular proliferation with infiltration into the surroundings of the vessels are present. In the periphery growth manifests itself by the formation of solid endothelial columns which become canalized in a way similar to that of the growing of capillaries.

The precipitant growth during childhood, when certainly conditions connected with the adjustment of the blood pressure come into play, takes place mainly on a congenitally changed stratum.¹⁾ Sometimes growth reaches giant proportions before the onset of regressive processes within the tumour. Clinically, it may thus acquire a malignant character although the histological diagnosis remains uncertain for a long time. In the histological picture transitions of the typical structure from mildly growing to exuberantly proliferating areas are present.⁵⁾ Because of this diverse picture the differential diagnosis is very difficult. To avoid severe bleeding the biopsy material is usually excised from the periphery where only simple proliferation is found in most cases.

As distinct from a benign haemangioma, a haemangio-endothelioma is considered as malignant. However, its malignancy is of a varying degree.¹⁾ Highly malignant tumours and tumours with metastases are found but rarely. Hall mentions only 12 cases of haemangio-endothelioma with metastases published in the American literature during the period from 1935 till 1948.^{1 4)}

CLINICAL PICTURE

As stated above in addition to an initial tendency for growth, most vascular tumours show a tendency for regression and spontaneous healing. This process usually starts with a thrombotic obliteration of vessels and proceeds with fibrotic transition. In some cases this process takes place without being clinically observed, in others it is accompanied by signs of inflammation, sometimes quite violent, frequently in the course of some general infection. Effective treatment aims at the acceleration of this process. We agree with the American authors who demonstrate on the basis of a large material, that more than 60% of all congenital vascular naevi and haemangiomata of the skin regress during the first three or four years of life and, therefore, do not require any therapy.^{2 6 3)} This capacity for regression is also present in blood vessel tumours which proliferate initially, and may, therefore, be aided by all methods of conservative treatment, such as sclerotization, coagulation and X-ray irradiation.



Fig. 1a.



Fig. 1b.



Fig. 1c.



Fig. 1d.

In making the diagnosis and assessing the prognosis of a rapidly growing haemangioma the clinician has to rely on the clinical picture. The pathological picture may not yet show any signs of malignancy, but the tumour by its development, character, situation and size can already become a danger to life. These signs can be arranged into three groups:

1. Bleeding of the tumour under certain circumstances may become uncontrollable and thus fatal.
2. By growth the tumour may compress some vital organ in its vicinity and thus endanger some vital function (compression of the air way, etc.).
3. Due to the large size the tumour reaches the limits of operability, causes disfigurement and thus prevents the patient from finding employment.

T H E R A P Y

The surgeon is faced with making a decision on the type of treatment which calls for intricate planning based on experience both in conservative treatment and operative technique, the latter having recently made a great leap forward by the introduction of hypotension anaesthesia. The task is intricate because the anatomical conditions in the face impede radical procedure and demand maximum consideration for preventing permanent disfigurement.

Our therapy consists in a series of preparatory and radical procedures. It is different in cases of simple, non-pulsating, circumscribed tumours without large supply vessels, and in cases of compound, pulsating, rapidly developing growths. In the first stage, we try to ligate the afferent and efferent vessels round the whole periphery of the tumour whether visible, i. e. transparent through the skin, or identifiable by palpation. We repeat this procedure in case of recanalization and the formation of a new collateral link of the tumour with its surroundings or if we had not previously succeeded in ligating the main supply vessels to the tumour. By this procedure we aim at stopping the refilling of the tumour and at effecting thrombosis and fibrotic transition. We assist this process by careful injections of sclerotizing solutions, mainly in less actively proliferating tumours. We make a partial excision of tumours which have ceased to pulsate and do not grow any further but at the same time do not regress. Frequently the fibrotic transition of the tumour is hastened by a reactive inflammation around the foreign material of the ligatures. In rapidly growing tumours the partial excision serves to obtain material for biopsy. Total extirpation must be executed with the aim of the resulting scars being situated on a concealed site. This can usually only be done in the stage of advanced sclerosis. The operation must, therefore, be divided into a series of partial excisions so as to prevent large scars.

In infiltratively growing tumours surgical procedure must often be limited to gradual diminution because of the danger of extensive bleeding, and frequently must content itself with diminution of the tumour only in order to avoid damage to important organs, mainly the facial nerve, the parotic gland, the oculomotor nerve, muscle, etc.



Fig. 2a.



Fig. 2b.



Fig. 2c.



Fig. 2d.



Fig. 2e.

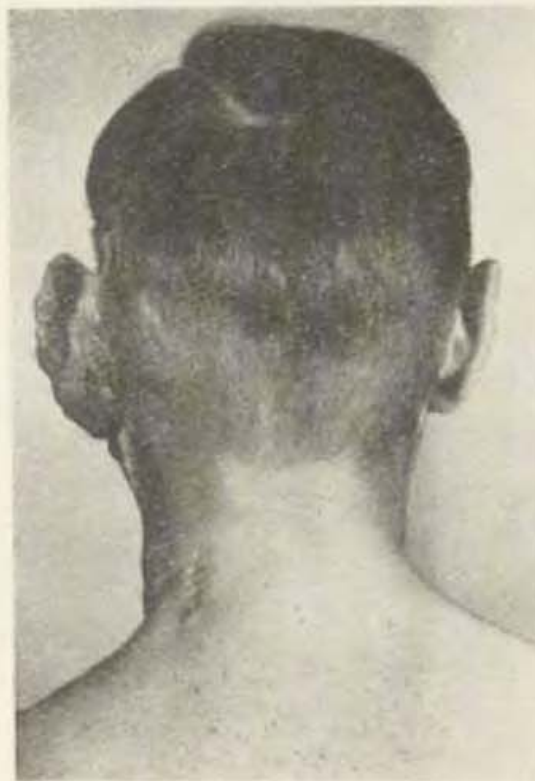


Fig. 2f.

On the whole, it can be said that these operations are quite difficult. They require well planned complex therapy and good preoperative treatment. Blood must be on hand for transfusion, efficient resuscitation must be ensured, and good anaesthesia with hypotension if necessary.

Such anaesthesia can make the operation field quite bloodless, but mostly only in cases of simple haemangioma. In tumours combined with lymphangioma, where the lumina and sinuses are much wider, hypotension can be ineffective. In cases, where bleeding has occurred from the haemangioma for a long time prior to operation, it is necessary to proceed with great caution. The operation should be performed only after complete resuscitation of the patient, and any radical procedure should be refrained from, because it may result in a further severe blood loss. In a state of collapse after loss of blood hypotension anaesthesia often fails or effects a paradoxical rise in blood pressure, which may lead to a fatal result, as happened in one of our patients.

CASE HISTORIES

For illustration three of our patients, in whom a radical extirpation of the tumour was performed, are referred to. The tumour, by its character, represented a serious danger to the life of the patient.

The first case is an example of the primary progression of a tumour originating from the congenital stratum of a pathologically angiomatous tissue which gradually filled with blood and grew bigger until it became a danger to the child's life by compressing the air way (E. N. No. of casepaper 92). Within six weeks the tumour became apparent in the right parotid region (Fig. 1a). On account of the rapid growth we ligated the supplying vessels around the tumour on four occasions and obliterated it with Varicocide. Growth, however, could not be arrested, and after six months the tumour spread to the neck. The child had, therefore, to be nursed in an upright position to lessen the compression of the trachea (Fig. 1b). In the period up to 12 months we successively performed partial excisions in front of the auricle, then below the chin, and later on the lip, by which means we virtually liquidated the tumour (Fig. 1c). The last picture shows the child at the age of 12 (Fig. 1d).

The second patient was a worker of 49 (V. P. No. of casepaper 17524) who was born with an haemangioma in the vicinity of the left auricle. At the age of ten an operation was performed involving the whole circumference of the tumour, probably in an attempt to ligate and extirpate it. At the age of 40 the remnants of the tumour on the auricle and in its surroundings started to grow suddenly. It began to show pulsation and further progression (Fig. 2 a, b, c). At 45 the patient consulted us because he was afraid of bleeding. The tumour had widened by a row of isolated nodules covered by a paper-thin layer of skin. The entire tumour pulsed strongly. Evidently a number of arteriovenous communications had formed not only with the vertebral vessels, but also with bone branches, reaching right down to the posterior fossa, as we were able to ascertain later.

In the course of two years we first, twice ligated vessels in the surroundings, then three times gradually diminished the tumour from its periphery and finally



Fig. 3a.



Fig. 3b.



Fig. 3c.



Fig. 3d.



Fig. 3e.



Fig. 3f.



Fig. 3g.



Fig. 3h.



Fig. 3i.

extirpated it under hypotension anaesthesia, which liquidated most of it around and on the auricle (Fig. 2d, e, f). It remains now to remove the tumour right on top of the cartilage of the auricle.

In the third patient, a technician of 29 (J. P. No. of casepaper 15379), we dealt with a congenital naevus of the left side of the face and an haemangioma



Fig. 3j.



Fig. 3k.



Fig. 3l.



Scheme a.



Scheme b.



Scheme c.

of the left lower lid. At the age of 12 and 13 the then small tumour of the lid was treated with radium. The swelling on the eyelid was stated to have subsequently receded. We saw the patient in 1952 at the age of 22, and found a distinct tumorous swelling with a tendency to grow on the lower lid. Since conservative treatment in this case was contraindicated and the tumour continued to grow, we performed a partial excision on the eyelid in two stages in 1954, mainly

for diagnostic purposes (Fig. 3a, b, c). The histological investigation during the whole period of treatment always resulted in the diagnosis of cavernous haemangioma. In 1956 the tumour suddenly started to grow rapidly, spreading into the whole face, showing gross pulsation in all efferent venous plexuses which quickly widened (Fig. 3d, e, f). We, therefore, ligated all afferent and efferent vessels in the surroundings of the tumour in three stages; pulsation, however, did not cease, and, since filling became very fast, we decided first on ligating the external carotid artery as well as the anastomosis of the angular and facial arteries. But even after this pulsation did not stop so that we had to assume that the tumour was supplied by the infraorbital vessels or by some newly formed deep communications. Because the tumour ulcerated and started bleeding profusely, we had — at this critical stage — to ligate the common carotid artery on the same side. Afterwards we carried out radical extirpation of the tumour under hypotensive anaesthesia given by Mr. Sázavský (scheme a, b, c). The course of the operation was quite smooth and we were thus able to ablate the tumour radically into evidently sound tissue. The resulting defect was covered immediately by a large temporal flap together with a free skin graft (Fig. 3g, h, i). During the further course of treatment we exchanged the free graft for a tubular flap from the arm and reconstructed the lower eyelid which had been radically removed in the first operation. Since 1956 the condition of the patient has remained quite satisfactory; no recurrence has occurred (Fig. 3j, k, l).

SUMMARY

A malignant haemangioma of the face manifesting itself by malignant growth and the capacity of forming secondaries is very rare. A congenital haemangioma, however, by its character and situation can become a danger to life at any period; the main cause of danger being: compression of the airway, necrosis and secondary infection, uncontrollable bleeding, late precipitant growth after the formation of secondary arteriovenous communications, activation of growth and necrosis after previous unsuitable therapy.

Progression of the tumour by growth gives no hope for the success of conservative treatment. It requires a radical procedure in order to save the life of the patient. The possibilities of such surgical treatment were, hitherto, limited. Plastic surgery makes it possible to solve the problem of covering a large defect in the face remaining after excision of the tumour, the obstacle, however, of severe bleeding due to the inaccessibility of the afferent vessels and the multitude of newly formed arteriovenous communication remained.

The possibility of ligating main arteries in the face is limited. Only since hypotension anaesthesia has been introduced has the new era of radical therapy begun, although even this anaesthesia has its contraindications.

A patient with a tumour showing malignant growth after birth and late progression after arterization, and a patient with a tumour showing malignant growth after unsuitable treatment during childhood, were described after successful treatment by plastic surgery at the Clinic of Plastic Surgery in Brno.

ВЫВОДЫ

«Злокачественная гемангиома» лица

В. Карфик

Злокачественная гемангиома лица, проявляющаяся злокачественным ростом и способностью образовывать метастазы, встречается крайне редко. Однако, врожденная гемангиома своим характером и расположением на лице может в любом периоде стать угрозой жизни больного. Главная причина опасности обычно состоит в следующем: сужение верхних дыхательных путей, распад со вторичной инфекцией, неукротимое кровотечение, поздний бурный рост после возникновения вторичных артерио-венозных соединений, активация роста и распад после несоответствующей предшествующей терапии.

Развитие роста опухоли не дает надежды на успех консервативного лечения. В таком случае требуется радикальное вмешательство для спасения жизни больного. Возможности этого хирургического метода лечения были до сих пор ограничены. Пластическая хирургия располагает методами, при помощи которых можно устранить возникающие обширные дефекты лица, однако, до сих пор большим препятствием являлось слишком тяжелое кровотечение, обусловленное недоступностью приводящих сосудов и большим количеством новообразованных артерио-венозных соединений. Подвязывание артериальных стволов на лице допускается с большими ограничениями. Только наркоз с одновременным понижением кровяного давления открыл новую эру радикальной терапии, даже не смотря на то, что и в данном случае существуют некоторые противопоказания.

В статье приводится случай злокачественно растущей опухоли после рождения, случай позднего роста опухоли после возникновения артерио-венозных соединений и, наконец, третий случай злокачественного роста опухоли после несоответствующей терапии в детстве. Все эти больные подверглись успешному лечению в клинике пластической хирургии в г. Брно.

RÉSUMÉ

«L'Hémangiome malin» de la face

V. Karfík

L'hémangiome malin de la face avec une faculté de croissance maligne et la possibilité des métastases est bien rare. Pourtant l'hémangiome dès naissance peut, faute de son caractère et sa position (localisation) dans la face, devenir un danger aigu dans quiconque période de la vie. La cause principale de ce danger est présentée par: la sténose des voies aériennes supérieures, l'ulcération suivie de l'infection, l'hémorragie aiguë, l'élargissement hâtif faute d'une communication artério-veineuse secondaire, la croissance activée et l'ulcération suivant la thérapie inconvenable.

La faculté de croître s'oppose à l'espoir du succès de la thérapie conservative. Elle exige le traitement radical, sauvant la vie. Les possibilités de la thérapie chirurgicale ont été limitées jusqu'aujourd'hui. La chirurgie plastique est capable de résoudre les problèmes de la fermeture d'un grand défaut de la face, mais l'hémorragie aiguë faute des vaisseaux amenants inaccessibles autant que la quantité des récentes communications artério-veineuses y font obstacle. L'emploi de la ligature des troncs artériels dans la face est très limité. Seule, l'anesthésie à l'hypotension a ouvert une nouvelle ère du traitement radical, malgré quelques-unes des contra-indications.

Des tumeurs malignes, l'une après la naissance du malade l'autre avec la croissance tardive suivant l'artérisation de la tumeur, et, la tumeur maligne suivant la thérapie inconvenable dans l'enfance, soignées avec succès par la clinique de la chirurgie plastique à Brno, vient d'être présentées.

ZUSAMMENFASSUNG

„Malignes Haemangiom“ des Gesichtes

V. Karfík

Maligne Haemangiome des Gesichtes, die durch malignes Wachstum und Fähigkeit einer Metastasenbildung gekennzeichnet werden, sind sehr selten. Seinem Charakter nach und der Situation im Gesicht kann das angeborene Haemagion in jedem Stadium lebensbedrohlich sein. Die Hauptgefahr bilden: Verengung der oberen Luftwege, Zerfall mit Sekundärinfektion, unstillbare Blutung, überstürztes Spätwachstum nach sekundärer arteriovenöser Verbindung, Wachstumsaktivierung und Zerfall nach vorhergehender unzweckmässiger Behandlung. Die Wachstumsprogression des Geschwulst gibt der konservativen Behandlung keine Hoffnung auf Erfolg. Sie erfordert einen radikalen, lebensrettenden Eingriff. Die Möglichkeiten einer chirurgischen Behandlung waren bisher beschränkt. Die plastische Chirurgie ist bei der Deckung eines entstandenen grossen Gesichtsdefektes imstande, die damit zusammenhängenden Aufgaben zu lösen. Das Hindernis bildete bisher eine untragbare, durch Unzugänglichkeit der zuführenden Gefässe und Neubildung von arteriovenösen Verbindungen verursachte Blutung. Die Verwendung von Stammunterbindungen ist beschränkt. Erst die Einführung der hypotensiven Narkose eröffnete, trotz einiger Kontraindikationen, hier eine neue Ära radikaler Therapie.

Es werden Fälle von malignem Geschwulstwachstum nach Geburt, mit Wachstumsverspätung nach Geschwulstarterisation und mit malignem Geschwulstwachstum nach unzweckmässiger Behandlung im Kindesalter demonstriert, die mittels plastischer Eingriffe auf der Klinik für plastische Chirurgie in Brno erfolgreich behandelt wurden.

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TRANSPOSITION OF FLAPS IN THE FACE ON A SUBCUTANEOUS PEDICLE

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The method of tubed flaps in large tissue losses of the face is used by preference today in reconstructive surgery. It provides not only skin of good quality in sufficient amounts, but also enough material for forming and modelling the damaged relief of the face. This method, however, has the disadvantage of the transplanted skin possessing a colour and texture which is always somewhat different from the natural skin of the face. The tube flap, therefore, can never provide a full substitute for the skin of the face. This can only be done by identical, i. e. facial skin.

To cover large defects of skin, however, identical material cannot be used either because there is not sufficient of it available or because of possible new scars which cannot be placed in the natural folds of the face when more extensive transpositions are performed. The use of facial skin is, therefore, indicated only in small or medium defects, e. g. defects of the eyelids, the nostrils, partial loss of the tip of the nose, the nasal septum, partial defect of the lip, the cheek, etc. In these cases the best method proved to be one of the modifications of the Indian frontal flap and of the French local transposition, also the angular or the temporal flap and finally the Stein-Abbé-Estländer flap. Each of these methods, however, can rarely be used in a one-stage plastic operation. They require transposition by means of a pedicle and adequate local preparation. It is generally recognized that the nutrition of the flaps is ensured by the afferent artery and efferent vein within the pedicle. The author, however, considers that in the majority of these transpositions nutrition is ensured not only by the supply of the main vessels of the pedicle, but that the precapillary and capillary system of the pedicle play an important part in the blood supply of the flap. In the face this supply is secured by a particularly favourable lay-out of the vascular network. For these reasons Burian rejected the terminology of Esser who calls a frontal flap the biological flap. According to Burian every flap which performs its reconstructive functions and which remains viable after transposition, is a biological flap no matter whether its pedicle lies on the afferent artery as in an arterial flap or not. It is well known that by suitable preparation with preliminary

circular incision and mobilization of the transplanted area of skin it is possible to ensure good blood supply and viability of any type of flap chosen.

