ACTA CHIRURGIAE PLASTICAE

INTERNATIONAL JOURNAL
OF PLASTIC SURGERY

20 · 3

1978

CS ISSN—0001—5423

AVICENUM - CZECHOSLOVAK MEDICAL PRESS
PRAGUE

Exclusive Distributors for all Western Countries
KARGER-LIBRI AG, Petersgraben 31, CH-4000 Basel 11 (Switzerland)

Published four times (in 1959: two times) a year by Avicenum - Czechoslovak Medical Press, Malostranské nám. 28, Praha 1. Editor in Chief Prof. H. Pešková, M. D.; Deputy of Editor in Chief Prof. V. Karfík, M. D. — Address of the Editorial Office: Acta Chirurgiae Plasticae, 120 00 Praha 2, Legerova 63, Czechoslovakia. — Press: Středočeské tiskárny, n. p., provoz 01, Hálkova 2, Praha 2

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FREE FLAP TRANSFER IN A MICROSURGICAL EXPERIMENT

J. FEDELEŠ, Š. ZBOJA, J. DREXLER, J. SLEZÁK, J. JANOVIČ, M. BROZMAN, V. SEKAN

Reconstructive surgery has for centuries been tackling the problem of transplanting large blocks of tissue using flaps and rope flaps. Already Shrushruta, Tagliocozzi, Micoladoni and others strongly believed that there must be an easier and more rapid technique of transference. Gibson of Glasgow was probably the first to find this easier way. He was the first to insist that a block of tissue can be transplanted provided the transplant is well supplied with blood by means of an extracorporal pump until the vessels of the bed have been joined. He recommended the use of the terminal branches of the a. mammaria interna and the inferior epigastric vessels for the purpose. However, due to haemolysis in such small oxygenators and pumps the idea was first abandoned as a failure. Nevertheles, in 1958, it did inspire efforts at suturing vessels 1 mm in diameter as the University of California offered a grant towards solving the problem. It was, indeed, solved on a rabbit ear model without the use of surgical microscope and presented to a surgical forum by Harry J. Buncke (1960). In that same year, Jacobson and Suarez published their pioneering work "Microsurgery in Small Vessell Anastomoses". Their technique involving the use of operating microscope soon began to spread rapidly. Microsurgery soon found its way to Australia, China and Japan.

As regards free flap transference using microvascular anastomoses, this took a longer time to develop. The first to try and cope with this problem was White's firm in Pittsburg. However, inadequate microsurgical instruments proved to be an impediment. Kreizek et al. (1965) were the first to succeed in transferring a free flap from the abdominal wall to the neck in the dog.

At our department in 1975, we decided to approach the problem in an experimental way with a view to practising the technique and developing a model such as could be standardly used under our own conditions later on as a springboard for more experiments and as a method of keeping up our skills.