Favourable tissue structure and the rich network of vessels supplying the flap are situated in the subcutaneous and never in the dermal layer. The skin flap is, therefore, transplanted on a subcutaneous pedicle, and the capillary

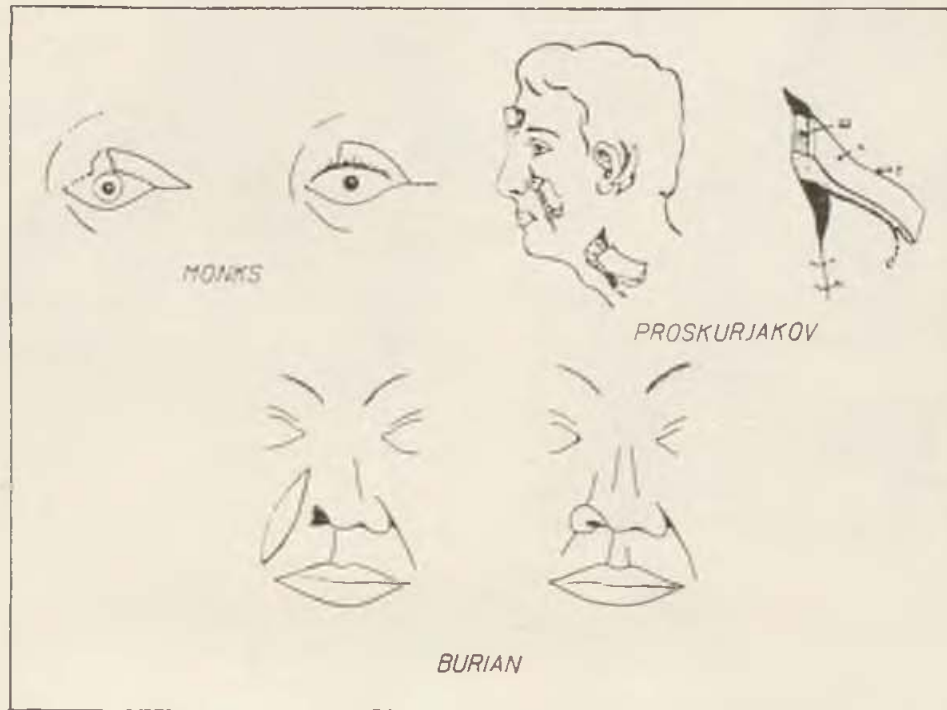


Fig. 1. Monks, Proskuryakov, Burian

network in the superficial layer of the skin is actually of secondary importance for the purpose of ensuring the viability of the transplanted flap. When the flap has to be rotated by more than 90 degrees and the pedicle starts to angulate the danger arises of compression by tension and forcible bending of the firm remaining connection of the skin with its surroundings. The superficial skin is often an obstacle to the complete rotation of the flap. Only when the skin is cut along the whole circumference is tension eased and it then becomes possible to rotate the flap on its subcutaneous pedicle by more than 90 degrees. This method is, therefore, mainly suitable in swinging an Indian flap into the nose or a cheek flap into another plane, e. g. into the plane of the nostril or the side of the nose. The experience that a local skin flap is mainly supplied by its subcutaneous pedicle and that complete severing of its connection with the surrounding skin makes a larger angle of rotation possible, has led the author to make more frequent use of large flaps of facial skin on a subcutaneous pedicle after the complete severing of the connection between the skin of the donor area. This is not a new idea. Monks formed his "island flap" (1898) to fill a defect of the eyelid after complete disconnection of the skin with the donor area in this way. Proskuryakov's skin-mucosa flap with its submerged pedicle is of the same origin. He uses it mainly in oto- and rhinoplastic operations, and has thus even

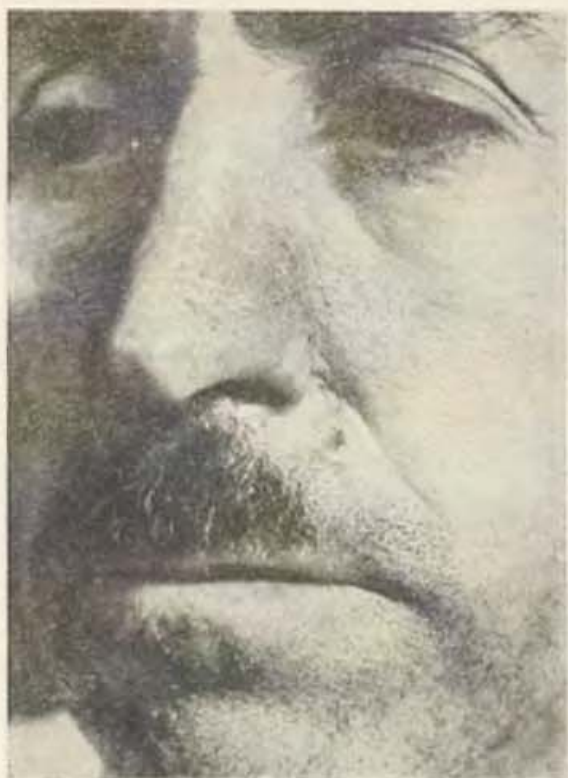


Fig. 2.



Fig. 2a.

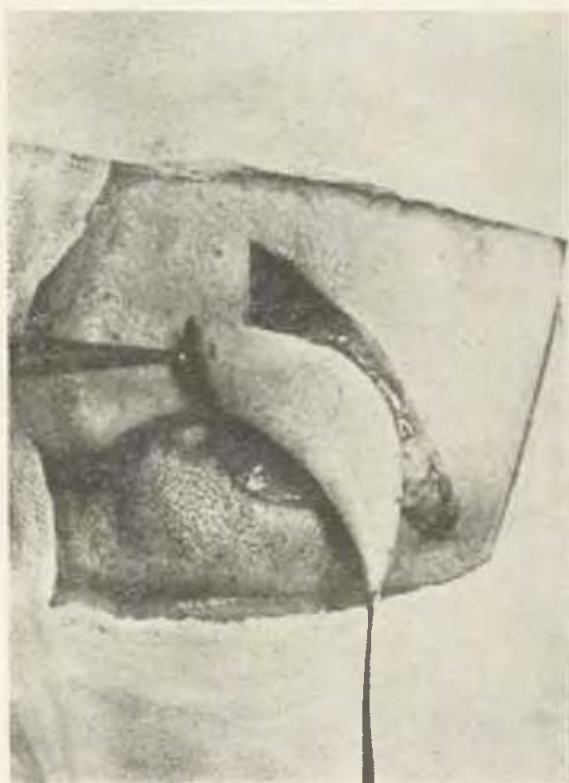


Fig. 2b.

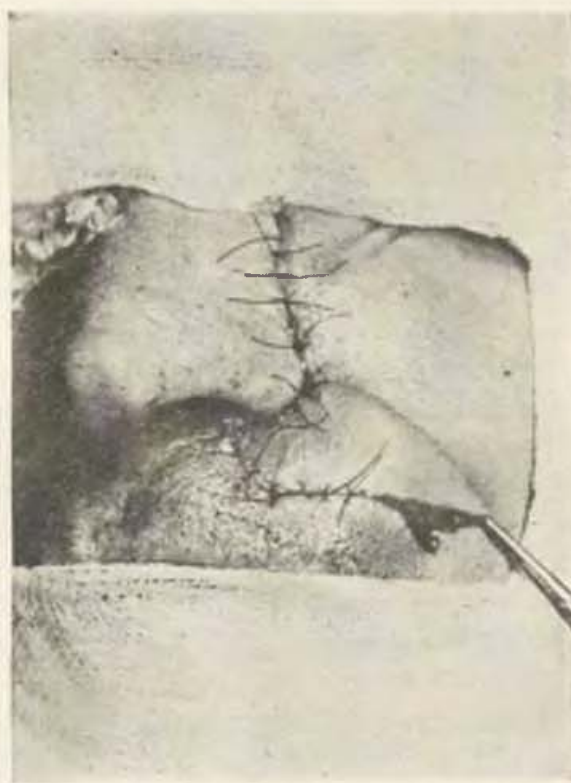


Fig. 2c.



Fig. 2d.



Fig. 2e.

Fig. 2, 2e. Radically extirpated basaloma of the upper lip resistant to irradiation. Defect covered in a one-stage operation by a flap on subcutaneous pedicle rotated by 60 degrees.



Fig. 3.



Fig. 3a.

successfully transplanted the buccal mucous membrane in substituting for the loss of the lining of the nostrils. Burian's flap taken from the nosolabial fold to form a new ala nasi in an syphilitic patient is also a typical island flap (Fig. 1).





Fig. 3b.



Fig. 3c.

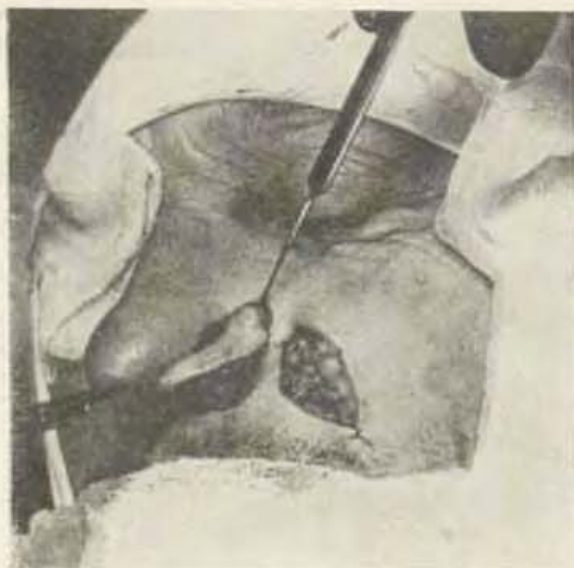


Fig. 3d.



Fig. 3e.

Fig. 3, 3a. Radically extirpated basaloma of a nostril previously treated with X-rays. Defect covered by a flap on subcutaneous pedicle taken from the nasolabial fold and transposed from under the skin bridge between nostril and donor site.

The arterial flap by Monks-Esser with its dissected vascular pedicle also often becomes an island flap, since it remains viable even if the arterial supply is definitely interrupted (Fig. 4a, b).

CONCLUSION

The author considers the advantages of a flap with a submerged pedicle to be the following:



Fig. 4.



Fig. 4a.



Fig. 4b.



Fig. 4c.

1. It makes transposition of flaps possible from areas which do not ensure a direct arterial supply.
2. It makes possible rotation and transposition after complete dissection of the skin with its donor area [fig. 2a, 3a].
3. It reduces the resulting scars by allowing them to be placed in the natural folds.
4. It reduces the number of operations to the minimum.
5. It makes possible the transposition of the skin flap into cavities lying in different planes [e. g. in defects of the (inner) lining of the orbit or the vestibule of the nose].
6. It permits the complete suture of the operation wound thereby reducing the formation of residual granulations.

SUMMARY

As a result of his experience and the experience of other workers the author of the present paper shows that the nutrition of a local skin flap in facial surgery is not ensured by the afferent artery and efferent vein only but also by an ample arterial network in the subcutaneous layer. This experience led workers of the Clinic of Plastic Surgery at Brno to use a skin flap with a subcutaneous pedicle without an afferent trunk artery more frequently and with advantage in the repair of small and medium sized defects in facial surgery. The author subsequently explains the advantages of the flap with a subcutaneous pedicle using examples and stresses in particular the identical colour and texture of the transplanted skin and the skin of the face and the possibility of more complete rotation and transfer into another plane by complete separation of the graft. The method of skin flaps with a subcutaneous pedicle also makes it possible to reduce modelling to a minimum. It is a method which facilitates the localisation of the resulting scars in natural folds of the face, which is not without importance from the aesthetic point of view.

ВЫВОДЫ

Перемещение на лице лоскутов на ножке из подкожной клетчатки

В. Кубачек

На основании собственного опыта и опыта других авторов, автор в своей статье доказывает, что питание кожного местного лоскута в хирургии лица обеспечивается не только стволом приводящей артерии и отводящей вены, но и богатой сосудистой сетью подкожной клетчатки. По этой причине в клинике пластической хирургии в г. Брно часто с успехом применяется при пластике небольших и средних по размеру дефектов лица кожный лоскут с ножкой из подкожной клетчатки без стволовой приводящей артерии. Далее автор указывает на примерах преимущества лоскута с ножкой из подкожной клетчатки и подчеркивает идентичность окраски и рисунка перемещаемой кожи с кожей лица, а также обращает внимание на возможность лучшей ротации и перемещения в другую плоскость при полном прекращении соединения перемещаемого участка кожи с исходным местом. Метод кожного лоскута с ножкой из подкожной клетчатки способствует также понижению количества моделировок до минимума. При помощи этого метода удастся лучше расположить возникающие при операции рубцы по естественным складкам лица, что, с точки зрения эстетики, является весьма важным.

RÉSUMÉ

Le lambeau du voisinage au pédicule sous-cutané de la face

V. Kubáček

A la base de ses propres expériences et de celle des autres, l'auteur assure que la nourriture du lambeau du voisinage dans la chirurgie de la face n'est point assurée que par l'artère ammenante et par la veine emmenante, mais de même par un riche réseau artériel de la région sous-cutannée. Cette expérience donna raison à l'emploi du lambeau du voisinage au pédicule sous-cutané manquant de l'artère ammenante pour couvrir les petits et les moyens défauts de tissu dans la chirurgie de la face à la clinique de la chirurgie plastique à Brno.

Les exemples de l'avantage du lambeau au pédicule sous-cutané vient d'être démontrés par l'auteur: c'est surtout l'identité de la couleur et de la texture de la peau en transfer avec celle de la figure de même que la facilité de la rotation et du glissement à l'aide de l'interruption de la jonction de la peau en transfer avec celle de l'origine que l'auteur souligne. La méthode du lambeau du voisinage au pédicule sous-cutané permet en même temps abaisser le nombre des modellages au minimum. C'est une méthode qui nous permet de situer les cicatrices opératoires dans les rides naturelles de la face, chose peu négligeante dans la chirurgie esthétique.

ZUSAMMENFASSUNG

Verschiebung von subkutan gestielten Hautlappen im Gesicht

V. Kubáček

Auf Grund von eigenen Erfahrungen und von Erfahrungen anderer Autoren folgert der Autor in seiner Arbeit, dass die Ernährung des lokalen Hautlappens in der Gesichtschirurgie nicht nur durch die zuführende Stammarterie, sondern auch durch ein reiches Gefässnetz im Subcutis gesichert wird. Auf Grund dieser Erfahrung wird an der Universitätsklinik für plastische Chirurgie in Brno bei kleinen und mittelgrossen Gesichtdefekten der Hautlappen ohne zuführende Stammarterie verwendet. An Hand von Beispielen führt der Autor die Vorzüge des Lappens an und betont besonders die Identität und Textur derselben mit der Gesichtshaut und Möglichkeit einer vollkommenen Rotation und Verschiebung in eine andere Ebene durch völlige Unterbrechung des verschobenen Hautabschnittes mit der Entnahmestelle. Die Methode des Hautlappens ermöglicht auch die Modellierungsanzahl auf ein Minimum zu senken. Es ist eine Methode, die eine bessere Verlagerung der resultierenden Narben in die natürlichen Hautfalten ermöglicht, was vom ästhetischen Standpunkt nicht bedeutungslos ist.

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REPLACEMENT OF AN AURICLE

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All plastic surgeons who developed methods for the replacement of auricles agree that this operation is one of the most difficult in reconstructive surgery. The complicated anatomical shape of the ear and the peculiarity of its tissue make it impossible to achieve anything near to perfection in the replacement of an auricle. Although fully aware that a graft replacement is by no means perfect in shape, the author is not an advocate of prostheses although their quality has recently improved with regard to fixation as well as material and shape. It needs to be borne in mind that it is troublesome for the patient to have a prosthesis all his life, to be conscious of wearing a foreign body for which reasons he finally refuses to use an artificial auricle even if it is satisfactory from an aesthetic point of view. The author, therefore, in accordance with Mathews, Smith, Pešková and others, considers prostheses to be indicated only in old people or as a temporary substitute for the auricle after resection for a malignant tumour.

In young people, particularly in men, because the defect cannot be hidden by hair, the author is definitely in favour of reconstructive surgery. In the Clinic of Plastic Surgery in Brno 335 patients with various malformations of the auricle have been operated on in the last seven years. Of the total number 89 had a defect of the auricle, 71 of which were congenital, 16 traumatic and 2 after resection of a tumour. Statistically, therefore, the prevalence of congenital defects, which form about three quarters of the total, is evident. These defects are mostly partial, but frequently combined with atresia of the external auditory meatus and other malformations which often lead to severe asymmetry of the face.

Replacement of the auricle is started at the age of six after the formation of the meatus. This is done in cooperation with specialists in otiatrics. The final shaping of the auricle is postponed to adolescence when the dimensions of the face have become stabilized. The last operation is performed on the sound auricle in order to make it symmetrical with the replacement.

In acquired defects, too, stenosis of the meatus is found frequently, and its widening is considered as the primary task of reconstruction.

This report deals with the replacement of the whole auricle or its greater part. It does not mention partial defects the small extent of which permits a comparatively easy operation by the transposition of tissue from the neigh-

bourhood or by the use of tissue from the other auricle, free grafts from remote sites, etc.

The replacement of an auricle is a problem the solution of which involves a number of individual tasks. The first lies in securing enough skin; next the choice of material for the skeleton, and finally the method of modelling the more detailed relief of the auricle.



Fig. 1a.

For obtaining skin two basically different methods are recommended. One is the method of Gillies, recommended and modified by many other authors, by which the skin is taken from the hairless region behind the auricle. By this method skin is obtained mainly by a local transposition and then supplemented by a free skin graft. It is, however, dependent on the individual distance between the auricle and the hairline. This shortage of skin in the vicinity of the auricle has been pointed out by many authors, and they therefore try to obtain material by a cylindrical pedicle flap from a remote site. This method of Pierce gives great possibilities for modification, and, therefore, flaps from the neck, the arms, breast, etc. are recommended.

It may be admitted that the skin in the vicinity of the auricle bears the greatest resemblance to that of a normal ear, although even this is not quite perfect. The author considers a collar-shaped tubular flap from the neck more suitable than a flap parallel to the course of the sternocleidomastoid muscle because of the site of the secondary scar. In young patients, particularly in large congenital defects, the author considers a cylindrical flap from the inner surface of the arm as the most suitable, because it gives ample material for transplantation and facilitates subsequent modelling.

Although the opinion is not yet unanimous as to the choice of material for the transplantation of skin, the present discussion is focussed on the problem of substituting the skeleton of the ear. The material for reinforcement of the soft parts of the ear can be roughly classified into three groups: the patient's own cartilage, other cartilage and artificial material. Auto-cartilage is the material mostly used and recommended by Lexer, Burian, Bogoraz, Conner, Adams and

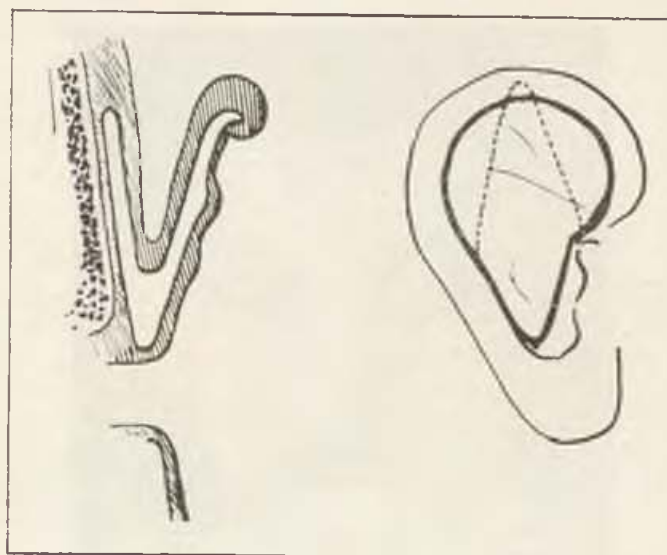


Fig. 1b. Schematic drawing of the method of implantation of the cartilage (transplant) split into the shape of a V.

many others. It also has, however, its disadvantages. In some patients it is difficult to obtain a piece of cartilage sufficiently large to permit the easy modelling of the relief of the auricle. Black, Peer and Aufricht, therefore, recommended the pre-treatment of the cartilage in a mould made in the shape of the auricle where small pieces of cartilage are left to heal in under the skin of the abdomen or the region of the auricle itself. By this method it is probably possible to form a sufficiently large shell for the auricle from a comparatively small piece of cartilage. Histologically, however, it has been proved that cartilage never unites but holds together only by fibrous tissue which undergoes late shrinkage, thus causing warping of the transplant. This considerably spoils the final result of the operation when cartilage transplants are used. The author has observed warping even in massive cartilage blocks and this cannot be prevented even by chemical treatment or by leaving the cartilage under the abdominal skin for a long period.

As an alternative, cartilage from another individual (homotransplant) is used. This group mainly consists of cartilage of cadavers from the tissue bank. This material is recommended by Peer, Pierce and others. The author, too, has used this material in many patients.

Gillies first used cartilage from the patient's mother in 1937, but after early enthusiasm it was proved that even this material underwent changes such as shrinkage and descent.



Fig. 1c.



Fig. 1d.

Fig. 1c, d. Patient after operation.

Heterotransplants of cartilage were also suggested for use in the shaping of an auricle. The author used the meniscus from a calf in a number of cases, because its shape resembles that of an auricle. The results, however, were not good; the material is too soft, does not keep its shape, and after a time undergoes resorption or is eliminated.

The last possibility for the formation of an auricle is an allotransplant. Various plastic materials have been recommended as being sufficiently firm, inert and elastic. According to the latest reports, however, these materials are resorbed or eliminated. Plastic materials hitherto used in medicine are produced for industrial purposes for resistance to corrosion and have been taken over into medicine for some of their qualities. Only research and the production of a special substance for use in living tissue may, perhaps, bring better results in the future.

In the Clinic of Plastic Surgery in Brno quite large auto- and homotransplants of cartilage are secondarily implanted into the skin transplant. In spite of this the author has observed warping and descent of the whole replaced part as the main cause of poor late operation results. The skin in the vicinity of the auricle is very fine, easily lengthens and, therefore, cannot give permanent support to the rather heavy substitute. It is evident that connection with the cartilage of the meatus and other natural anchorages of the auricle are lacking.

This loosening of the transplanted parts, which may become a very unpleasant complication already after one year, has not been stressed in the literature hitherto.



Fig. 2a.



Fig. 2b.

Fig. 2a. Congenital defect of the right auricle of which only a small rudiment remains. Atresia of external auditory meatus. — Fig. 2b. Tubed flap from the arm sutured to the auricle.



Fig. 2c.



Fig. 2d.

Fig. 2c, d. Condition after repeated modelling and reinforcement by cartilage.



Fig. 3a.



Fig. 3b.

Fig. 3a, b. Partial defect of the auricle replaced by tubed flap and by rib cartilage.

In order to counteract this development and to fix the auricle permanently the author suggests the following method: after rough modelling into shape the cartilage transplant is partly split into a V-shape (Fig. 1a—d). One branch of the V is placed under the periostium of the temporal bone and, therefore, prior to this it is cut into a wedge shape so that it is more easily pushed into the prepared periosteal pocket. The other branch of the V then actually forms the



Fig. 4a.



Fig. 4b.

Fig. 4a, b. Congenital aplasia of the auricle and atresia of the external auditory meatus. Condition after fenestration and reconstruction of the meatus and auricle by a flap and cartilage.

skeleton of the auricle. The result is a surprisingly firm anchorage which does not even loosen — and the auricle does not drop — after the development of the cranio-auricular angle.

The author considers that this method of additional anchorage of the auricle cartilage will contribute to the improvement of auricle replacements although he is fully aware that many shortcomings still exist which will have to be eliminated. The photographs of three patients, in whom the soft parts of the auricle were replaced by a cylindrical flap graft and the skeleton by the method described above, are shown (Fig. 2a—d; 3a; 4a, b).

SUMMARY

Replacement of a completely lacking auricle is still one of the most difficult tasks in reconstructive surgery. The problem can be subdivided into several tasks. The first is to obtain sufficient skin. The skin from the area surrounding the auricle is according to Gillies, most similar. It is, however, usually not available in sufficient amounts for the entire auricle. We consider a tubular transverse flap on the neck more suitable than a flap running parallel with the sternocleidomastoid m. We consider a tubular flap from the inner side of the arm to be most satisfactory. The second task, the substitution of the skeleton of the auricle, is the subject of continual discussions. We prefer the patients rib cartilage to homotransplants and do not approve of hetero- and allotransplants. We consider the central problem to be the adequate fixation of the cartilaginous skeleton so that it does not undergo deformation from its own weight. We fix the cartilage subperiostally using the method described by Karfik and thus achieve complete fixation of the auricle on which we subsequently perform fine modelling.

ВЫВОДЫ

Возмещение ушной раковины

М. Шлесингер

Возмещение полного дефекта ушной раковины относится до сих пор к числу наиболее затруднительных задач восстановительной хирургии. Проблему можно разделить на несколько составных задач. Первая задача состоит в получении достаточного количества кожного материала. Кожа вокруг ушной раковины, согласно Жилизу (Gillies) является наиболее похожей на кожу ушной раковины, но в большинстве случаев ее не хватает для образования всей ушной раковины. Для этой цели мы считаем более пригодным трубчатый лоскут, расположенный на шее в виде воротника и предпочитаем его лоскуту, расположенному параллельно с грудино-ключично-сосковой мышцей. Самым пригодным мы считаем трубчатый лоскут, взятый с внутренней стороны плеча. Вторая задача состоит в замещении скелета ушной раковины, что является предметом постоянной дискуссии. Мы предпочитаем применять собственный реберный хрящ, чем гомотрансплантат, и отвергаем применение гетеро- и аллотрансплантатов. Главная задача, по нашему мнению, состоит в хорошей фиксации хрящевого скелета так, чтобы он собственным весом не опускаясь вниз и в дальнейшем не деформировался. Мы пользуемся методом Карфика и закрепляем хрящ субпериостально и достигаем превосходной фиксации ушной раковины, на которой впоследствии производится тонкая моделировка.

RÉSUMÉ

La Réconstruction du Pavillon de l'Oreille

M. Šlesinger

La reconstruction du pavillon de l'oreille présente un des plus difficiles problèmes de la reconstruction en chirurgie plastique. Ce problème peut être divisé en quelques-uns des problèmes partiels: Le premier — c'est de gagner une quantité suffisante en matière de la peau. Celle-ci, aux environs de l'oreille, est la plus convenable d'après Gillies mais elle manque en quantité pour former tout le pavillon de l'oreille. Nous préférons le lambeau tubulé en forme du col au lambeau tubulé sterno-cleïdo-mastoïdien. Le plus convenable quand à notre avis, c'est le lambeau cylindrique de la partie interne du bras. Le deuxième problème, la reconstruction du squelette de l'oreille, reste ouvert à discussion.

Nous préférons le cartilage de propre côte à l'homotransplant et repoussons l'hétérotransplant et allotransplant. Le problème cardinal pour nous, c'est la fixation parfaite du squelette afin qu'il ne succède pas à la poids à la déformation. Nous encrons le cartilage à la manière sous-périostale d'après Karfik et par là, nous aboutissons à une fixation parfaite du pavillon de l'oreille que nous pouvons plus tard soumettre à de fins modelages.

ZUSAMMENFASSUNG

Ohrmuschel-Ersatz

M. Šlesinger

Der Ersatz eines totalen Ohrmuscheldefektes gehört bisher unter die schwierigsten Rekonstruktionsaufgaben. Das Problem lässt sich in einige Teilaufgaben einteilen. Die erste beruht in der Gewinnung von genügenden Hautmengen. Nach Gillies ist die Haut in der Umgebung der Ohrmuschel am ähnlichsten, ist jedoch nicht in genügender Menge zwecks Bildung einer totalen Ohrmuschel vorhanden. Zweckmässiger erachten wir den tubulierten Kragenlappen am Hals, als den mit dem Nicker parallel verlaufenden Hautlappen. Am zweckmässigsten betrachten wir den von der Innenseite des Armes entnommenen tubulären Hautlappen. Die zweite Aufgabe, Ersatz des Ohrenskelettes, ist Gegenstand einer dauernden Diskussion. Wir geben vor dem Homotransplantat der eigenen Rippenknorpel den Vorzug und verwerfen das Hetero- und Allotransplantat. Als Zentralproblem betrachten wir eine vollkommene Fixation des Knorpelskelettes, das keiner Schwere und weiteren Deformation unterliegt. Wir verankern nach Karfik den Knorpel subperiostal und erreichen auf diese Weise eine ausgezeichnete Fixation der Ohrmuschel, auf der wir hernach eine feine Modellierung vornehmen.

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X-RAY DAMAGE TO THE SKIN OF THE HANDS IN PHYSICIANS

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The Clinic of Plastic Surgery is frequently consulted by health personnel, mainly physicians, who have contracted a chronic professional dermatitis on their hands from X-ray or radium irradiation. From the viewpoint of prognosis and working capacity these changes are often more important than changes in the blood and the general condition caused by ionizing radiation.

The chronic skin damage of the hands from primary radiation is effected by small, repeated doses which themselves do not evoke any immediate reaction, but which after a latency varying in length, lead to irreversible changes. It has been proved that the daily tolerated dose of X-rays is so small that it would not be possible to use it for fluoroscopy. The necessary doses used are, therefore, always dangerous, particularly if people who work with them do not have the required technical knowledge and training and do not use adequate protection.

This skin damage must be regarded as rather serious and dangerous. This is the more serious since in 19 cases, i. e. in 41%, of the 46 health workers operated on at the Clinic, clear histological evidence of malignant changes were found at the site of damage; in 12 cases, i. e. in 26%, the histological findings were assessed as pre-cancerosis and only in 15 cases, i. e. 33%, were no signs of malignancy found histologically. Attention must be drawn to this danger of occupational damage especially since five of the patients operated on at the Clinic for extensive and neglected changes on their hands died from carcinomatous metastases in the lymph glands and lungs.

Of the 46 health workers treated at the Clinic only five were X-ray assistants and all the others were doctors. Only one of the doctors was a specialist in radiology, all the others were specialists working with X-rays: two stomatologists, one paediatrician, 12 physicians, mainly pneumologists, and 24 surgeons. These data differ from the statistics of Jirásek where pneumologists prevail. They attest to the fact that it is mainly surgeons, who due to the character of their daily work, seek the advice of plastic surgeons. Daily repeated and protracted scrubbing of hands with a brush and disinfectants and long hours of work in rubber gloves make the condition of the affected skin worse and easily lead to ulceration. These very painful ulcers endanger not only the working capacity

of the surgeon but constitute a permanent threat of infection. It is obvious that an infected focus on the hand of a surgeon also constitutes a danger to the operation wound. Histological findings prove that repeated mechanical damage and irritation of the skin previously affected by irradiation leads more frequently and earlier in surgeons to malignant degeneration, than in other medical specialists.

In the majority of patients treated at the Clinic, chronic skin changes occurred without any signs of acute dermatitis. These changes were observed with a latency of two years at the earliest, most frequently of 5—8 years and rarely of 10—20 years.

The first objective signs of damage were mostly found in the nails. They started to become frayed, fragile, rough on the surface, with longitudinal grooves up to changes resembling onychogryphosis with frequent sub- and periungual hyperkeratosis. In the skin there was first livid discolouration followed by repeated rhagades, atrophy, changes in pigmentation, loss of hair, minute wart-like formation and hyperkeratosis. The skin became glossy, dry and rough. This stage usually lasted for several years until a small superficial injury gave rise to repeated breakdown and, finally, led to a chronic ulcer. The initial tendency of this ulcer to heal gradually decreased, the healing time prolonged, and finally the ulcer did not heal at all. After a time in a number of patients painful peri-arthritis leading to contractures of the interphalangeal joints developed. In more severe cases the bones showed signs of osteoporosis, sometimes even marginal absorption and osteolysis.

In surgeons and physicians operated on at the Clinic the skin changes were predominantly found on the dorsum of the hands and fingers, particularly on the last two phalanges (caused by the practice of fluoroscopy, bronchography, setting of fractures under X-ray, searching for foreign bodies, etc.). With dental surgeons the most extensive changes were found on the volar aspect of the second and third digit (caused by the practice of holding the X-ray film against the lingual aspect of the jaw) (Fig. 1, 2). The thumb was affected predominantly in X-ray assistants.

The patients complain of dryness, scaling and the formation of painful rhagades of the skin, of paraesthesia and pains in the fingers, mainly at night, of repeated septic fingers and tender sub-ungual hyperkeratosis, of being particularly sensitive to cold, sometimes of limited movements in the joints leading to permanent contractures.

In accord with Jirásek the general condition and the blood were found to be unchanged in these chronic affections of the skin. Only in three patients treated at the Clinic, who had been X-ray assistants for a long time, could marked changes in the general condition be observed, from which one of them died.

Skin damage appeared after work with radiation of various wave length (diagnostic and therapeutic X-ray, including Bucky's tube).

The majority of patients had been treated by various methods years before their admission to the Clinic. Most frequently ointments were applied with protective, healing or analgetic action; sometimes coagulation with varying success.

Many of the patients took large doses of vitamins, hormones, vasodilators and frequently also antibiotics.

In the great majority of patients all previous therapy had been effective only for a short time, little effective or not effective at all, and, therefore, they decided in favour of radical surgical treatment.



Fig. 1. X-ray damage to the volar area of 2nd and 3rd fingers of the right hand in a stomatologist. The index finger is severely contracted.



Fig. 2. Condition after transplantation of skin into the volar area of the fingers and the repair of the contracture.

The principle of surgical treatment lies in the removal of the damaged tissue and its replacement by healthy tissue. In small and confined foci, mainly in minute but painful hyperkeratosis at a site where the surrounding skin is quite mobile, excision of the focus with primary suture is better than coagulation. The possibilities of excision and suture are, of course, rather limited in the fingers. Much more often it is necessary to replace the damaged tissue, i. e. the skin, by skin transplanted from an undamaged site.

Excision followed by transplantation is not quite a new method in the treatment of chronic affections of the skin after irradiation. According to Lagrot and Simon, Charles Allen Porter recommended it already 50 years ago. This method has already been used for a long time in the English speaking countries while in France it remained unknown. There are almost no references in the literature to the results and the method of treatment. Only Lagrot and Simon³) reported on five successful operated cases in 1955.

Porter recommended replacement of the affected skin after excision by a Thiersch graft applied to the defect. Already in 1932 Burian successfully operated on the hands of a worker from Jáchymov which were damaged by radium. From the very beginning, however, he used a full-thickness skin graft which gives much better results not only from a cosmetic but chiefly from a functional point



Fig. 3. Area on the index finger marked for excision; on the third finger a focus of hyperkeratosis.



Fig. 4. Defect on the index finger covered by free skin graft; focus of hyperkeratosis on the third finger excised.

of view than the thin Thiersch graft. The new covering does not shrink and is firm and resistant. After some weeks the transplanted skin becomes mobile against the underlying tissue, and has, on the whole, far better biological qualities than of an epithelial graft.

Today, it can be said that excision and free skin grafting has saved many hands, even many lives of health workers. Excision and skin grafting is indicated in all extensive foci of chronic X-ray dermatitis, in keratotic plaques, in atrophy of the skin, in chronic ulcers, and also on the early stages of malignant degeneration which, as yet, has not involved the deep layers, particularly the periosteum and the bone.

The general condition of the patient is not affected by the operation. It can usually be performed under local anaesthesia, frequently in the out-patients department. An incision is made round the focus of affected skin which is then shaved off, so that the deep layers of subcutaneous tissue are preserved. After any oozing from the raw surface has been stopped the defect is covered by a full-thickness skin graft.

Where a tendon has been uncovered or an interphalangeal joint opened it is better to cover this defect by a pedicle graft swung in from the surrounding skin or a neighbouring finger provided its skin is undamaged (so-called cross finger flap), and the secondary defect, then, by a free skin graft. This necessity, however, arises rarely. In only two patients treated at the Clinic was it necessary to use a flap from the surrounding skin and in one an opened interphalangeal joint was covered by a primary thin pedicle flap from the arm. In all other patients free skin grafting sufficed. As the donor site usually the inner area of the arm of the same extremity is used, since even a relatively large defect there can be closed by primary suture with a resulting linear scar which is inconspicuous at that site. Successive excisions of small areas are preferred to the one-stage removal of larger sections. Experience has shown that skin covering moving parts, i. e. joints of fingers, loosens up after a certain time so that it does not impede free movement.