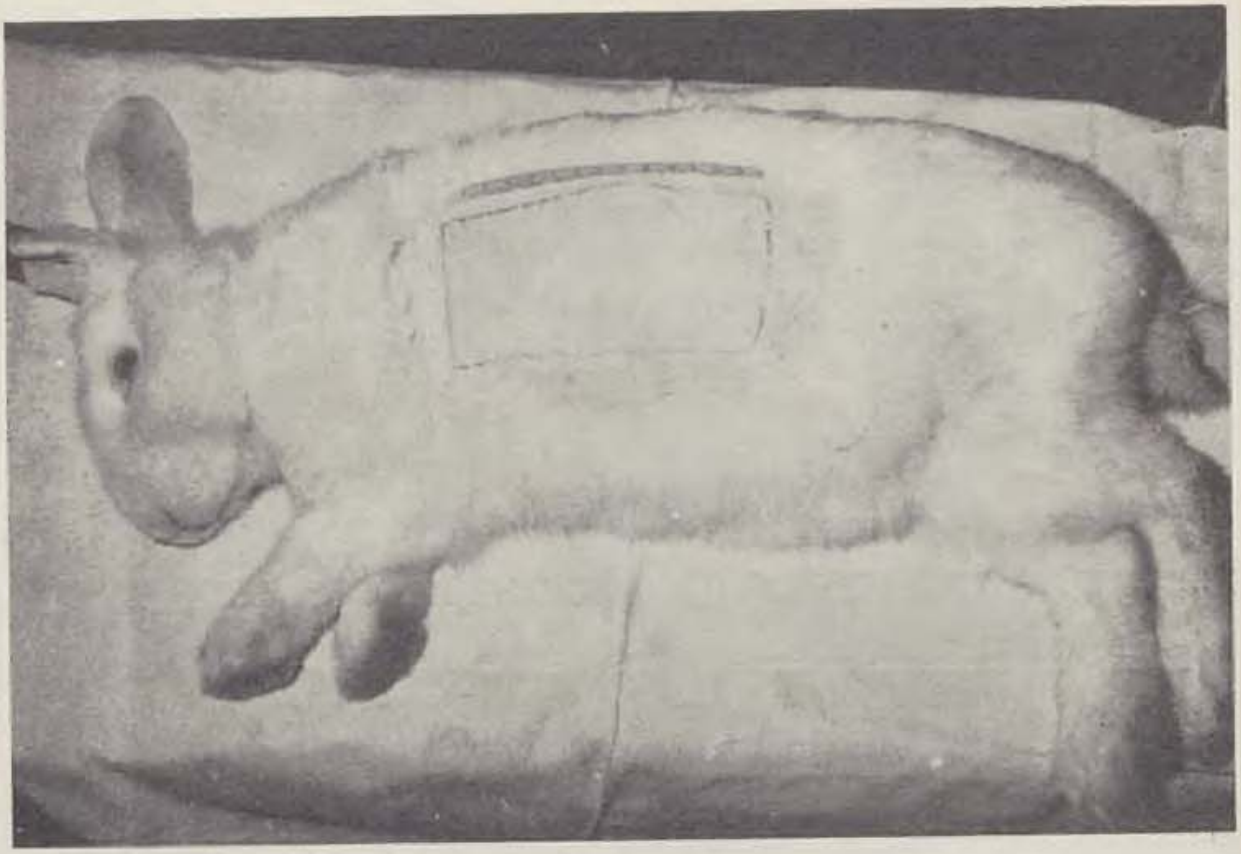

Fig. 1. Flap 14×7 cm marked on rabbit back

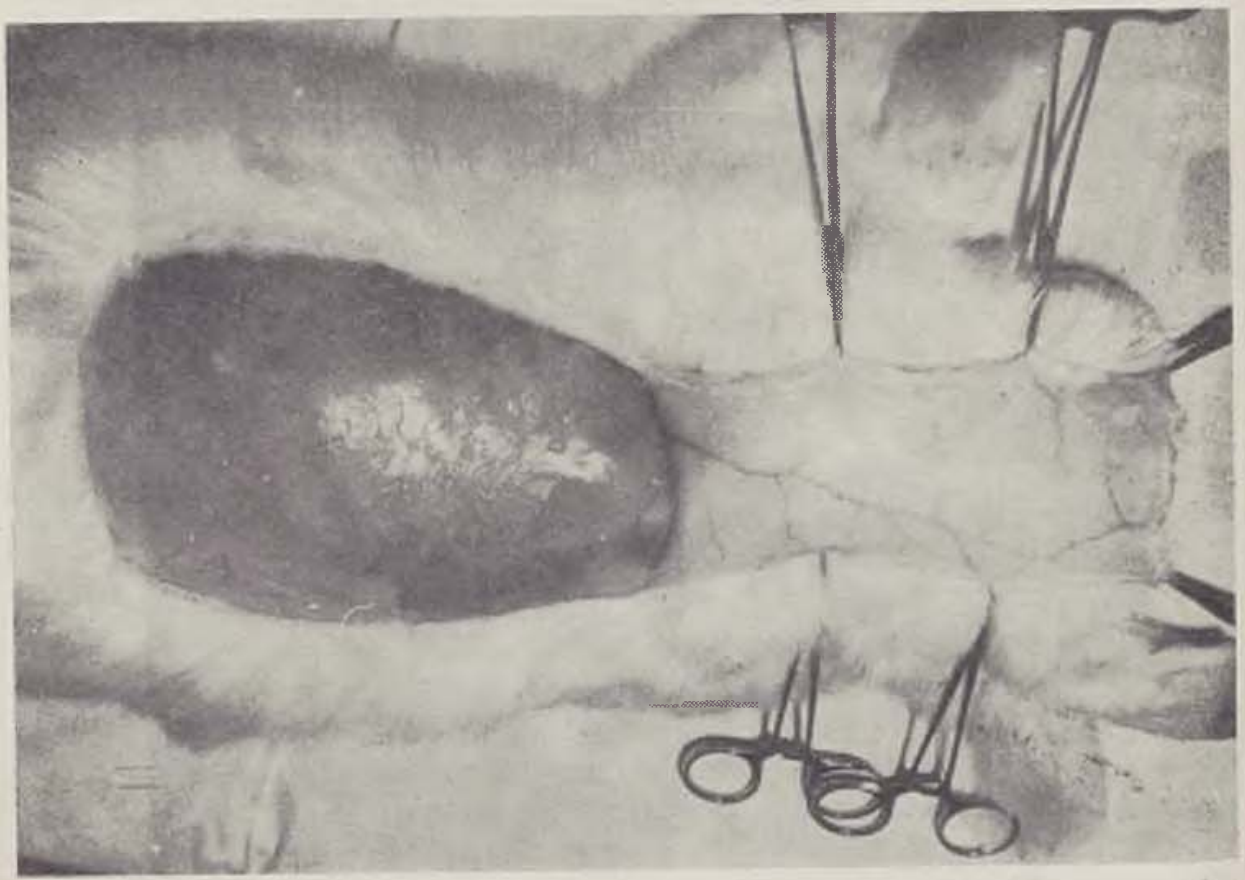

Fig. 2. Clearly visible vascular pattern on lifted flap

MATERIAL AND METHODS

The rabbit was chosen to serve as an experimental animal as its vessels are sufficiently like human ones. The average weight of the experimental animals used was 2.4 kg.

Intravenous anaesthesia was chosen with 0.5 g Tiopental (Spofa), 45 ml Aqua per inj. and 50 ml saline solution per one infusion. The drip method was used with one member of the team assigned to this particular task throughout the time of the operation.

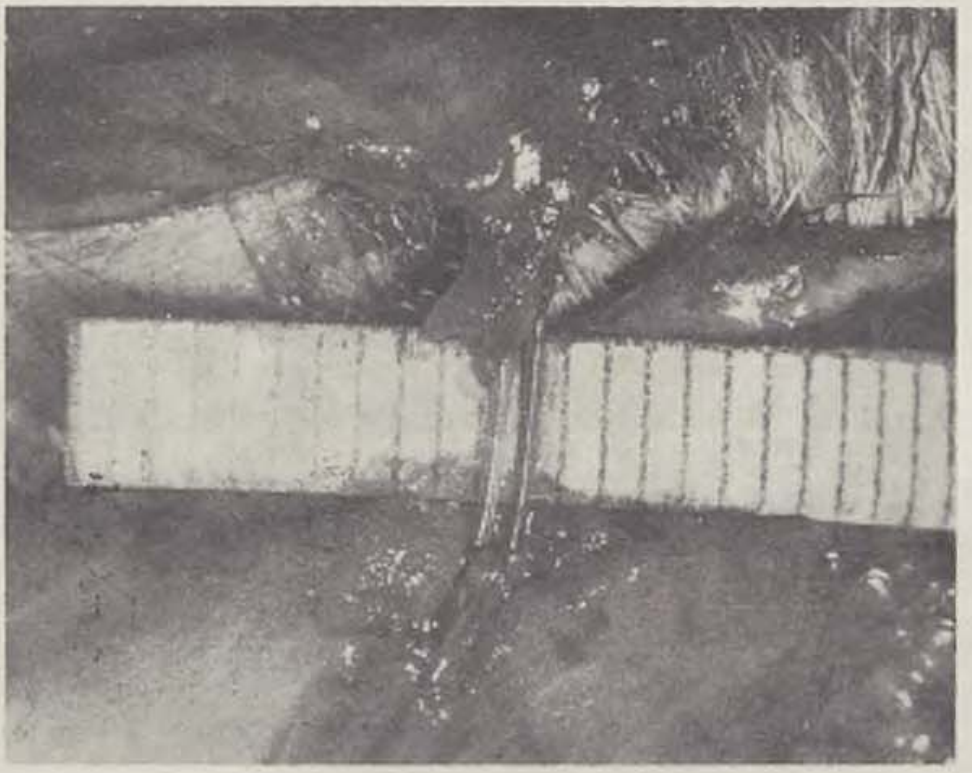

Fig. 3. Exposed vascular bundle of flap compared with scale in mm

Following an anatomical exploration of the rabbit a flap 14×7 cm in size from the animal's back was chosen. The operating site was then prepared, depilated, and the whole flap lifted clearly showing the vascular pattern (Fig. 2) as proof of its excellent blood supply from the central artery as well as of the drainage into the respective central vein. Needless to say, the vessels responsible for the blood supply to the flap had been carefully exposed and the nerve accompanying the vessels in the area excised. The lumina in the vascular bundle ranged between 0.4 and 0.8 mm (Fig. 3). Eventually, the whole bundle was completely cut off. After the flap had been reimplanted without suturing the vascular bundle, dry necrosis developed. This was a control series of 10 flaps with the vessels left unsutured. All the flaps became completely necrotized.

The experimental series of 30 flaps was aimed at reimplantation involving suture of the vascular bundle (Fig. 4), a procedure based on the use of the authors' own technique developed by Fedeleš et al. (1977).