The skin transplant must be sutured exactly to the edges of the defect with fine silk or nylon sutures so that it is stretched and its whole undersurface, at the same time, is in contact with the base of the defect. No perforations are made in the skin graft. The ends of the sutures are left long (Fig. 3, 4). The graft is then covered by fine perforated cellophane or tulle gras which can be well modelled to the surface. A thick, soft elastic layer of gauze pads or a gauze swab is placed on top and the sutures then knotted across so that the gauze pad applies slight pressure holding the graft to the base. Care should be taken not to apply too much pressure (Fig. 5). It is necessary to immobilize the operated part for about 10 days. Five or six days after operation the sutures lying on the gauze are cut. Eight or ten days after operation the swab, which applied pressure to the graft, is removed together with the marginal sutures. If exactly sutured and properly held in place the transplant usually takes completely. After the removal of the dressing the graft is covered by Dermatol or another sterile powder for several days.

Some two or three weeks after the operation the skin may be left uncovered and normally washed. Most of the surgeons, who were operated on, washed the transplanted skin with a fine brush and non-irritant disinfectant already after three to four weeks. The transplant becomes sensitive relatively early and two or three months after operation it can hardly be distinguished from the surrounding skin.

In each of four patients operated on at the Clinic an affected nail and its bed were removed and after resection of a small piece of bone the defect covered by a skin graft. The results were satisfactory.

In six patients, with deep and extensive changes where the process had penetrated into the deeper layers and involved the periosteum and the bone showing clinical signs of malignancy, exarticulation of phalanges and in another four amputation of a whole finger had to be performed. In one case the entire hand was amputated. This, however, did not prevent the malignant process from progressing and the patient died from lung metastases. In two patients remote metastases appeared three and four years after amputation of one finger although

the operation wound healed smoothly and no local recurrence of the process occurred. All the excisions were confirmed histologically and also biopsy of the metastatic tumours in the nodules and lung was carried out.

The microscopic picture shows inflammatory changes in the dermis combined with atrophy, later proliferation with multiple changes towards akantosis and hyperkeratosis with lengthening of the interpapillary epithelial indentation



Fig. 5. Wound on the third finger closed by primary suture; graft on index finger kept in place by a swab with knotted sutures across it.

at the site of widened capillaries, where thrombosis and fibrosis of the wall can frequently be found. In the inter-cellular substance oedema with a fibrinoid reaction and lymphocyte infiltration develops. In other cases signs of pre-cancerosis with polymorphous cells and numerous mitoses in the basal layers can be found or signs of a fully developed malignant proliferation consisting mostly of a spino-cellular carcinoma, can be detected. In the patients operated on at the Clinic the pathologist never found sarcomatous growth, reported on rare occasions in the literature, as having been derived from an X-ray ulcer.

In conclusion it is necessary to state that damage to the skin caused by X-rays in health workers should today be avoidable. In older workers who often tested the hardness of the rays with their own hand, these changes may be regarded as a manifestation of an early ignorance as to the effect of irradiation and protection against it. In younger and young workers, however, it must be condemned as negligence and trespassing against safety regulations. Although the surgical treatment of X-ray skin damage shows predominantly good and lasting results, prevention of the damage by foresight and proper as well as conscientious protection is still more effective.

S U M M A R Y

The author draws attention to the seriousness of occupational skin damage on the hands of health personnel, particularly doctors. Forty-six patients treated at the Clinic of Plastic Surgery, Prague, are reported on, 24 of whom were surgeons whose daily routine of work comprising scrubbing-up and the prolonged wearing of rubber gloves led more frequently to malignant degeneration. In the operated cases this was confirmed by histology in more than 40 %. Five patients with neglected lesions died from carcinomatous metastases. The author describes the method of surgical treatment: excision of the affected skin and subsequent replacement by a free skin graft. Occupational damage to hands by X-rays in doctors may now be considered as the outcome of negligence which may be fatal. Proper preventive measures are recommended.

В Ы В О Д Ы

Повреждение кожи на руках врачей рентгеновским излучением

Е. Пешкова

В своем сообщении автор обращает внимание на важное значение профессионального повреждения кожи на руках у медицинского персонала, встречающегося преимущественно у врачей. Приведено сообщение о 46 пострадавших лицах, леченных в клинике пластической хирургии в Праге, из которых было 24 хирурга, у которых повседневный способ работы с мытьем и длительным ношением резиновых перчаток зачастую приводит к злокачественному разрастанию, которое было среди наших оперированных подтверждено гистологом более, чем в 40%. Пять больных с запущенными изменениями умерло от метастазов рака. Описан способ хирургического устранения поврежденной кожи с последующим замещением ее при помощи свободного кожного трансплантата. Профессиональное повреждение рук рентгеновским облучением является в настоящее время у врачей следствием неосторожности, которая может стать роковой. Рекомендовано соблюдение надлежащих превентивных мероприятий.

R É S U M É

L'endommagement sur la peau des mains chez les médecins causé par les rayons X

H. Pešková

L'auteur de cet article souligne l'endommagement professionnel grave sur la peau des mains chez les services des hôpitaux, surtout chez les médecins. Le rapport est fait de quarante-six endommagés traités à la clinique de chirurgie plastique à Prague. Sur ces malades, il y avait vingt-quatre des chirurgiens, chez lesquels la manière du travail à lavage du même que la nécessité de porter à la longue des gants opératoires mène souvent à la dégénération maligne, laquelle fut dans plus de quarante pour cent sur ces malades légalisée par histologie. Cinq de ces malades sont morts à cause des métastases du cancer faute des mutilations négligées. L'auteur décrit la manière chirurgicale d'enlever la peau endommagée et de la remplacer à l'aide de la greffe de la peau totale. L'endommagement professionnel des mains causé par les rayons X chez les médecins n'est aujourd'hui que le résultat de la négligence qui peut devenir fatale. Les mesures préventives viennent d'être recommandées par l'auteur.

ZUSAMMENFASSUNG

Hautschädigungen an Händen der Ärzte durch Röntgenstrahlung

H. Pešková

In Ihrer Mitteilung macht die Autorin auf die Wichtigkeit von professionellen Hautschädigungen beim Sanitätspersonal, überwiegend bei Ärzten, aufmerksam. Es wird über 46 Fälle berichtet, die auf der Klinik für plastische Chirurgie in Prag behandelt wurden. Von den Behandelten waren 24 Chirurgen, bei denen die tägliche Arbeitsweise mit Waschen und langdauerndem Tragen von Gummihandschuhen öfters zu einem malignen Rückschlag führt, der bei unseren Operierten in mehr als 40 % histologisch bestätigt wurde. 5 Patienten mit vernachlässigten Veränderungen starben an Krebsmetastasen. Hernach wird die Art der chirurgischen Beseitigung der geschädigten Haut mit nachfolgender freier Hauttransplantation beschrieben. Professionelle Schädigungen der Hände durch Röntgenstrahlung bei Ärzten sind das Ergebnis von Unvorsichtigkeit, die schicksalsschwer werden kann. Es wird eine richtige Prävention empfohlen.

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CONTRIBUTION TO THE PROBLEM OF COVERING EXTENSIVE SKIN DEFECTS

L. HASMAN

INTRODUCTION

Extensive tissue defects occur today to an ever increasing extent as sequelae of traffic, industrial and agricultural accidents. The repair of these defects is possible only by means of tube skin flaps involving a large amount of valuable skin and causing inconvenience to the patient both as regards the length of hospitalisation and number of operations.

They are covered by the transplantation of a double flap tubed in the hypogastrium or by the transfer of a single flap which must unusually be extensive. Examples of such flaps are the dorsal skin flap of Academician Burian, the thoraco-epigastric flap of prof. Webster and the scapulo-abdominal flap used by Prof. Karfík.

All long flaps afford quite satisfactory and valuable material but they are often liable to circulatory disturbances resulting from the distinct disproportion between the length and the width of the flap.

The permanent threat of circulatory disturbances in the more complicated transfers of long flaps into defects in the lower limbs leads, therefore, to the more frequent use of reliable oblique double flaps in the hypogastrium.

CASE HISTORIES

We used this method in one of our patients who at the age of 3 years sustained a severe injury of the right leg. An extensive decollement of the skin of the whole anterior surface of the leg and a partial defect of facies anterior tibiae occurred as result of being knocked over by a car (Fig. 1). After the accident the patient was treated for several months in hospital then being discharged, with granulating surfaces, to outpatient treatment which lasted five months. As far as we could find out epithelization of the defect by means of skin grafts was not attempted.

After healing a thick scarred block developed on the whole anterior surface of the leg. At the age of 20 the patient made up her mind to undergo a plastic operation and was admitted to our clinic. On admission there was an atrophic and easily vulnerable scar with an area of about 310 square centimetres which

interfered with walking and prevented dorsiflexion of the foot. The extent of the defect affected the appearance of the patient and led to the developing of an inferiority complex in an otherwise young and good-looking woman.

On July 10, 1956 at one operation we made two oblique flaps of 22 X 10 centimetres, in the hypogastrium. Between the medial pedicles a large skin bridge was formed crossing the linea alba (Fig. 2) the secondary defect was closed by



Fig. 1.

a linear suture. Healing was uneventful and the blood-supply was good from the first day.

Twenty five days later we proceeded to transfer the medial common pedicle on to the volar and lateral surface of the left fore-arm. For reasons of safety the transfer was performed stepwise in such a way that the lower margin of the common pedicle between the two flaps was cut off, lifted, and then implanted into the fore-arm into a prepared widely open bed in the form of a direct pedicle flap. We thus created a broad surface of contact and at the same time ensured the supply of the whole central part between the flaps from the upper segment, which remained connected with the abdominal wall.

Twelve days later we completely separated the central part thus finishing the transfer of both flaps to the fore-arm (Fig. 3). The secondary defect in the abdominal wall was closed easily without undue tension.

Three weeks later we were able to cut off both upper pedicles of the flaps in a one-stage operation and transplant them via the forearm into the lower limb.

Here, the pedicles were implanted far apart, for the most part into healthy tissue at the proximal and distal margin of the defect in the leg (Fig. 4).

The implanted pedicles healed in 21 days. It was thus possible to separate the common pedicle from the fore-arm under general anaesthesia and transfer it into the central part of the defect after removing the scar tissue and surface layer of the tibia.



Fig. 2.



Fig. 3.

Three weeks after this last operation the patient was discharged at the stage of a rough modelling of the covering of the defect (Fig. 5).

The operation was finished by definitive modelling one year later (Fig. 6).

DISCUSSION

The covering of extensive or circular defects of the lower limbs has always constituted a difficult problem because of the great amount of valuable material needed. It is fully logical that two tubed skin flaps in the hypogastrium were first used for this purpose, their medial pedicles being secondarily connected by tubulization. This resulted in a very long flap. However, the cross-cutting of the



Fig. 4.

linea alba is always dangerous, due necrosis of the medial part. Other sites of the body were sought, therefore, which would afford a sufficiently long flap with less risk. Academician Burian recommended a dorsal skin flap for this purpose before Webster. Later, Webster suggested the use of a thoraco-epigastric flap which made it possible to transfer a sufficient amount of tissue with less risk than with methods used hitherto.

But with time the first enthusiasm for this method slowly decreased because the flap consisted of abundant but otherwise non-homogenous material from various sites of the body (from the axilla to the groin) and left a scar on the visible parts of the body. Furthermore, the safety of the operation was not ensured with regard to the circulation.

We decided to use an oblique double abdominal pedicle flap for covering the extensive leg defect, since this form possessed a good blood-supply permitting the transplantation of a large amount of good skin without leaving a defect or a striking scar.

In contradistinction to the isolated cases published in the world literature, we selected the medial part of the common pedicle between both flaps for transplantation on the fore-arm, while other authors start the transfer by implanting one or both lateral pedicles on the fore-arm (Erdélyi, Gillies, etc.).

We did not attempt the tubulization between the flaps since we were aware of the considerable hazard of necrosis due to the crossing of the midline.



Fig. 5.



Fig. 6.

The advantage of our method is that we maintain the lateral pedicles, which have a better supply, and start by transferring the medial part as a direct flap. The broad, two-stage implantation of the medial part on the forearm ensures a rapid taking over of nutrition and provides for the circulation of both flaps for the entire length required for covering the defect.

For these reasons we do not agree with Janvier who published his own procedure in *Annales de Chirurgie plastique* 1957, where, starting the transplantation of the medial part of the double flap in a similar way, he performed implantation on the fore-arm in a one-stage operation with a very narrow surface of contact consisting of the width of the distal part of the fore-arm only. In such a case the risk is practically the same as in the tubulization of this part.

During the subsequent transfer of the flap to the scarred surface we can widely implant or nearly fully unfold both pedicles into the healthy margins of the defects. Thus we avoid the implantation of the medial part into the very

midst of the defect on a poor base, where the conditions for the re-establishment of the circulation are substantially worse, with no risk of decreased blood-supply or necrosis of the medial part of the flap bridge which, after being severed, is suddenly forced to take its supply from the pedicles.

CONCLUSION

The transplantation of abundant and good material is a difficult task requiring a procedure which is as safe as possible causing the least possible disturbance to the patient. We used a double flap transferred by its medial connecting part and the good result in the demonstrated case led to our using this method in a total of four cases, always with the same result. According to our experience the safety of the transfer is due to the fact that the first transfer of the medial part to the fore-arm is carried out in the form of a direct flap, i. e. as a two-stage operation. The blood-supply is very satisfactory since it is fed from broad implantation surfaces in the course of the whole transplantation process.

The application of this method of two abdominal flaps appears to reduce the time of hospitalization and diminish the number of operations as compared with other methods of skin flap transplantation.

SUMMARY

The author recommends the use of a double abdominal tube flap from the hypogastrium to cover extensive skin defects in the lower limbs. In contradistinction to other methods the operation recommended by the author ensures an adequate supply to both flaps by first implanting the central part in the fore-arm in the form of a direct flap with both medial pedicles far apart.

In the course of the subsequent implantation it is possible to perform a broad implantation of both flaps into the healthy tissue at the margin of the defect. The method described of two abdominal flaps, which has hitherto been used successfully in four cases, reduces the number of operations and the duration of hospitalization.

ВЫВОДЫ

К вопросу закрытия крупных дефектов кожи

Л. Гасман

Для закрытия обширных дефектов тканей на нижних конечностях автор рекомендует применять двойной косой стебель с подчревной области. Предложенный автором метод обеспечивает, в отличие от других методов, хорошее питание обоих стеблей тем, что сначала средняя часть с обеими медиальными ножками имплантируется очень широко на предплечье в виде прямого лоскута.

При дальнейшей пересадке возможна широкая имплантация обоих стеблей в здоровую ткань на краях дефекта. Описанный метод двух брюшных стеблей, с успехом примененный до сих пор три раза, снижает число операций и сокращает срок госпитализации.

R É S U M É

Contribution à la question de la cloisure des grands défauts de la peau

L. H a s m a n

L'auteur recommande l'emploi de deux lambeaux abdominales en miroir pour couvrir les larges pertes de tissus localisées sur les jambes. Cette manière recommandée par l'auteur assure — différant à d'autres manières — la parfaite nourriture des deux lambeaux à l'aide d'implantation large sur l'avant-bras en forme du lambeau droit de la partie moyenne avec les deux pédicules médiaux.

Ainsi, une large implantation des deux lambeaux dans le tissu sain aux environs du défaut devient possible. La méthode des deux tubes abdominales citée ci-dessus, dont on s'est servi à grand succès déjà trois fois diminue le nombre des opérations et raccourcit le temps de l'hospitalisation.

Z U S A M M E N F A S S U N G

Beitrag zum Problem der Deckung grosser Hautdefekten

L. H a s m a n

Der Verfasser empfiehlt die Verwendung eines doppelten schrägen Lappens aus der Haut des Unterbauchs zur Deckung ausgedehnter Gewebsdefekte an den unteren Extremitäten. Zum Unterschied von anderen Methoden garantierte das vom Verfasser beschriebene Vorgehen eine einwandfreie Ernährung beider Lappen dadurch, dass zuerst der mittlere Teil mit beiden medialen Stielen sehr breit am Vorderarm nach Art eines direkten Lappens implantiert wird.

Bei der weiteren Übertragung ist eine breite Implantation beider Lappen in das gesunde Gewebe an den Defekträndern möglich. Die beschriebene Methode der beiden Abdominallappen, die bisher dreimal mit Erfolg angewendet wurde, verringert die Anzahl der Eingriffe und verkürzt die Dauer des Krankenhausaufenthalts.

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SURGERY IN STERILITY CAUSED BY HYPOSPADIAS

F. BURIAN

My contribution is based on the experience of the University department of Plastic Surgery in Prague where, over a period of thirty years, 458 cases of hypospadias were operated upon.

The different forms are represented as follows: the glandopenile 72 (15.7%), the penile 279 (61.5), the penso-scrotal and scrotal 70 (14.9%) and the perineal 37 (7.9%). In the last two groups there were 12 pseudo-hermaphrodites and true hermaphrodites which cannot always be clearly distinguished.

The mildest form of hypospadias, in which the orifice of the urethra is situated in the furrow of the crown, is generally considered as being without significance and not calling for operative treatment, except in occasional cases of stenosis of the orifice. Nevertheless, we are frequently asked by adult patients to remedy such defects. They complain of being ashamed and of avoiding sexual intercourse. They finally become impotent. The same may result from operations for true hypospadias of a higher degree in which a urethra is created with an opening in the furrow.

Plastic prolongation of the urethra in the glans is very difficult. Sexologists often obtain good results by psychotherapy: this can be helped by plastic reconstruction of the prepuce for which the surplus skin on the dorsal side is used. This ugly accumulation of skin on the dorsal side seems to be one of the main causes of the inferiority complex in these individuals.

The second, relatively rare form of anomaly, is hypospadias sine hypospadias (*virga palmata*). The urethra may open on the top of the glans or in the furrow. It is shortened so that during erection the penis bends making insertion impossible. The first operation on this anomaly consists of transforming it into the penile form of hypospadias. There is some hypoplasia of the ventral part of the corpora cavernosa penis together with fibrous hyperplasia and longitudinal tension of the skin on the ventral side. In true hypospadias these pathological changes are more pronounced in more severe anomalies. In pseudo-hermaphroditism hypoplastic changes prevail and in true hermaphroditism the character and structure of the membrum is that of a clitoris.

The position of the urethral orifice in the middle of the ventral side of the penis reduces the power of fecundation, because the above-mentioned changes

make it impossible. In the extirpated parts of the chorda there are strong layers of fibrous tissue which in some cases even penetrate the cavernous substance. Isolated fibres of unstriated muscle are occasionally found scattered between the fibres of the chorda as well as strong-walled blood vessels.

The first problem is when to correct the curvature of the penis. In all congenital defects we tend to postpone operation until the tissues have reached such degree of development as not to be endangered and disturbed by the operation. That is generally during and after the fourth year of life. This is quite suitable for the lesser forms of penile hypospadias. The more severe the form is and the more accentuated the aplasia, the greater is the danger to the tissues, so that the operation should be still further postponed.

Sometimes the sexologist urges that an early operation be performed because he considers the persistence of chorda hinders the development of the penis. In such cases of necessity we proceed in three or four stages with intervals of at least three months. There is no doubt that the curvature of the penis increases with advancing age, the hypoplastic ventral parts having a reduced capacity for growth as compared with the dorsal parts.

With adults there is trouble in the post-operative period, caused by erections which cannot always be suppressed either by hormonal or by sedative therapy. Haematomas or even disruption of sutures are caused and are followed by secondary scarring and relapse of the curvature. We had to re-operate on 50 % of these cases.

It is very important in the operation to isolate the urethra as far as necessary and to shift its orifice proximally, thus increasing the degree of the anomaly. We resect the median strip of thin covering-vestige of urethral mucous membrane and very carefully excise the fibrous tissue situated in the furrow between the corpora cavernosa.

The tension of the borders of the skin incision which are relatively short will be relieved by alternating oblique incisions. Thus, wedge-shaped skin flaps are prepared which, in the stretching of the penis, interchange their position, each slipping into the cleft in the opposite side. The resulting scar is saw-shaped and secondary scar contraction cannot develop. When there is very little skin covering we carry the side incisions as far as the prepuce so that great flaps of skin can be shifted ventrally.

The second stage of treatment consists in the formation of the absent part of the urethra. We perform this at the age of six years at the earliest, provided the penis is sufficiently developed.

We prefer the *O m b r é d a n n e* operation for cases where the orifice of the urethra is at the most on the dividing line between the middle and the distal third of the penis. In this way the hair-bearing skin of the base of the penis is not included in the new urethra.

With the peno-scrotal and perineal forms we use the *N o v é - J o s s e r a n d* method which results in 75 % of primary healings. The posterior part of the urethra in the scrotal and perineal forms is built by suturing together the two

halves of the scrotum. We rarely apply the Denis-Browne method because the skin-covering from the preceding operation is not adequate and might include hair-bearing papillae.

For the final step, the joining of the primitive and the newly built urethra, we adopted the Denis-Browne principle and we had good results with it even without perineal cystostomy. The suture of Vejvalka-Farkaš (subcutaneous suture fixed on an elastic wire-appliance 1957) effectively reduces the formation of fistulae.

The anatomical results are satisfactory. We had 75 % of healing which resulted in ability to micturate as a male. As far as the promotion of fecundity is concerned the results are much less favourable with severe degrees of the anomaly. The biological value of the sexual glands is usually poor and the constructed penis too small mainly with the pseudo-hermaphrodite and hermaphrodite forms. In the few cases of sex alteration we never had proof of established procreative capacity.

S U M M A R Y

The author submits a comprehensive survey of the experience with 460 patients operated on for hypospadias at the Clinic of Plastic Surgery in Prague up to 1957. He gives the percentage of and describes the various types of urethral clefts. He pays attention to the rare anomaly of hypospadias without hypospadias (*virga palmata*) and describes the difference between real hypospadias and pseudo-hermaphrodisim. He emphasises the necessity for the early freeing and straightening of the bent penis. He also refers to cooperation between the surgeon and the sexologist and to the indication of operation with regard to age as well as to various types of operations (Ombrédane, Denis-Brown, Nové-Josserand). The anatomical results are satisfactory in operations performed according to present methods. Less satisfactory are results with regard to the capacity for intercourse, particularly in severe forms of hypospadias.

В Ы В О Д Ы

Хирургия стерильности при гипоспадии

Ф. Б у р и а н

Автор приводит наглядный обзор опыта клиники пластической хирургии в Праге, где было до 1957 г. оперировано 460 больных с гипоспадией. Автор описывает отдельные типы расщепления мочеиспускательного канала и приводит в цифрах процентное отношение отдельных видов аномалии. Обращает внимание на редкостную аномалию *hypospadias sine hypospadias* (*virgo palmata*) и описывает различия между истинной гипоспадией и псевдогермафродитизмом. Подчеркивает необходимость своевременного освобождения от натяжения и выпрямления искривленного полового члена. Автор говорит о сотрудничестве с сексологом и разбирает вопрос возраста, в котором показана операция, и разные методы операции (Омбредана, Дени-Брауна, Нове-Жоссерана). Анатомические результаты при современном способе оперирования являются удовлетворительными. Менее эффективными являются результаты в отношении способности к оплодотворению, в особенности при тяжелых формах гипоспадии.

RÉSUMÉ

La chirurgie de la stérilité chez les sujets hypospades

F. Burian

L'auteur passe en revue les expériences faites à la clinique de chirurgie plastique à Prague où, jusqu'en 1957, 460 sujets hypospades ont été opérés. Il présente le pourcentage de l'existence des types différents de la fissure de l'urètre dont il donne une description. Il attire l'attention sur l'anomalie rare d'un hypospadias sine hypospadias (virga palmata) et décrit la différence entre un hypospadias vrai et un pseudo-hermaphroditisme. Il insiste sur la nécessité de libérer et de redresser à temps le pénis recourbé. Il parle de la collaboration du sexologue et discute l'âge indiqué pour l'intervention, ainsi que les différentes méthodes opératoires (Ombrédanne, Denis-Browne, Nové-Josserand). Les résultats anatomiques de l'opération dans leur modification actuelle sont satisfaisants. En ce qui concerne la faculté de fécondation, les résultats sont moins bons, surtout en présence de formes graves d'hypospadias.

ZUSAMMENFASSUNG

Die Chirurgie der Sterilität bei Hypospadie

F. Burian

Der Verfasser bringt eine zusammenfassende Übersicht der Erfahrungen der Klinik für plastische Chirurgie in Prag, an der bis zum Jahre 1957, 460 Patienten mit Hypospadie operiert worden sind. Er führt den Prozentsatz der einzelnen Typen der Hypospadie bei diesen Patienten an und beschreibt ihre verschiedenen Arten. Weiter befasst er sich auch mit einer seltenen Anomalie, der Hypospadia sine hypospadia (virga palmata) und beschreibt den Unterschied zwischen echter Hypospadie und Pseudohermaphroditismus. Der Verfasser betont die Notwendigkeit einer rechtzeitigen Loslösung und Streckung des umgebogenen Penis. Er bespricht die Zusammenarbeit mit dem Sexuologen und befasst sich mit dem Alter der Patienten als Indikation für den operativen Eingriff, sowie mit den verschiedenen Operationsarten (Ombrédanne, Denis Browne, Nové-Josserand). Die anatomischen Ergebnisse sind bei den heutigen Operationsmethoden zufriedenstellend. Weniger gut sind die Resultate, was die Befruchtungsfähigkeit betrifft, besonders bei schweren Formen der Hypospadie.

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PROBLEMS OF HERMAPHRODISM AND PSEUDOHERMAPHRODISM

F. BURIAN

Disorders of sexual differentiation have always aroused great interest, particularly on account of the mystery they evoke. In ancient times they became the object of myths. In modern times they require attention mainly because the persons affected demand a change of their social and sexual status and ask for an adjustment of their sexual organs corresponding to the manner in which they have decided to live.

Many objections have been raised against such operations, arguing that they cannot produce an individual exactly differentiated in sex, and are, therefore, useless.

Because of many applications we, at the Clinic, decided to adjust the external genitals and some of the secondary sexual characters surgically. This we did in order to eliminate the patient's moral sufferings or at least to lessen them.

One of the objections against the operation was that sex could not be exactly determined although the genitals had a definite character. However, new methods have been elaborated which permit an exact diagnosis. The difference in sex is manifested in all somatic cells. In a smear from the oral mucosa special cells are found with a specific character in the nucleus. If there are more than 5 % of these cells in the smear, the individual is of female sex; less than 5 % may be considered as characteristic for the male sex. In general, the theory of Ombrédanne might be accepted, according to which an individual is of the sex that he or she feels to belong to. However, prior to decision, it is necessary to consider all somatic, psychic and functional characteristics.

Perineal vulviform hypospadias might be considered as androgynoid hermaphrodisism; the genitals have a female appearance. After birth such a child is usually regarded as of female sex and often remains so throughout life. The penis does not grow and breasts of a female type develop. In other cases both testicles descend into apparently enlarged labia majora and the individual grows up as a man. In such instances the decision is rather delicate and it is necessary to postpone it until puberty. If, however, exact examination excludes all doubts as to the male character of the patient, operation is performed as in the case

of perineal hypospadias, regardless of whether a rudimentary vagina or even a uterus are present. If breasts tend to grow their development may be arrested by hormonal therapy.

In the same way it is necessary to postpone the operation until puberty in gynadroids with a large penis and a well developed vagina. In cases where secondary female characteristics develop and even menstruation starts the penis may be amputated. But it is definitely unwise to amputate the penis in a child because it frequently develops along a masculine trend and, therefore, may later feel harmed. In dubious cases Ombrédanne advised a palliative operation, i. e. the covering of the hypertrophic clitoris by suturing the anterior portions of the labia major over it.

Slight anomalies can also be found where, for instance, the urethra opens at the apex of the clitoris or the posterior portions of the genital pads join and form a pseudo-scrotum.

Real hermaphrodites are relatively rare. Thus far only some 80 cases have been precisely diagnosed. The significance of this precision, however, is only theoretical since, after all, decisive is how the patient feels and toward what sex he tends, regardless of whether he has both kinds of genital glands or only one.

These disorders in differentiation have their origin in the early stage of embryogenesis when the primary sex cells start to migrate. If only a small number enters the basis of the genital gland an individual of female sex develops. A gland containing both sexual formations may develop, i. e. a true hermaphrodite. The testicles develop in the primary genital gland. In a female embryo, the ovarian tissue envelops the primary genital gland which thus becomes inactivated together with the male sex cells. However, in the follicles of the ovaries rudimentary male sex cells may develop.

Even if a male genital gland has primarily developed normally, disorders in the development of the external genitals may occur on account of insufficient androgens as a consequence of hypoplasia of Leydig's cells. In such a case the external genitals develop along a female trend. Hormones stimulate the sexual potential within the genetic foundations.

According to Charvát, the development of a female foetus may be influenced by adrenal insufficiency starting with the fourth month. Overproduction of 25-hydroxylase inhibits the production of steroid hormones, with the exception of androgens. Surplus of these leads to hypertrophy of the clitoris and the external genitals take on the appearance of a perineal hypospadias. This is in analogy with the androgenital syndrome.

Various pathogenic elements are reflected in the clinical histories of the patients. One patient with a female legal status definitely manifested masculine inclinations and feelings. The external genitals were of a type of male hypospadias. Behind the sphincter of the urethra there was a rudimentary vagina. On laparotomy a bisexual gland, an epididymis, a rudimentary Fallopian tube and half a uterus were found on one side. On the other side neither glands nor other genital organs were present. The request of the patient to change her legal

status into a male was found to be justified and the external genitals adjusted accordingly by operation.

Another patient was legally registered as of female sex until the age of five because of the appearance of the external genitals. The clitoris, however, was longer than normal and had the appearance of a penis. The urethra and vagina opened separately into the genitals sinus. The vagina was a narrow, blind canal, 5.5 cm long. Nodules the size of a pea could be felt in both genital. In the abdominal cavity no genital glands were found and only a rudimentary Fallopian tube and uterus connected with the rudimentary vagina were present. The behaviour of the child was that of a boy and the parents decidedly asked for a change in the legal status. This was granted and afterwards the external genitals were adjusted as in the case of hypospadias. Almost the same characteristics were observed in a 15-year-old patient but one testicle was found at the anterior opening of the inguinal canal and the other in the abdominal cavity.

Another adult woman asked for a change in her sexual status. Her external genitals were of a female type, the clitoris, however, masculine. The rudimentary vagina opened into the urethra. On laparotomy only hypoplastic testicles but no female glands were found. This patient had well developed breasts. After surgical adjustment of the genitals the mammary glands were extirpated.

Two adult persons registered as women were operated on at the Clinic. Both had attained considerably success in athletics and made records. Both were rather surprised to find themselves being sexually attracted by their female sports mates. Doubts arose in them as to their sexual character and, therefore, they asked for an exact examination. In both a perineal hypospadias and a rudimentary vagina were found; in one even a rudimentary uterus and Fallopian tube. Neither had any genital glands. In both adjustment of the genitals was performed and afterwards they settled successfully in male occupations.

There is no great difference between such cases and those of perineal and peno-scrotal hypospadias, which are very frequent. If a male pseudo-hermaphrodite of a female appearance wishes to live as woman there is no reason why amputation of the clitoris and enlargement of a rudimentary vagina — if present — or the formation of a new vagina by a plastic operation, should not be performed. If, however, the person is attracted by the female sex and wants to live as a male the adjustment of the female genitals is indicated. The operation is performed as in a case of hypospadias. Further development along masculine trends may be aided by androgens. In all dubious cases examination of 17-ketosteroids, oestrogens and gonadotropins may help to establish the diagnosis. Problems with gynaecomastia arise at the period of sexual maturity. Gynaecomastia may develop as a result of insufficient androgens or if the equilibrium between the androgens and the oestrogens is upset. In women this may be manifested by masculine characters such as virile features, deepening of the voice, growth of a beard. Other differences may develop in the direction of tertiary sexual characters: these female individuals are attracted by women and have an unconquerable desire to behave like men, including clothing. Into this category belong many cases of travestists, homosexuals and eunuchoids.

The genetic basis of sex, variations of the primary sex cells, their migration and final settlement in the glands are the cause of the fact that in each male individual there exists a mixture of masculine and feminine qualities. In general, characteristics corresponding to the genital glands and organs predominate. However, in many individuals the sex is not precisely defined. These often experience great moral sufferings which may affect their mental balance. This is the reason why such cases become an important problem in medicine to be solved by plastic surgery. The author is of the opinion that the resolving of this problem in compliance with the wishes of the suffering patient is fully justified.

S U M M A R Y

Disorders of sexual differentiation are a complicated problem not only for the patient who suffers from psychic, sexual and social difficulties, but also for those concerned with the treatment. Contrary to certain views, the author regards it as the duty of a surgeon to relieve the patient of his sufferings or at least to lessen them.

Each individual with a disorder of sexual differentiation himself inclines to and decides for one of the sexes. This, according to Ombrédane, is the main indicator. Detection of characteristic signs in the nuclei of somatic cells of the oral mucosa and the preponderance of one or another secondary sexual character complement the decision on the sexual status.

The author relates embryological and hormonological aspects and deals with the most frequent as well as special clinical types and forms of intersexuality. He pays special attention to the occurrence of hermaphroditism in relation to various anomalies of the urethral orifice.

Plastic surgery has great possibilities in this field. The author advises that certain operations be postponed until puberty in order to avoid unnecessary damage through premature decision.

In the further part the author reports on cases under his care.

The author considers the assistance to patients suffering from undefined sexual characterization to be an important problem in medicine and a responsible task for the plastic surgeon.

ВЫВОДЫ

Вопросы гермафродитизма и псевдогермафродитизма

Ф. Буриан

Расстройства половой дифференциации представляют собой нелегкую лечебную задачу и трудную проблему для пораженного, главным образом, ввиду страданий, которые эти расстройства приносят его психическому, половому и социальному существованию. Вопреки некоторым взглядам автор считает обязанностью хирурга устранить или уменьшить эти страдания.

Каждый субъект с нарушенной половой дифференциацией сам решает о своей принадлежности к определенному полу в зависимости от своей склонности. Это — согласно Омбредану — является главным показателем; исследование и обнаружение признаков

в ядрах соматических клеток слизистой полости рта и наличие превосходства тех или других вторичных признаков дополняет решение о половом состоянии.

Автор приводит эмбриологические и гормональные аспекты и разбирает чаще всего встречающиеся и особые клинические типы и формы гермафродитизма. Особое внимание он посвящает наличию гермафродитизма в отношении к разным аномалиям наружного отверстия уретры.

Пластическая хирургия обладает значительными возможностями оказать здесь помощь. С некоторыми операциями автор рекомендует подождать до периода полового созревания, чтобы преждевременным решением не был причинен излишний вред.

В дальнейшем автор приводит казуистику собственных случаев.

Помочь субъектам, пораженным и страдающим неточно выраженной сексуальностью, автор считает важной проблемой медицины и ответственной задачей пластической хирургии.

R É S U M É

Questions de l'hermaphroditisme et du pseudo-hermaphroditisme

F. Burian

Les troubles de la différenciation sexuelle présentent une tâche thérapeutique difficile et un problème grave pour le malade, surtout à cause des souffrances qu'ils infligent à son état psychique sexuel et social. Contrairement à certaines opinions, l'auteur juge que la chirurgie ait le devoir d'abolir ces souffrances ou de les soulager.

Chaque individu dont la différenciation sexuelle est troublée, incline lui-même vers un sexe défini pour lequel il se décide. Ceci présente, d'après Ombrédane, l'indication principale; l'examen et la mise en évidence des caractéristiques dans les noyaux des cellules somatiques de la muqueuse de la cavité buccale et la prédominance de tels ou tels signes secondaires constituent des éléments supplémentaires pour la détermination du statut sexuel.

L'auteur mentionne les aspects embryologiques et hormonaux et étudie les types et les formes cliniques courantes et spéciales de l'intersexualité. Il insiste spécialement sur les manifestations de l'hermaphroditisme par rapport aux anomalies différentes de l'ouverture de l'urètre.

La chirurgie plastique a beaucoup de possibilités d'intervention. L'auteur conseille d'attendre l'âge de la puberté avant d'exécuter certaines interventions pour éviter des dégâts inutiles, causés par une décision prématurée.

Par la suite, l'auteur présente ses expériences personnelles.

L'auteur considère l'aide aux atteints qui souffrent des manifestations inexactes de leur sexualité comme un problème important de la médecine et un devoir où la chirurgie plastique doit prendre ses responsabilités.