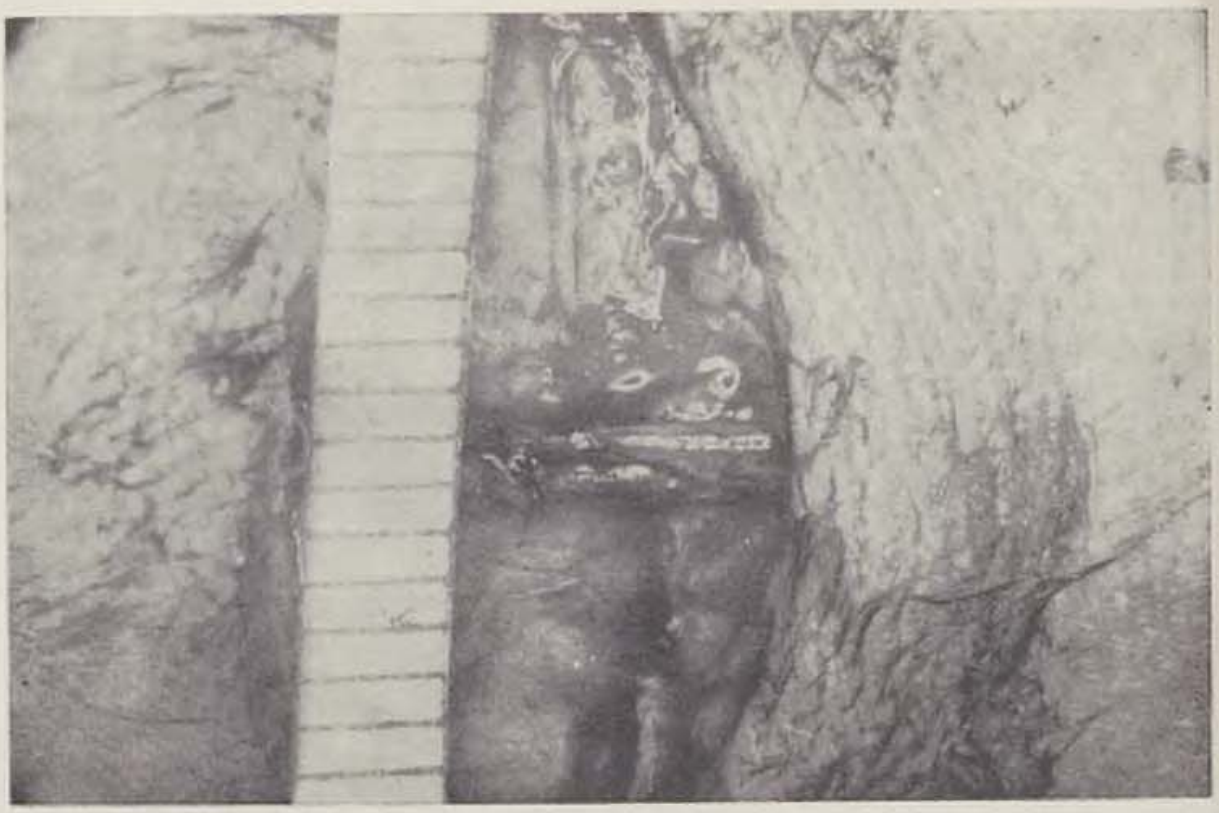

Fig. 4. State after suturing flap vascular bundle compared with scale in mm

Fig. 5. Hair begins to appear on flap on day 8 after surgery

The experimental flaps survived with no threatened necrosis, and as from day 7 after the operation hair began to grow discernibly.

Fig. 5 shows a flap on the eight day after surgery. For interest's sake, a histological check-up was made from the site of the suture of the artery (Fig. 6). A transverse section can be seen at the point of suture. The vascular