Z U S A M M E N F A S S U N G

Probleme des Hermaphroditismus und Pseudohermaphroditismus

F. Burian

Die Störungen der geschlechtlichen Differentiation stellen für die Therapie eine schwierige Aufgabe und für den Betroffenen ein qualvolles Problem dar und das insbesondere wegen der schweren Beeinträchtigung, die sie für sein psychisches, sexuelles und soziales Dasein bedeuten. Entgegen manchen anderen Meinungen vertritt der Verfasser die Ansicht, dass es Pflicht des Chirurgen ist, diese Leiden zu beseitigen oder zu verringern.

Jedes Individuum mit gestörter geschlechtlicher Differentiation entscheidet sich nach seiner Neigung selber für ein bestimmtes Geschlecht. Das ist auch nach Ombrédanne der hauptsächlichste Hinweis; die Untersuchung und der Befund von bestimmten Merkmalen in den Kernen der somatischen Zellen der Mundschleimhaut und das Überwiegen des einen oder anderen sekundären Geschlechtsmerkmals stützt die Entscheidung für ein bestimmtes Geschlecht.

Der Verfasser erwähnt embryologische und hormonale Aspekte und behandelt die häufigsten sowie auch einige eigentümliche klinische Typen und Formen der Intersexualität. Besondere Aufmerksamkeit widmet er dem Vorkommen von Hermaphroditismus in Verbindung mit verschiedenen Anomalien, die die Ausmündung der Urethra betreffen.

Die plastische Chirurgie hat hier ein bedeutendes Wirkungsfeld. Für die Durchführung mancher Eingriffe soll, wie der Verfasser rät, die Pubertät abgewartet werden, damit durch eine vorzeitige Entscheidung keine überflüssigen Schäden verursacht werden.

Im weiteren führt der Verfasser eine Kasuistik eigener Fälle an.

Patienten, die an einer ungenau ausgeprägten Sexualität leiden, Hilfe angedeihen zu lassen, hält der Verfasser für ein wichtiges Problem der Medizin und für eine verantwortungsvolle Aufgabe der plastischen Chirurgie.

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THE USE OF LABELLED PHOSPHORUS IN THE STUDY OF THE METABOLISM OF CARTILAGE GRAFTS

R. KLUZÁK, J. MUSIL

One of the most important questions in the study of the transplantation of tissues is that of the viability and metabolism of grafts. Hitherto, suitable methods have not been available for answering this question. Growth in tissue culture is not a reliable indicator, the main obstacle being early de-differentiation. There are only two acceptable ways: metabolimetry with Warburg's apparatus and its modifications, and biochemical tracing methods with radioisotopes.

The majority of experimental and clinical observations have stressed the obvious demand for the transplanted tissue to remain viable, although there are still authors who maintain that this is not the main issue (O'Connor and Pierce, Gordon New). They have published a series of clinical results in support of their statements (including dead heterotransplants). A serious critical analysis, however, always comes to the conclusion that live tissue yields the highest percentage of lasting results, particularly live autotransplants, whereas the results with dead tissue lag far behind. Burian wrote: "At present we put the main emphasis on the viability and vitality of the tissue and the cells of the transplant and its bed". The same demand is raised by Peer in his paper "Cell Survival Theory versus Replacement Theory".

Among histological studies on the transplantation of cartilage only few deal in more detail with the question of the viability of grafts (Leopold 1881, Burian and Soraluec 1937, Dupertuis 1941). For the study of that problem by methods, other than histological, knowledge of the metabolism of cartilage was a necessary prerequisite.

The greatest attention was paid to the composition and metabolism of the amorphous component represented by chondroitine-sulphuric acid. On the basis of experiments with labelled S^{35} it was ascertained that this compound shows very active metabolism with a low biological half-time (16 days); the first $S^{35}O_4^{--}$ ions appeared in the tissue already two hours after administration (Bostrom 1952, Pelc and Glücksmann 1955, Wyburn and Bacsich 1955).

Bywaters 1936, Dickens and Weil-Malherbe 1936, Hills 1940 and Lutwak-Mann 1940, studied glycolytic processes in cartilage and demonstrated the presence of enzymes participating both in anaerobic glycolysis and in the oxidation of pyruvic acid within the cycle of tricarmonic acids. Albauni and Sobel (1953) then demonstrated by chromatography the presence of metabolites of carbohydrates containing the phosphoryl group in trichloroacetic acid extracts of rabbit cartilage after the intraperitoneal administration of labelled phosphate.

For assessing the suitability of labelled phosphate $P^{35}O_4$ for studying the viability of cartilage grafts in plastic surgery, the authors were specially interested in the metabolism of this compound in the cartilage *in vitro*, under conditions closely approximating those found *in vivo*. In experiments described elsewhere (Musil and Kluzák 1959) the authors studied the uptake of labelled phosphate into rabbit cartilage *in vitro* in Krebs-Ringer phosphate buffer on the one hand, and in the presence of enzymatic poisons and methylene blue on the other. Further, the authors made a parallel quantitative determination of the consumption of O_2 and inorganic phosphates in a closed system. The experiments showed that the amount of radioactive P^{32} taken up might serve both in the assessment of the degree of glycolytic processes taking place in the cartilage and of the exchange of this ion between the cartilage and its milieu externe.

EXPERIMENTS

In a series of experiments the authors used phosphate ions labelled with P^{32} for studying the viability of cartilage transplants. This method was first used with very good results by Barron and Veall for ascertaining the viability of skin grafts in various nutrient fluids, although they took tissue of high differentiation consisting not only of the specific epithelial elements, but also of connective tissue, vessels and nerves.

A general knowledge of the mechanism of anaerobic glycolysis (Nielands, Stumpf), which is one of the most important processes taking place in the cartilage and demanding a supply of inorganic phosphorus from without, has led the authors to use a similar procedure in the study of the viability of cartilage grafts transplanted in different ways. The extent of the uptake is limited only by the metabolic activity of the cartilage itself, i. e. of the chondrocytes, and on the availability of phosphorus supplied by the blood stream to the tissue fluid, which itself is the real nutrient medium of the grafts. Cartilage was only taken into consideration if no ossification processes, which themselves could simultaneously influence the metabolism of phosphorus, had taken place.

As dealt with in detail below, the authors made a comparative study of the speed and degree of the uptake of phosphate labelled with P^{32} in auto-, homo- and heterotransplanted cartilage, and as a control they used nontransplanted cartilage *in situ* and human cartilage (used as a heterotransplant) *in vitro*. The authors focused their attention primarily to the earliest stages after transplantation of which they did not find any reference in the available literature.

Transplantation: In groups of three adult female Chinchilla rabbits of the same age (18 months) and approximately of the same weight, autotrans-

plantation of auricular cartilage without perichondrium into the subcutaneous tissue was carried out in the first group; in the second group homotransplantation was carried out in a similar way; in the third group heterotransplantation of fresh (non-conserved) human cartilage obtained during operation and also freed from perichondrium, was performed. Each time a number of grafts of the same kind and approximately the same weight and surface were inserted in order to make their removal possible in stages. The implantation of grafts was carried out under aseptic precautions and local anaesthesia with 0.5% procain. Each graft was implanted separately into a subcutaneous tunnel formed by blunt dissection from a minute incision which was afterwards closed by one or two mattress sutures with Dermalon. The tunnels were burrowed on the flank of the animal in a dorso-ventral direction so as to prevent the graft from shifting by its own weight towards the skin incision from which it was at least 3 cm. distant. The transplants were denuded of their perichondrium in order to avoid an error of radiological measurements deriving from the presence of another kind of tissue. Cartilage without perichondrium which does not contain any vessels or connective tissue is exceptionally suitable for this investigation method as a homologous material.

Administration of radioactive ions: 19 hours after implantation each animal received a subcutaneous dose of 0.5 mC P^{32} per 1 kg. of weight. The injection was administered on the other flank from that where the implantation was performed so as to make sure that the labelled ions reached the graft only by means of the blood stream.

Specimens of transplants were removed under aseptic conditions always 3, 43½, 77, 101½ and 261 hours after injection. After removal the specimens were repeatedly rinsed with distilled water in order to remove any trace of radioactive ions which may have adhered to the surface only, and afterwards freed from surplus rinsing water and weighed still moist. The experimental animals did not change weight during measurements.

Experiments *in vitro*: Specimens of tissue without perichondrium, approximately of the same weight and surface as those of the used grafts, were put under aseptic precautions into Ringer's solution enriched with $P^{32}O_4$. The concentration of the radioactive ions in the solution was the same as that under biological conditions during the experiment *in vivo*, i. e. 0.5 mC P^{32} per 1 kg. The solution with the tissue specimens was kept in a thermostat at a temperature of 37.5° C. The specimens were taken for measuring at the same time intervals as those of the transplants.

MEASURING OF RADIO-ACTIVITY

Preparation of specimens: For measuring the radioactivity the specimens of the transplanted grafts and the controls were ashed in a quartz crucible in an electric oven at a temperature of 650° C. The ash obtained was dissolved in 2.5 N HCl and spread as an homogenous layer onto a disc of filter paper with a marked circle of 15 mm. in diameter.

Actual measuring: For measuring the radioactivity the Beta radiation (max. energy 1.70 MeV) was used. A Tesla 30/50 tube with a Tesla binary reducer was

used. The measurements were calculated relatively. Measuring of the specimens was carried out according to time, mostly during five minutes, with an average error ranging between ± 1.2 to 2% depending on the kind of specimen.

Other methods: measuring of the metabolic quotient $Q_{O_2}^{0_2}$ for respiration and $Q_{O_2}^{x_2}$ for anaerobic glycolysis was carried out by the usual methods with Warburg's apparatus.

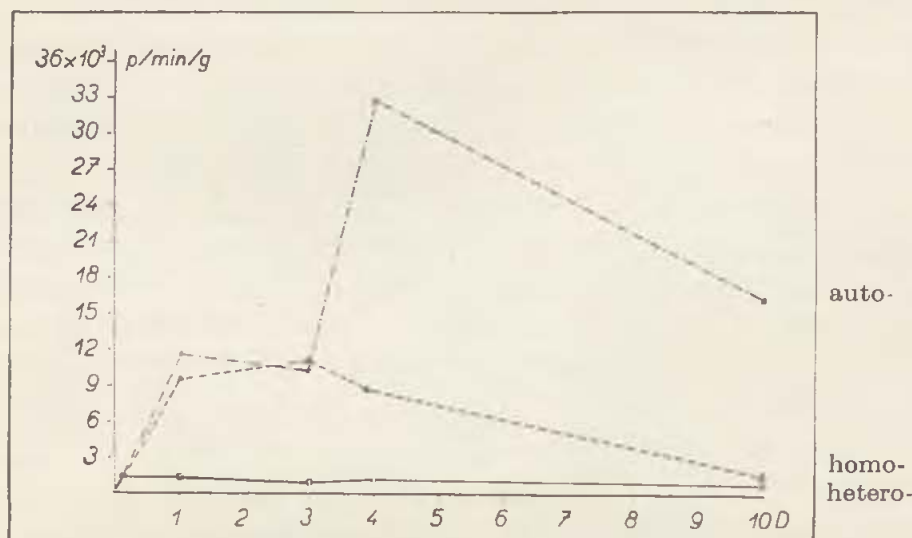


Fig. 1. Course of uptake of P^{32} into auto-, homo- and heterotransplants of cartilage in imp./min./g. in dependence on time.

RESULTS AND DISCUSSION

By studying the radio-activity in the specimens of cartilage transplants, measurements depicted in fig. 1, showing the course of uptake of $P^{32}O_4$ supplied from without in impulses min./g., were ascertained at time intervals as indicated above. From the curve it becomes obvious that the highest metabolic activity is shown in the first hours after transplantation of autografts, a lower activity of homografts, whereas in heterografts practically no uptake takes place. The curves clearly show that the first increase of radioactivity was ascertained already three hours after the administration of P^{32} , i. e. 22 hours after transplantation. This indicates that autografts and partly also homografts do not remain under the given circumstances confined to their own resources but very early integrate with the metabolic processes of the host organism. This metabolic relationship between the tissues of the graft and its bed was observed hitherto only weeks after transplantation (Wyburn and Bacsich, Ring); the authors, have demonstrated it already after 24 hours. It is, however, probable that it exists already earlier.

In view of the principles stressed before, i. e. to transplant only live grafts, the immediate integration of the metabolic processes of the grafts with those of the host organism is regarded as the most important prerequisite for a successful take.

Clinical experience coincides with the authors' findings: Homotransplants show approximately one third of the radioactivity of autografts in the whole course of the curve which corresponds to about 30 % of successful results of transplantation of non-conserved homografts in clinical practice. Fresh and live heterografts have not been used hitherto in clinical practice (Peer); the failure of heterotransplantation in experimental practice is reflected by the constant

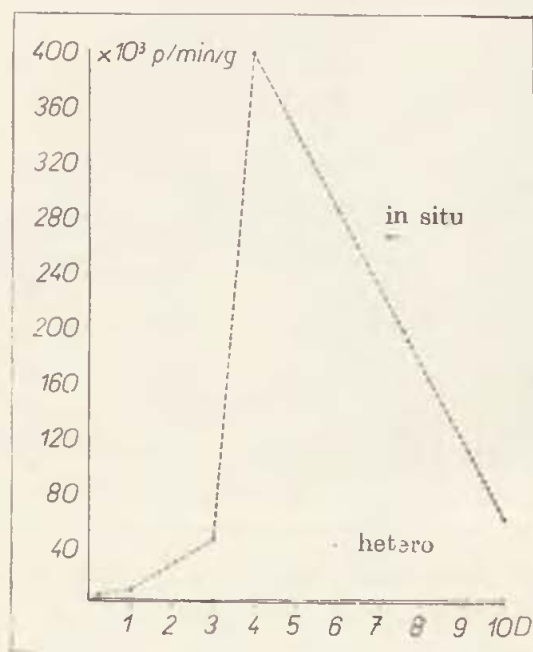


Fig. 2. Course of uptake of P^{32} into auricular cartilage of experimental animals *in situ* compared with measurements of heterotransplanted grafts (in imp./min./g. in dependence on time).

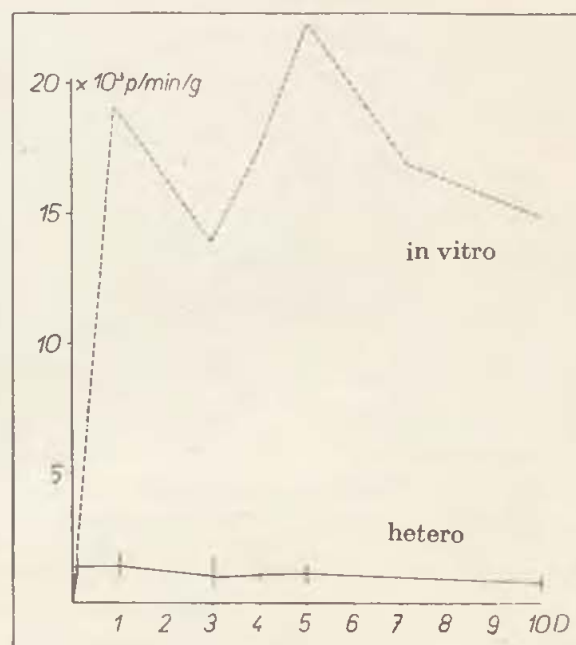


Fig. 3. Course of uptake of P^{32} into human cartilage *in vitro* (Krebs-Ringer's solution at 37.5°C) and into the same cartilage used as heterotransplant. In imp./min./g. in dependence on time.

minimum radioactivity of heterotransplants as found in these experiments. This, however, does not mean that an heterotransplant which does not integrate with the metabolism of the host would soon undergo necrosis; by measuring its metabolic quotients for respiration and anaerobic glycolysis it was ascertained that it remains viable (table 1), i. e. that a heterograft survives, but does not cover its consumption of energy from the bed of the host.

Fig. 2 depicts the course of the uptake of $P^{32}O_4$ into the non-operated auricular cartilage of experimental animals *in situ* compared with measurements in heterotransplanted grafts. Specimens of cartilage *in situ* were taken for measuring, of course, also without perichondrium -- for reasons mentioned in the Paragraph on methods. (Table 1. Metabolic quotients of human cartilage before and after heterotransplantation in $\mu\text{l. O}_2$ (CO_2) per g. of moist weight per hour.) The many times greater radioactive P^{32} content of the unaltered cartilage is a proof of the

Tab. 1.

	Metabolic quotient for respiration $Q_{O_2}^{O_2}$ in $\mu\text{l O}_2$ (in the presence of methylene blue)	Metabolic quotient for anaerobic glycolysis $Q_G^{N_2}$ in $\mu\text{l CO}_2$
Human cartilage, used as hetero- graft, before transplantation	+ 89.32 $\mu\text{l/g/hrs.}$	- 41.81 $\mu\text{l/g/hrs.}$
Heterograft (human cartilage into rabbit) 26th day after im- plantation	+ 97.02 $\mu\text{l/g/hrs.}$	- 48.29 $\mu\text{l/g/hrs.}$

powerful metabolic activity of live tissue under natural conditions. The course of the curve indicates that the steep rise in the radioactive P^{32} content takes place in this tissue one day later when completely covered with perichondrium than when without perichondrium. This is in accord with previous findings of the authors¹⁹⁾ who proved by manometry that the preserved perichondrium in cartilage grafts decreases their metabolic activity acting as a barrier against the osmotic forces. On the other hand, however, the undamaged perichondrium actively supplies the cartilage tissue with a powerful flow of nutrients acting as a mediator and regulator of the biological processes which take place between the chondrocytes and the *milieu interne* of the organism. It would not be expedient, therefore, to regard cartilage *in situ* as a fully valuable control for grafts transplanted in various ways. This control was used by the authors only as a criterion for estimating the change in the uptake of $P^{32}O_4$, depending on the content of $P^{32}O_4$ in the blood decreasing in a well known manner (Low-Beer et al.). In the course of the curve a characteristic maximum can be shown which is reached on the fourth day after administration, while the subsequent decrease corresponds to the decrease of radioactivity in the blood.

Fig. 3 shows an interesting difference between the time course of radioactivity in human cartilage used as an heterotransplant and in the same cartilage *in vitro* (in Krebs-Ringer's solution enriched with $P^{32}O_4$ in the same proportion as *in vivo* at a temperature of 37.5°C). The ascertained measurements confirm previous manometric results (Kluzák), i. e. that cartilage kept *in vitro* at a temperature around 37°C preserves its viability for a comparatively long time. They also indicate the significant difference between the degree of uptake of $P^{32}O_4$ from the environment of an heterohost and the degree of uptake from the indifferent environment of a physiological solution. This difference indicates that for certain reasons the transfer of metabolites from the bed to the heterotransplant is prevented, and this applies already to the first hours and days after transplantation when no immunological processes can as yet be taken into account. The live heterograft, however, preserves its viability and, therefore, it is necessary to assume that, in order to make up for the energy deficit, it consumes its own tissue structure.

Experimental failures with heterotransplantation of cartilage and relatively frequent clinical failures with homotransplantation are explained by Medawar's conception of the antigen-antibody reaction on the one hand, and by Loeb's conception of the biological basis of individuality (Peer) on the other. Direct proof to confirm these theories has, however, not yet been produced.

The results achieved by the authors rather support the theory of Loeb. The specific biochemical systems of the bed and the graft are identical or very similar in auto — or homotransplantation respectively, but entirely different in heterotransplantation, whereby the transfer of metabolites from the host is made impossible.

In order to assure a successful take of cartilage grafts it is necessary not only to preserve the viability of the chondrocytes, which maintain the intercellular substance (Peer), but also the good biological condition of this substance which protects the chondrocytes from absorption mainly by its content of mucoproteins (Bacsich and Riddell, Peer). A considerable time after transplantation of homografts of human non-conserved cartilage Peer found the following changes in the matrix: clotting of the lute substance and fibrillation. What was the cause of such a phenomenon?

On the basis of their own observations the authors assume that the primary cause of the failure in heterotransplantation and in many cases of homotransplantation of cartilage lies in the divergence of the biochemical systems transmitting nutrients and metabolites. This divergence is probably based on the existence of specific inhibition. It is most probable that a live graft then consumes its own structure, mainly its intercellular substance, as a source of energy. By the loss of its matrix the cellular elements are deprived of their protection against invasion by the host (Bacsich and Riddell, Peer). From chondrocytes thus affected substances acting as antigens, which derive mainly from the nuclear substance (Klen), are freed later. It seems that the immunological reaction originating in this way comes into play as a later factor thus closing the vicious circle.

CONCLUSION

The results achieved prove that the use of the labelled compound $P^{34}O_4$ is suitable for the study of the viability of cartilage transplants. Further, it follows from these results that auto- and partly also homotransplants integrate with the metabolic processes taking place in the bed of the host, already a few hours after transplantation. This can be judged by the uptake of exogenous phosphate as a necessary component of anaerobic glycolytic processes. Heterografts, however, do not have this capability. According to the authors' opinion heterotransplants, therefore, reach a state of negative energy balance manifested by the consumption of their own structure even though their viability is preserved. Other papers of the authors deal with a more detailed analysis of possible causes. The experimental results are in full accord with clinical experience, the empiric basis of which is thus theoretically complemented.

SUMMARY

1. A method for studying the viability of auto-, homo- and heterotransplants of cartilage by using $P^{32}O_4$ has been elaborated. Control investigations were carried out by manometry.

2. It was ascertained that auto- and partly also homotransplants integrate with the metabolism of the host already in the first hours after transplantation.

3. Heterotransplants on the other hand do not integrate with the metabolism of the host after transplantation. The opinion is put forward that the negative energy balance of heterografts thus produced is one of the main causes for failure of transplantation.

ВЫВОДЫ

Использование меченного фосфора для изучения метаболизма трансплантатов хряща

Р. Клужак, Я. Музил

1. Был разработан метод определения жизнеспособности авто-, гомо- и гетеротрансплантированных хрящей при помощи $P^{32}O_4$. Контрольные исследования производились манометрическим путем.

2. Было установлено, что автотрансплантаты, а отчасти также и гомотрансплантаты, подключаются к метаболизму реципиента уже в течение первых часов после трансплантации.

3. В противоположность этому гетеротрансплантаты после трансплантации не подключаются к метаболизму реципиента. Высказывается мнение, что возникающий таким образом отрицательный энергетический баланс гетеротрансплантата является одной из основных причин неуспеха трансплантации.

RÉSUMÉ

L'utilisation du phosphore marqué pour l'étude du métabolisme des greffes de cartilagineux

R. Kluzák, J. Musil

1. Une méthode permettant d'étudier la vitalité des greffes cartilagineuses auto-plastiques, homoplastiques et hétéroplastiques à l'aide du $P^{32}O_4$ fut élaborée. Les examens de contrôle furent exécutés par la méthode manométrique.

2. On a pu démontrer que les greffes autoplastiques et aussi, en partie, les greffons homoplastiques, s'intègrent dès les premières heures après l'opération dans le métabolisme de l'hôte.

3. Les greffons hétéroplastiques, par contre, ne s'intègrent pas dans le métabolisme de l'hôte après leur implantation. Les auteurs soutiennent l'opinion que le bilan énergétique négatif ainsi formé des greffes hétéroplastiques constitue une des causes principales de l'échec de telles transplantations.

ZUSAMMENFASSUNG

Die Ausnützung des markierten Phosphors zum Studium des Grundumsatzes von Knorpeltransplantaten

R. Kluzák, J. Musil

1. Zwecks Verfolgung der Lebensfähigkeit von auto-, homo- und heterotransplantierten Knorpeln mittels $P^{32}O_4$ wurde ein Arbeitsvorgang ausgearbeitet. Die Kontrolluntersuchungen wurden manometrisch vorgenommen.

2. Es wurde festgestellt, dass sich Autotransplantate und teilweise auch Homotransplantate von den ersten Stunden der Übertragung an, in den Grundumsatz des Wirtes einschalten.

3. Demgegenüber schalten sich Heterotransplantate nach Übertragung in den Grundumsatz des Wirtes nicht ein. Es wurde die Ansicht ausgesprochen, dass die auf diese Weise entstandene negative energetische Bilanz des Heterotransplantates eine der Hauptursachen des Misserfolges der Übertragung ist.

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ON THE POSSIBILITY OF AN ALLERGIC REACTION TO ZOOGENOUS GRAFTS

R. KLEN

It appears that in the assessment of the use of human or zoogenous bone grafts in clinical practise, the weight of evidence is in favour of heterogenous grafts. A great deal of evidence for this has been presented by a number of laboratories. We are also inclined to the view that a heterogenous bone graft, well chosen, suitably prepared and properly preserved, can in some cases replace human bone. But this is not to infer that the donor problem has been solved. On the contrary, it merely provides a stimulus to the farther study of a number of important and interesting problems.

One of the problems is the question of allergic reactions which can occur after implantation of heterogenous bone grafts, either compact or 'spongy', containing red marrow. By allergy we refer to a specific reaction between an antigen and a sensitized tissue leading to various types of response. Implantation of a heterogenous graft provides a certain basis for this reaction, particularly, if the individual has already been sensitized or if material from the same mammalian species has been repeatedly used.

Since the manifestations of allergic reaction are manifold and far from being clarified and since bone allergy has not hitherto been described (perhaps because bone tissue is little suited for this kind of investigation), our present approach to the problem is rather speculative and reference will be made particularly to observations, as yet nonsystematized, which we made in our laboratory.

First of all, it is necessary to pose the question whether an allergic reaction occurs at all after transplantation of heterogenous grafts. We know from the literature (Milgrom 1953) and from our own studies (Klen 1956, 1957) that antibodies are produced after the implantation of heterogenous tissues. Both of our studies, in which we followed certain problems of antibody production after implantation of our heterogenous bone grafts, showed that in approximately 60% of the operated patients there was a substantially raised antibody level and that women reacted in relatively larger number. In view of the fact that simple bone fracture or bone operation leads to changes, for example, in the composition of blood protein fractions (Morisi 1957), blood picture (Škrovina 1956) and so forth, it is absolutely necessary to conduct a well-planned study with due regard to the metabolic response to surgery itself in order to show the specificity of the reaction.

An attempt has been made to demonstrate this specificity. Sterile bone debris of calf compacta and spongiosa, containing the red marrow, which were prepared and preserved in the same manner as grafts for clinical use, were first decalcified with Komplexon III. The debris was then minced in a sterile dish and extracted overnight at 4° C with sterile saline solution. The supernatant obtained after centrifugation, together with Freund's complete adjuvant, were injected subcutaneously into each limb of rabbits twice with an interval of 5 weeks. The sediment prepared in the same manner was injected subcutaneously with a large-bore needle into other rabbits. Four weeks after the second injection, skin sensitivity to intracutaneous injection of the supernatant was tested. In two cases a slight reddening at the site of injection was seen in 24 hours when the supernatant from the spongiosa was used. At the same time blood was obtained by intracardiac puncture and tested for antibodies by colloidal agglutination. No conclusion was reached because the antigen itself caused agglutination of colloidal particles (even at a dilution of 1 : 80). The properties of the antigen were not altered after ether extraction. The experiment was discontinued until more information on the chemical composition of calf bone and isolated pure fractions of its mixtures is obtained (Kánský and Klen 1958). Assuming that we had been successful in demonstrating specific antibodies, the question would still not have been solved because the characteristic feature of allergic reactions is the peculiar course of the reaction between the antigen and the resulting antibodies.

Likewise, other tests for determining allergy, for example, eosinophile count, are not specific for establishing the diagnosis. Unsystematically performed differential blood counts in subjects implanted with our heterogenous bone graft confirm this point of view. The finding of eosinophiles in tissue (Rogers 1953) cannot by itself resolve the problem. In numerous histological examinations of diverse experimental material, we have not found a greater number of plasma cells, eosinophiles and giant cells than is usual in other granulation tissue. This, however, is not quite authoritative since the findings in human beings are of decisive importance. In three patients who were implanted with our calf bone graft 10 to 18 months previously, the findings in the surrounding tissue was identical to that in animals.

In general, it should be stated that there exists a certain fundamental and real basis for the occurrence of allergic reactions in sensitive individuals. Allergic reactions are of several types. First is the early reaction of the serum sickness type. Its equivalent may be seen in certain persons in the formation of a sterile secretion in the wound soon after operation. Usually this results immediately after the noxa takes effect. Due to its slower metabolic rate and slight tendency to form exudates, this type of reaction is not considered likely in osseous tissue. In the event that such a reaction does occur, it should be distinguished from the reaction due to surgical intervention or foreign material used in the operation. In these patients it is necessary to perform a cytological, biochemical, immunological, careful microbiological and, if possible, a virological examination of the exudate. A study of the serous reaction is often rendered difficult by the use of plaster casts and, in numerous cases, made impossible by the fact that the ope-

rated part of the bone is covered by a thick layer of soft tissue. According to reports [up to the middle of 1957] on long-term results with our zoogenous grafts, this reaction was observed in 5 out of 546 cases, i. e., in less than 1%. Mention will be made of two of these 5 cases.

A nine-year-old boy in whom an extensive cyst was filled with calf bone containing medullary tissue prepared in our laboratory developed a rash on the second day after operation. The rash subsided after the usual treatment with anti-histaminics. The second case was that of a 21-year-old youth who was suffering from morbus Olier. After the second filling with calf red marrow (the first filling was homogenous spongiosa) a rash also appeared on the 5th day after operation, disappearing in 5 days after the usual antiallergy therapy.

There was suspicion in the first case that the rash was due to a reaction to streptomycin which was instilled into the wound, in the second case, to penicillin which was applied in the same way. Skin tests were performed in both patients with streptomycin, penicillin, cow and calf flesh antigen Biogena, eluate of heterogenous red marrow after decalcification with Komplexon III in saline solution, the same eluate prepared with Rongalit, with saline solution, solutions of Komplexon III and Rongalit, and anatoxin. None of these tests indicated the cause of the reaction.

The second type of early allergic reaction is characterized by vasoconstriction of part of the afferent network of the affected tissue. Since this is a functional condition, it cannot be demonstrated unequivocally by morphological study. Functional examination is practically impossible. The equivalent of this second type of reaction may be seen in the slow take of grafts caused mainly by the vasoconstriction, which alters the graft as well as the consequences of the vasoconstriction. This is certainly not the only mechanism which plays an important role in the speed of the take of the graft.

The late type of allergic reaction, which is sometimes called the tuberculin reaction, is marked by the absence of normal antibodies in the serum but their presence in the cells and hence the possibility of their transfer by cells. The late occurrence of antibodies is quite small in our material and amounts to 8 or 17%. This to a certain extent points to the possibility of a late reaction in the majority of people who were examined. There are a number of common points between this type of allergic reaction and the destruction of homologous skin grafts. In some aspects this type reminds one of cases in the literature on the rejection of skin grafts. Up to now there have been no reports of rejection of our heterogenous grafts. 1210 grafts have been in three years.

There is also the possibility that no allergic reaction is present at all. First, if a biochemically active graft is used which contains reversibly inhibited enzyme systems, their reactivation in the graft leads to gradual changes with a predominance of catabolic processes. Thus, for example, protein molecules are broken down by the cleavage of peptides so that the antigenic property changes gradually and becomes less effective. If there is a marked effect of catabolic enzymes, denaturation also takes place [Linderstrom-Lang 1953]. The recipient's tissue in the neighbourhood of the graft comes in contact, after implantation,

with immunologically active substances on its surface. These substances, in sensitive persons, are the source of an immune reaction. The tissue of the recipient gradually penetrates into the growing graft and thus comes into contact with tissue which has a different antigenic structure. This means that the recipient of the grafts is, over a long period of time, immunized with small doses of gradually changing antigenic stimuli. Although there is a large number of possible substances, the possibility is, in our experience, slight. Perhaps it is appropriate at this point to mention two cases of ours where a metal pin and an alloplastic prosthesis had to be removed because of intolerance. Our heterogenous graft was then substituted with success.

We have another situation if zoogenous material of the same species has been grafted at least twice in the same individual, or if the recipient has been immunized before implantation, or if sera from the same species have been used. In such cases there is certainly a greater possibility of allergic reaction. The possibility also exists at the time of the first implantation since the antigen, if insoluble, is firmly bound and is released slowly. Nine such cases were observed at the various hospitals using our grafts. The second graft was implanted at an interval of 14 days to 29 months after the first implantation. In two patients our grafts were used three times in succession. The reasons for the reaction have been various but never due to biological unsuitability. In the second and third grafts, deviations were never observed from the normal clinical and roentgenological course of healing of primary grafts or of typical healing of other grafts. Neither did laboratory tests demonstrate any abnormalities. It is clear that the relatively small number of observations cannot provide an answer to such a complex question. It will be necessary to determine approximately how many persons in our population are allergic to calf bone antigen.

Finally, there is the question of the effect of different types of allergic reaction on the take of the graft. An allergic reaction is a pathological reaction to a noxa. It is evident that removal of the noxa, the graft in our case, is wholly undesirable. Neither is the sterile secretion which can be contaminated to be welcomed. The same applies to the reaction marked by vasoconstriction. In such cases anti-allergy therapy should be successful. If we consider the remaining type of allergic reaction, the Arthus phenomenon, it cannot be excluded that the prolonged local reaction could accelerate the disorganisation of the graft. Should this reaction in bone grafts be caused by extractible substances, it could be corrected by proper preservation or perhaps by auxillary therapy.

These observations are but an introduction to further work which must be carried out.

SUMMARY

On the basis of the author's experimental studies and clinical material, supplemented with some references to the literature, he deals with the possible occurrence of allergic reactions after transplantation of preserved zoogenous (calf) bone grafts (compact and spongiuous containing the red marrow). The different types of allergic reaction are innumrated and their possible equi-

valents in transplantation. Mention is made of 9 operated patients in whom retransplantation of grafts from the same source was performed at various intervals. Factors preventing the occurrence of allergic reactions are dealt with. Finally, the author suggests the advantages of the different types of allergic reaction in accelerating the take of the graft and their possible uses.

ВЫВОДЫ

О возможности возникновения аллергической реакции при применении зоогенных костных трансплантатов

Р. Клен

На основании экспериментальных трудов и клинического материала, дополненных некоторыми литературными данными, автор разбирает вопрос возможности возникновения аллергической реакции после трансплантации подготовленных консервированных зоогенных (телячьих) трансплантатов из компактной и губчатой (содержащей красный костный мозг) кости. Приводятся отдельные типы аллергической реакции и их возможные эквиваленты, наблюдаемые при трансплантациях. Более подробно упоминается о 9 прооперированных больных, у которых в разные промежутки времени была произведена повторная пересадка одинакового вида трансплантатов. Кроме того приводятся факты, которые препятствуют возникновению аллергической реакции. Наконец выдвигается вопрос пригодности отдельных типов аллергической реакции для быстрой перестройки трансплантата и возможности их использования.

RÉSUMÉ

De la possibilité de l'éclat de la réaction allergique durant l'usage des greffes osseuses zoogènes

R. Klen

A la base de ses travaux expérimentales et du matériel clinique, complétés par les dates de la littérature, l'auteur s'occupe de la question de la possibilité de l'éclat d'une réaction allergique suivant à la transplantation des greffes osseuses zoogènes conservées (du veau, compacts et spongieux, à la moelle osseuse rouge). Il cite les divers types de la réaction allergique et leur possibles équivalents observés durant les transplantations, et soumet à la critique les neuf opérés, ayant subi la rétransplantation par la greffe de la même espèce dans de différentes périodes du temps. Il cite les raisons empêchant l'éclat de la réaction allergique. Enfin il nous pose la question de la convenance des différents types de la réaction allergique à la modification de la greffe, et les possibilités de son exploitation.

ZUSAMMENFASSUNG

Über die Möglichkeit des Auftretens einer allergischen Reaktion bei Verwendung zoogener Knochentransplantate

R. Klen

Der Verfasser erörtert auf Grund seiner experimentellen Arbeiten und an Hand klinischen Materials sowie unter Anführung ergänzender Angaben aus dem Schrifttum das Problem der Möglichkeit des Auftretens einer allergischen Reaktion nach Transplantation konservierter zoogener kompakter und spongiöser [aktives Knochenmark enthaltender] Knochentransplantate (von Kälbern). Er erwähnt die einzelnen Arten aller-

gischer Reaktionen und ihre eventuellen Äquivalente, die bei Transplantationen zur Beobachtung gelangten. Weiter beschreibt er 9 operierte Patienten, bei denen in verschiedenen Zeitabständen eine Retransplantation eines Knochentransplantats gleicher Herkunft durchgeführt worden war. Der Verfasser führt auch die Umstände an, die dem Auftreten einer allergischen Reaktion entgegenwirken. Schliesslich wirft er die Frage auf, ob die einzelnen Typen allergischer Reaktionen für den schnellen Umbau des Knochentransplantats günstig sind und was für Möglichkeiten ihrer eventuellen Ausnützung bestehen.