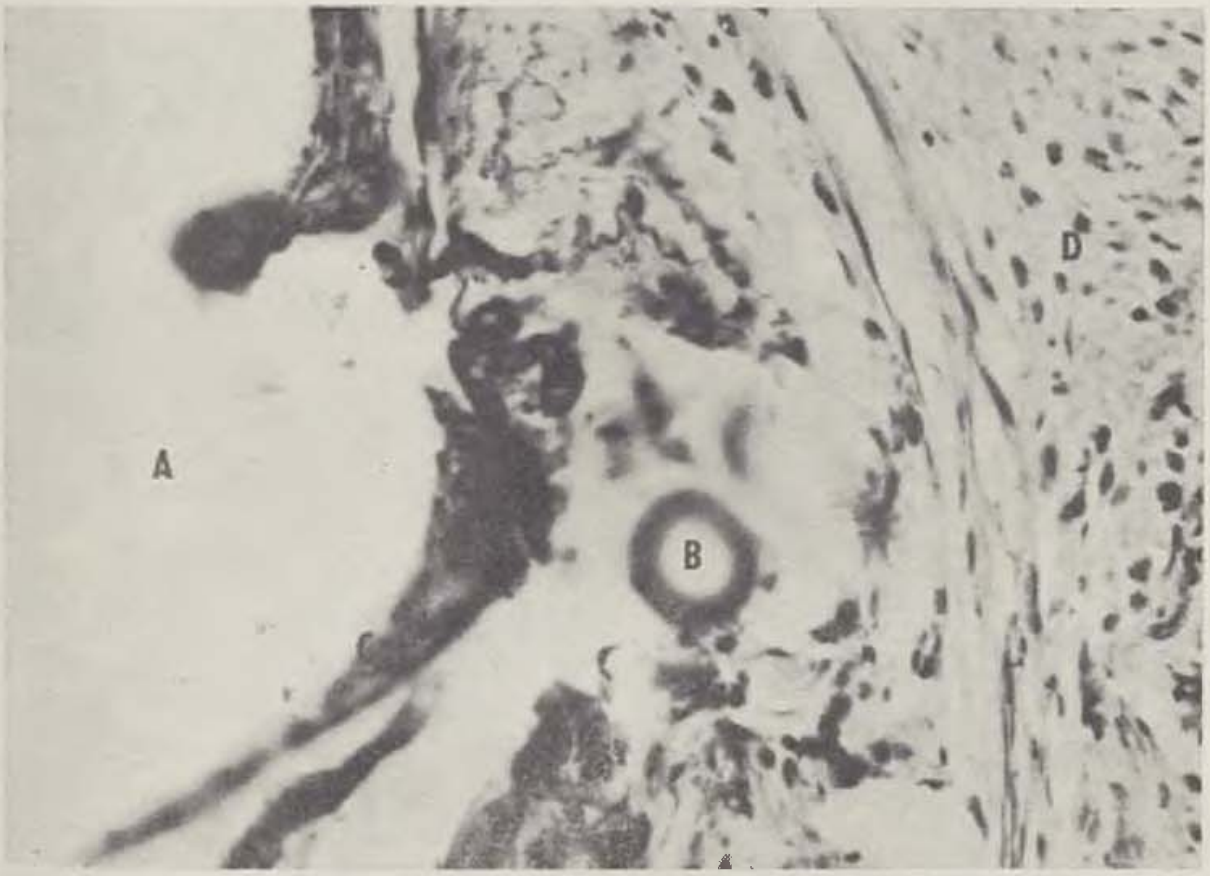

Fig. 6. Transverse section at suture site H E×800: A — vascular lumen, B — suturing material, 10-0 Nylon, C — suture-damaged endothelium, D — perivascular fibrotic tissue

wall is mechanically damaged by the suturing material. The lumen is patent, the space surrounding the vessel lodged in fibrotic tissue. The vascular architecture is partially preserved. Monofilamentouse, transversely sectioned suturing material, 10-0 Nylon, can also be seen. The preparation was stained with haematoxylin-eosin, enlargement ×800.

It was at that particular time that we came across reports by Shearin et al. (1976) who utilized a flap on the rabbit ear. In an effort to verify the results, we performed 20 experimental operations, creating a 6×4 cm flap on the rabbit ear (Fig. 7), separating it from the cartilage and lifting it on its neurovascular bundle. This was then transected and only the vessels were sutured again afterwards (Fig. 8). The diameter of the vessels on the ear was, on the average, 0.3 mm larger than on the back and, therefore, technically much easier to suture. The actual condition after the suture of the vessels and