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ANNOUNCEMENTS

The Czechoslovak Association of Plastic Surgeons will organize from June 28 to June 30, 1960 in Mariánské Lázně (Czechoslovakia) the Second international Symposium of Plastic Surgery.

The leading themes are: 1. Transplantation of tissues. — 2. Burns.

Detail information will be given by: Dr. Richard Kluzák, Secretary of the Symposium, Clinic of Plastic Surgery, Šrobárova 50, Praha 12, Czechoslovakia.

ИЗВЕЩЕНИЕ

Чехословацкое Общество пластических хирургов созывает II Симпозиум по пластической хирургии с участием зарубежных гостей, который состоится 28—30 июня 1960 г. в г. Марианске Лазне (Чехословакия).

Главным темами, которые будут обсуждаться на симпозиуме, являются следующие: 1. Пересадка тканей, 2. Ожоги.

Подробные информации сообщит секретарь симпозиума д-р Рихард Клузак (Чехословакия, Прага 12. Шробарова 50, Клиника пластической хирургии).

ANNONCES

L'Association des Chirurgiens Plastiques en Tchécoslovaquie organise dès 28 jusqu'à 30 juin 1960 à Mariánské Lázně (Tchécoslovaquie) le deuxième Symposium International de Chirurgie Plastique.

Les problèmes principaux traités: 1. Transplantation des tissus. — 2. Brûlures.

Toutes informations seront données par le secrétaire du Symposium: Dr. Richard Kluzák, Clinique de Chirurgie Plastique, Šrobárova 50, Praha 12, Tchécoslovaquie.

NACHRICHTEN

Die Tschechoslowakische Gesellschaft für die Plastische Chirurgie organisiert von 28en bis 30en Juni 1960 in Mariánské Lázně ein Internationales Symposium der Plastischen Chirurgie.

Die Hauptprobleme sind: 1. Transplantation der Gewebe. — 2. Verbrennungen.

Nähere Informationen erteilt der Sekretär des Symposium: Dr. Richard Kluzák, Klinik f. plastische Chirurgie, Šrobárova 50, Praha 12, Tschechoslowakei.

PRELIMINARY INFORMATION FOR CONTRIBUTORS

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WHERE TO PLACE SURGICAL INCISIONS IN THE FACE

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A certain tension and sometimes even fear, which the patient feels before the operation, subsides quickly after the operation has been completed and the wound properly healed. Then the patient starts to take careful notice of the scar, the only feature visible to him. This attitude of patients can be observed every day in cases where the scars are hidden by clothes, and the more so in scars of the face. Many people object to scars even if they are not very conspicuous. Little wonder they can hardly reconcile themselves to scars visible at first sight, particularly if they are to some extent disfiguring.

Although surgeons have essentially accepted certain principles of making the incision and placing the scar on the extremities, mainly on the hands, they do not all adhere to them as yet. Quite often they do not respect these principles in incisions on the face. The authors consider it the duty of each surgeon to pay the greatest attention to the way he places the incision in any operation of the face with regard to the postoperative scar. The aesthetic consideration should be regarded his duty though it might prolong the operation and make it technically more difficult.

It is amazing for how many decades the drawings depicting Langer's tension lines of the skin, published by the author in 1861, have been and are still being repeated in surgical textbooks as a guide for the correct placing of incisions. Not only general surgeons but also specialists in the surgery of the face refer to these lines in their books. In practice, however, they do not go by them, as can be shown by the incisions in various plastic operations. Actually only in the last 15—20 years have occasional reports appeared in the literature about the unsuitability of the routine application of Langer's lines as guides for the correct placing of incisions in the face.

Czechoslovak plastic surgeons, pupils of Academician F. Burian,¹⁾ have always been led to consider the aesthetic aspect when making surgical incisions in the face, which means to place them in the dynamic physiological grooves and creases. Already a long time ago Burian repeatedly emphasized and proved that it was not always possible to apply the results obtained from studies on cadavers to the living organism. Besides, it is known that the correctness of the lines as described by Langer in the region of the face has never been verified anew since his time. Cox³⁾ verified Langer's findings and results on other parts of the body

and arrived at a very different pattern. The pattern of tension lines on the body according to Cox corresponds more to clinical experience than to the classical lines of Langer, the correctness of which was already questioned by Smith in the last century. Among the clinicians Conway,²⁾ in 1938, pointed to the difference between the elasticity of the skin in cadavers and to that of living persons.



Fig. 1. Relationship of the course of skin creases to the underlying muscle.

Previously, in 1935, Webster in his review of factors leading to bad scars had come to the conclusion that the most suitable way of placing the incisions was to follow the natural wrinkles of the skin. Langer's lines are the result of static forces acting on the skin of cadavers. The physiological grooves and creases are, however, the result of dynamic forces acting on the skin of living persons.

The static pattern of Langer's lines, as was introduced by Koch in 1892, may be suitable for placing the incision on all the body except on the face.

Microscopic examination shows that the theory of the irregular, mosaic texture of collagenous and elastic fibres is no longer valid. It shows that the majority of fibres are arranged in parallel, forming membranes and bands in the direction of the greatest tension and are bound up into one continuous layer by a small number of cross fibres. The findings, therefore, are different in slides cut parallel to the lines of tension from those cut across these lines. In the latter the majority of elastic and collagenous fibres have been severed transversely whereas in the former the majority of fibres appear longitudinal. Skin under constant tension adapts itself to its function and the elastic and collagenous fibres place themselves in the direction of the greater pull. The direction of the

creases in the facial skin, which loses elasticity by physiological aging, depends on the physiological movements caused by the contraction and relaxation of the mimic musculature. The course of physiological grooves in the face is the result of the insertion of some superficial muscle bundles into the subcutaneous tissue or into the skin.



Fig. 2. Different course of the physiological creases and of Langer's lines.

Since the anatomical arrangement of the muscles is — apart from slight deviations — the same in every human face, the direction of the resulting wrinkles, too, is very similar in most people. Naturally, there are some individual differences. Studying the physiognomy of many people, it can be seen that these differences are not very marked or numerous and are mainly found in certain regions, e. g. around the mouth. Observations of the authors confirm the findings of Kraissl,^{5 6}) Cox, Conway, and also the findings of Rubin⁸) who, in order to study the course of the grooves and wrinkles in the face, used a print method similar to that of the police for finger prints.

Clinical observation and print methods show that skin creases in the face always appear physiologically at right angles to the direction of the muscle contraction. Fig. 1 shows drawings of conspicuously marked creases in the face formed on the basis of muscle function. When comparing this picture with the drawings of Langer's lines on Fig. 2 the marked differences in some parts of the face (forehead, supraorbital region, region round the eyes, the lateral aspect of the cheeks — mainly the lower part —, the upper lip, the sides of the nose, etc.), become evident.

On the forehead the wrinkles run horizontally slightly curving in two ways. The lowest groove lying next to the eyebrows is formed by the insertion of superficial bundles of the *m. frontalis* into the skin. Other wrinkles develop by adaptation of the skin to the vertical contractions of the forehead muscles. In the median part of the forehead, on both sides of the nasal root, the *m. corrugator*



Fig. 3. Course and location of the muscles in the face.

glabellae is inserted into the skin and contracts horizontally thus drawing the eyebrows towards the midline; here the skin folds vertically. Some individual differences in length and sometimes in the number of grooves, but not in their direction, can be found.

On the side of the nose oblique grooves develop through the action of the *m. nasalis*, mainly its transverse portion; on the root of the nose and below it transverse grooves develop which cross the *m. depressor glabellae* running longitudinally, being inserted into the skin of the nose at various depths. In the latter parts of the nose the wrinkles cross the *m. levator nasi et labii maxillaris medialis*. The conspicuous physiological tarsal groove on the upper lid results from the insertion of the *m. levator palpebrae superioris* whose fine bundles penetrate into the skin at right angles to the surface. The shallower groove on the lower lip is formed in a similar way by the *m. orbicularis oculi*, the palpebral and orbital portions of which run horizontally and are firmly fixed to the bone at each corner by the medial and lateral ligament respectively. The function of this muscle is mainly to lift the lower and pull down the upper lid. Here the skin wrinkles run at right angles to the action of the muscle but parallel to the course of its

bundles. At the corners, mainly at the lateral corner, where the muscle bundles form an arch, the wrinkles fan out in a bundle of rays and run at right angles to the arch of the muscle bundles. The physiological naso-labial grooves develop near the nostrils through the insertion of the m. quadratus labii superioris into the skin, and below this through the insertion and action of the entire muscular



Fig. 4.



Fig. 5.

Fig. 4. Conspicuously wrinkled face *en face* (technique according to Kraissl). — Fig. 5. Conspicuously wrinkled face *en profile* (technique according to Kraissl).

system running from the malar protuberance down towards the m. orbicularis oris. The grooves have an undulating course, because the complicated group of muscles acts in different directions.

The skin creases on the cheeks also run at right angles to the direction of the muscular contraction (Fig. 3, 4, 5). Various deviations in their course may be caused through the influence of individual factors, i. e. different functional efficiency of the muscles (e. g. trained mimics, habit of chewing, etc.). It is, therefore, necessary to study carefully the development of creases during mimic movements in each patient separately. In the lateral parts of the upper portion of the cheeks the creases run somewhat horizontally because of the action of the temporal muscle which contracts vertically.

Rubin⁸) using his print method on a large number of patients ascertained that two types of wrinkles are formed mainly around the mouth by which he distinguishes the so-called "happy" and "sad" type of face.

Around the mouth lies the *m. orbicularis oris* which is not inserted into the skeleton of the face but only irregularly sends a few small bundles towards the mandible. On contraction the skin creases into fanning-out grooves which are apparent mainly in people without teeth. Individual deviations in their course are caused by variations in the interconnection of the *m. orbicularis oris* with



Fig. 6. Direction of small excisions in the face.

other muscles of the face [e.g. the *m. buccinatorius*, *quadratus labii mandibularis*, *nasalis*, *caninus*, etc.].

On the chin and in the region of the *m. mentalis*, which runs transversely, the grooves develop more vertically than laterally, where they form arches passing horizontally under the chin. There the *m. triangularis* and *platysma* implement their influence more markedly.

As was said before, the course of the grooves and wrinkles, which are the result of the skin adapting itself to the contraction of the underlying muscle, widely differs from the course of the classical tension lines of Langer. Since the scar appears the least conspicuous if it imitates a new crease or runs in an already existing one, it is clear that the grooves and wrinkles ought to serve as a guide for deciding upon the direction of an incision in the face. This does not only apply to simple incisions and small excisions (Fig. 6), but to the placing of all incisions even in extensive plastic operations (Fig. 7—15).

The decision of where to place the incision in the face of a child or adolescent is more difficult than in the face of an adult where the creases are clearly marked at rest as well as on mimic movements. In such cases, too, it is necessary to



Fig. 7.



Fig. 8.

Fig. 7. Extensive carcinoma of the side of the nose and the corner of the eye. — Fig. 8. Closing of the defect after removal of the tumour by a skin transfer from the cheek. Scars placed into the grooves and wrinkles are almost unnoticeable after healing.



Fig. 9.



Fig. 10.



Fig. 11.

Fig. 9. Bell's palsy with smoothed-out grooves and wrinkles. — Fig. 10 and 11. Condition after suspension with fascia. Incisions of the skin placed so that they form folds at rest and on mimic movements well imitating the healthy side.



Fig. 12.



Fig. 13.

Fig. 12. Naevus of the cheek and the upper lip after radium therapy. — Fig. 13. Condition after excision of the naevus by incisions in the physiological grooves and covering of the defect by a free skin graft.



Fig. 14.

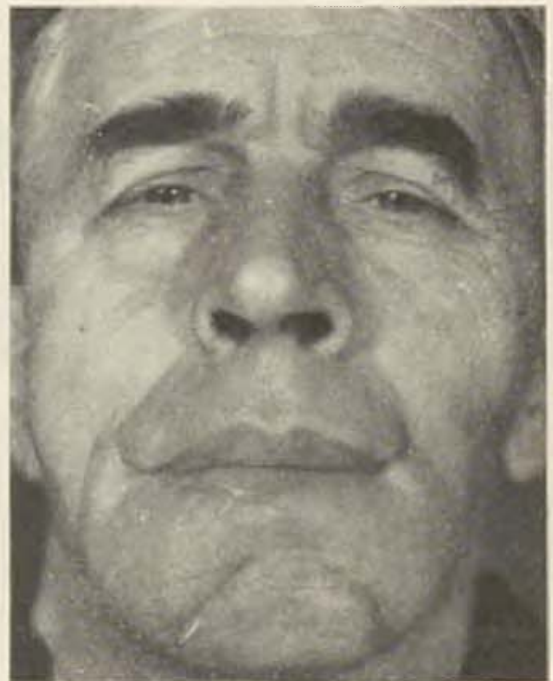


Fig. 15.

Fig. 14. Extensive carcinoma of the lower lip. — Fig. 15. Condition after plastic transfer of skin from the cheeks. Scars placed at the site where grooves and wrinkles are normally formed.

determine the probable course of the physiological lines by testing these movements. However, often the best that can be done is to place the incision in the direction in which the creases usually form in an adult face. Sometimes it is expedient to let the patient contract his muscles and slightly crease the skin between two fingers. Very fine lines then appear which may serve as a guide for placing the incision.

As a result of the grooves and wrinkles of the skin running at right angles to the direction of the muscle contractions, considerable gaping and stretching takes place in wounds, particularly deep wounds, of the live face, which is in a continuous state of movement by the pull of the mimic muscles. Parting of the wound edges often happens asymmetrically and in different directions. This is assisted by the specific, mainly fan-like arrangement of the numerous, rather short, but strong superficial muscles, which are frequently interconnected.

From these anatomical conditions it follows that it is necessary to pay great attention to the suture of incisions and wounds in the face. Suturing must be performed very carefully and exactly in each layer. Particularly at the site of the insertion of muscle bundles into the skin (on the eyebrows, the naso-labial region, around the mouth) is it necessary to approximate exactly the fine muscle bundles of the subcutaneous tissue. Unless this is done the bundles shrink and become sclerotic forming a conspicuous wall around the sunken-in scar. Subsequent freeing of the amassed bundles is very intricate and sometimes impossible. Fine intradermal approximation sutures with small bites should be a matter of routine for everybody who operates on the face. To prevent movements of the wound edges on the contraction of the mimic muscles it is advisable to secure the wound with a carefully applied dressing which keeps the wound edges in contact by a strip of cellophane and adhesive plaster.

In cases, where a wound resulting from an accident does not run in the direction of the physiological grooves and wrinkles, but across them, every attempt should be made on primary surgical treatment to place the suture in the direction of the wrinkles by a local transfer or a Z-flap exchange, the site and extent of the wound permitting. Where this is not possible it is necessary to suture the wound particularly carefully and pay attention to the exact approximation of the wound edges by the suture of those parts which are stretched and shifted by the pull of the muscles. In such cases, too, precise approximation is facilitated by observing the course of the skin creases.

Although these demands on the surgeon seem obvious, they are often not met to the detriment of the patient and to the disadvantage of the surgeon himself whose results are thereby worsened. Since operation without causing a scar is as yet unknown it is necessary to place the scars so that they are inconspicuous and do not impede function or have an adverse aesthetic effect.

SUMMARY

The authors draw attention to the importance of the correct placing of incisions in the face. If the incision is placed in the grooves and wrinkles a fine, inconspicuous scar develops. The school of F. Burian rejects the static lines of

Langer, traditionally advocated in text books of general surgery, as unsuitable for incisions in the face. The authors demonstrate the difference between these lines and the dynamic lines which develop through the action of the mimic musculature. The dependence of the wrinkles on these muscles is described in detail. For the correct placing of the incision the authors recommend a careful study of the skin creases and that great attention be paid to the exact approximation of musculature, subcutaneous tissue and skin when suturing. The importance of fine approximation sutures with a small bite for the appearance of the postoperative scar is emphasized.

ВЫВОДЫ

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Г. Пешкова, Б. Стоцкар

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RÉSUMÉ

La disposition des incisions chirurgicales faciales

H. Pešková, B. Stockar

Les auteurs insistent sur l'importance d'une disposition appropriée des incisions faciales. Si on pratique ces incisions dans les replis mêmes des sillons et des rides, il ne résulte qu'une cicatrice fine et peu perceptible. L'école de Burian rejette, en ce qui concerne les incisions faciales, la ligne statique peu appropriée de Langer, indiquée dans la plupart des manuels de chirurgie. Les auteurs démontrent en détail la façon de laquelle cette ligne diffère des lignes dynamiques formées sous l'action des muscles mimiques. Le rapport qui existe entre les rides et ces muscles est décrit d'une façon très complète. On recommande d'examiner à fond la frongure cutanée, pour pouvoir arranger les incisions de la façon la plus convenable et, en ce qui concerne les soudures, d'avoir soin de lier intimement et très soigneusement les muscles, les parties sous-cutanées et la peau. On souligne l'importance que l'on doit attribuer à l'emplacement des points d'adaptation, relativement à l'aspect futur de la cicatrice post-opératoire.

ZUSAMMENFASSUNG

Die chirurgische Schnittführung im Gesicht

H. Pešková, B. Stockar

Die Autoren machen auf die Wichtigkeit einer richtigen Schnittführung im Gesicht aufmerksam. Wird der Schnitt in die Faltenbildung oder in die Runzeln gelagert, so entsteht eine feine, wenig auffallende Narbe. Die statische Linie nach Langer, die allgemein von den chirurgischen Lehrbüchern übernommen wird, lehnt die Schule von Burian für

Gesichtsschnitte ab. Die Autoren demonstrieren, in welcher Form sich diese Linien von den dynamische Linien unterscheiden, die durch Funktion der mimischen Muskulatur entstehen. Die Abhängigkeit der Runzeln von dieser Muskulatur wird ausführlich beschrieben. Zwecks richtiger Schnittführung wird eine sorgfältige Untersuchung der Faltenbildung empfohlen. Bei der Suture ist einer sorgfältigen Annäherung von Muskel, subcutanem Gewebe und Haut Beachtung zu widmen. Die Wichtigkeit von fein angelegten Adaptationsnähten für das Aussehen der postoperativen Narbe wird betont.

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