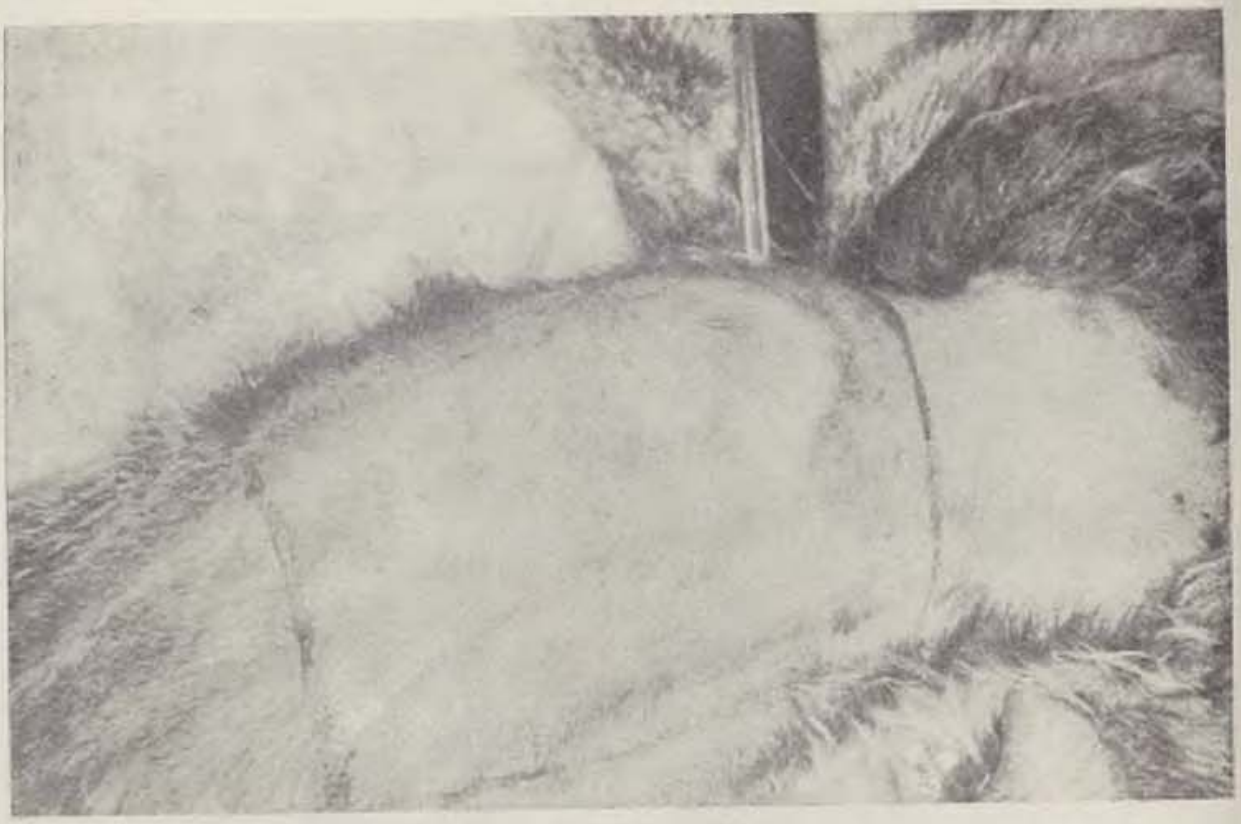

Fig. 7. Flap 6×4 cm marked on rabbit ear

Fig. 8. Flap vascular bundle on the ear after suture

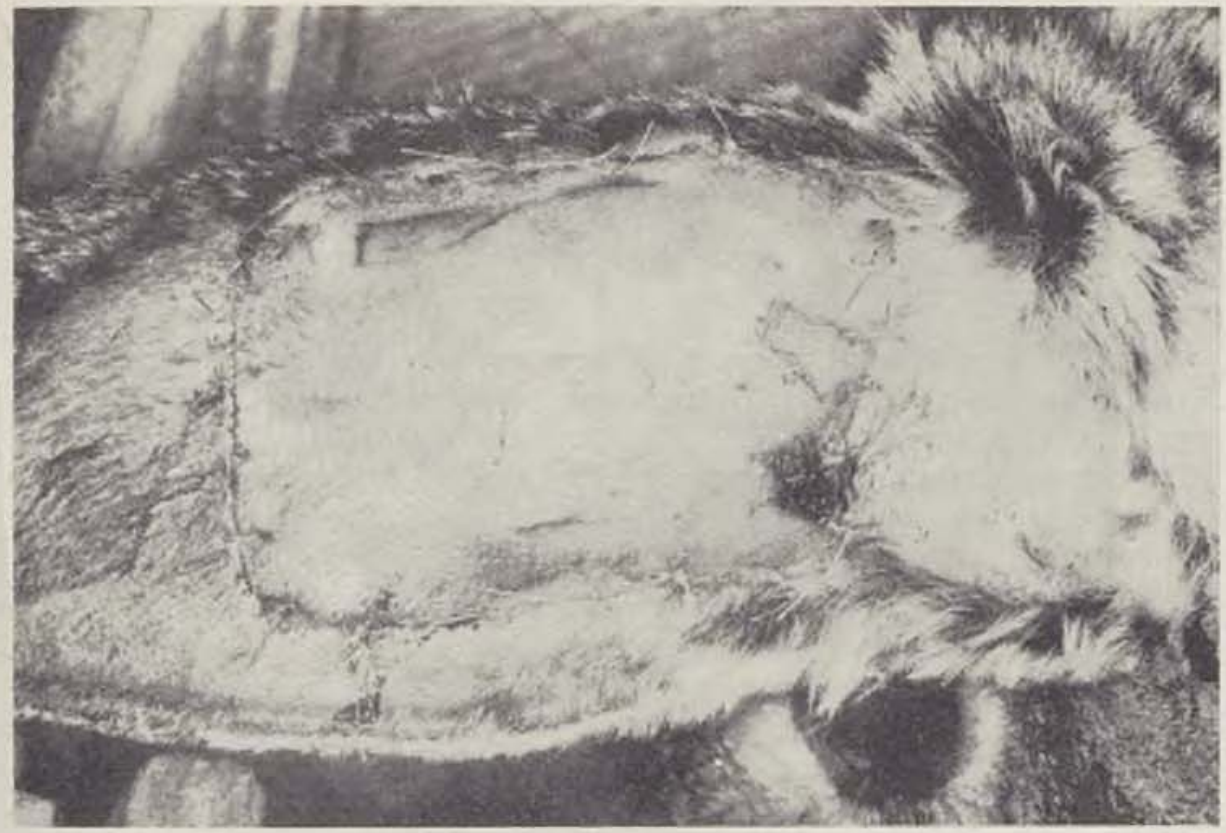

Fig. 9. Flap on day 3 after operation obviously surviving

after the reimplantation of the flap is evidence of their survival (Fig. 9) three days after the surgical operation. Flaps with no suture of the vessels became necrotized. Five such control experiments were made. The technique of suturing the vessels was very much like that in the first case.

DISCUSSION

Although the relevant literature carries descriptions of a number of models of transferring blocks of tissue in different experimental animals such as the rat, rabbit, dog, pig and monkey, the rabbit appeared to be best suited for our purposes because of the advantages of easy breeding. Our aim was to find a new model of free flap transfer in experiments making use of the techniques of microsurgery such as would also meet other requirements of experimenting in this field including those of preparations for clinical practice.

Leaving aside infusions of anaesthetics, the rabbit was not influenced by any anticoagulants during the experiments. Standard microsurgical instruments and an operating microscope with a magnifying power of ×12.5 were used, an equipment which proved to be perfectly adequate for the purpose.

CONCLUSION

Summing up the results obtained on our own model of free flap on the rabbit flap as well as those on a controlled model developed by Shearin et al. we can state that both are adequately suited to serve as models for studying

free flap transfer in an experiment as well as for practising the technique of free flap transfer in clinical practice.

Suturing the vessels using the technique of microsurgery was practised on the rabbit femoral vessels. The rabbit proved to be a perfectly suitable animal for experimental as well as practising purposes in microsurgery.

J. H.

SUMMARY

The authors followed the aim of developing a new model of free flap transfer in an experiment. Following an anatomical study, they lifted a 14×7 cm flap from the rabbit back. The blood supply vessel lumina ranged from 0.4 and 0.8 mm. The model was controlled in thirty experiments. In the control group with the vascular bundle left unsutured, dry necrosis of the flap developed.

The authors tested a model of free flap transfer on the rabbit ear developed by Shearin et al. (1976) using the technique of microsurgery in twenty experiments. The results justify the exploitation of both models for more experimental purposes in the sphere of free flap transfer as well as for purposes of practising prior to clinical practice.

RÉSUMÉ

Transposition des lambeaux libres dans une expérience faite au moyen de la technique microbiologique

Fedeleš J., Zboja Š., Drexler J., Slezák J., Janovič J., Brozman M., Sekan V.

Les auteurs se sont proposés le but de créer un nouveau modèle de transposition des lambeaux libres dans une expérience. Après une étude anatomique, ils ont fait un lambeau de 14 cm sur 7 cm au dos d'un lièvre. Le diamètre des vaisseaux nutritifs variait entre 0,4 à 0,8 mm. Ce modèle était vérifié par trente expériences. Dans le groupe de contrôle où on n'a pas cousu le faisceau des vaisseaux, il s'est produit une nécrose sèche du lambeau.

Les auteurs ont vérifié le modèle de la transposition des lambeaux libres sur l'oreille du lièvre réalisée par les auteurs Shearin et coll. (1976) à l'aide de la technique microchirurgique en 20 expériences. Les résultats donnent le droit d'employer les deux modèles pour les expériences suivantes dans le domaine de la transposition des lambeaux libres et même comme les modèles d'entrainement avant la pratique clinique.

ZUSAMMENFASSUNG

Übertragung freier Lappen im Experiment mittels mikrochirurgischer Technik

Fedeleš J., Zboja S., Drexler J., Slezák J., Janovič J., Brozman M., Sekan V.

Die Autoren stellten sich als Ziel ein neues Modell für die Übertragung freier Lappen im Experiment zu schaffen. Nach anatomischer Studie bildeten sie einen Lappen im Format von 14×7 cm am Hasenrücken. Das Modell überprüften sie in

dreissig Versuchen. In der Kontrollgruppe, in der das Gefässbündel nicht genäht wurde, kam es zu einer trockenen Nekrose des Lappens.

Die Autoren überprüften das von Shearin und Mitarb. (1976) entwickelte Modell der Übertragung freier Lappen am Hasenohr mit Hilfe der mikrochirurgischen Technik in 20 Experimenten. Die Ergebnisse berechtigen die Anwendung beider Modelle für weitere experimentelle Zwecke auf dem Gebiet der Übertragung freier Lappen sowie auch als Trainingsmodelle vor der klinischen Praxis.

RESUMEN

Transposición de lóbulos libres en un experimento por técnica microquirúrgica

Fedeleš J., Zboja Š., Drexler J., Slezák J., Janovič J., Brozman M., Sekan V.

Los autores se propusieron como objetivo crear un modelo nuevo de transposición de lóbulos libres en un experimento. Después de un estudio anatómico hicieron un lóbulo de 14 a 7 cm en el dorso de un liebre. El diametro de los vasos vacilaba entre 0,4—0,8 mm. El modelo fue examinado en 30 experimentos. En el grupo de control donde no había un fascículo vascular, se produció necrosis seca del lóbulo.

Los autores examinaron el modelo de la transposición de lóbulos libres en la oreja del liebre de los autores Shearin et al. (1976) mediante técnica microquirúrgica en 20 experimentos. Los resultados dan derecho a usar los dos modelos para nuevos fines experimentales en el área de la transposición de lóbulos libres y también como modelos de entrenamiento antes de una práctica clínica.

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FREE LATERAL PLASTY OF PERIPHERAL ARTERIES USING AUTOLOGOUS FASCIA

S. M. KURBANGALEYEV, G. V. KRUNYSHEV

Among other reconstructive operations on arteries, a technique of lateral plasty is widely used: by injuries, following intimectomy, for reconstruction of lumen of blood vessels, by stenosis of varied etiology. According to many authors, a broadening of the vessel's lumen by means of the lateral plasty diminishes a possibility of arterial occlusion by thrombus during an early postoperational period and prevents a rethrombosis after long periods of time. This fact is very important in the case of reconstruction of peripheral arteries, especially following intimothrombectomy, indicated by atherosclerotic occlusions (Filatov and Litmanovitch 1961).

The results of operations depend considerably on properties of the graft, which is used as a patch on the vessel. Therefore, various autologous tissues, homologous and heterologous vascular grafts and synthetic materials were examined and applied. Recently, an autologous phleboplasty is a method of choice and its advantages are well known. However, the removal of more or less significant part of a vein may not be indifferent for an organism. In addition to it, a preparation and use of saphena magna vein, the most often utilized vein for the lateral plasty of peripheral arteries, is not always advisable and often impossible in respect to its thromboses, varicose dilatation etc. Among other autologous tissues, a femoral fascia lata has consistently attracted an attention of surgeons utilizing it for strengthening of an abdominal wall, elevation of a prolapsed rectum, by stenosis of an anal orifice etc. A firmness, availability and a good adaptability in respect to surrounding tissues, if freely grafted, are its main advantages (Oppel 1915, Klepikova 1966 and others). A sufficient quantity of this tissue can be taken, while the function of an extremity is not disturbed and no significant traumatization of an organism takes place. Several experimental and clinical studies on use of an autologous fascia in vascular surgery were published (Neuhof 1918, Wylie et al. 1951, Krakovskii 1959 etc.). However, the femoral fascia lata was used basically on aorta and large blood vessels, just for strengthening of the zone of suture or

plasty. Lack of information, whether substitution of walls of the peripheral arteries would be possible by using such a material, was the reason for the present study.

Table 1. Firmness of femoral fascia lata, arterial and veinous walls as measured by a pressure load causing their rupture

Examined material	Pressure load of rupture, atm.							Corresponding mean value
Fascia:								
upper third	4	5.5	5	5	3.5	5	4.4	4.4
middle third	7	8	6	8	6.5	7	8	7
lower third	9	8	9	8	7.5	7.5	8.5	8
Artery:								
iliac	5.5	7	7.5	6.5	6	—	6	6.5
carotic	5.5	6.5	6.5	6	5.5	6	6	6
femoral	5	5	6	5.5	6	6	5.5	5.5
Inferior vena cava	5.5	6	6	5	4	5	5	5

A firmness of femoral fascia lata flaps and of flaps from arterial and veinous walls, was measured on a special experimental device as a resistance to rupture caused by pressure, and the results were compared. A statistical and a dynamic scale of the pressure load was used. It is shown in Table 1., that the fascia is not less firm than the compared tissues. These data and study of anatomical features of femoral fascia lata by dog and man led to

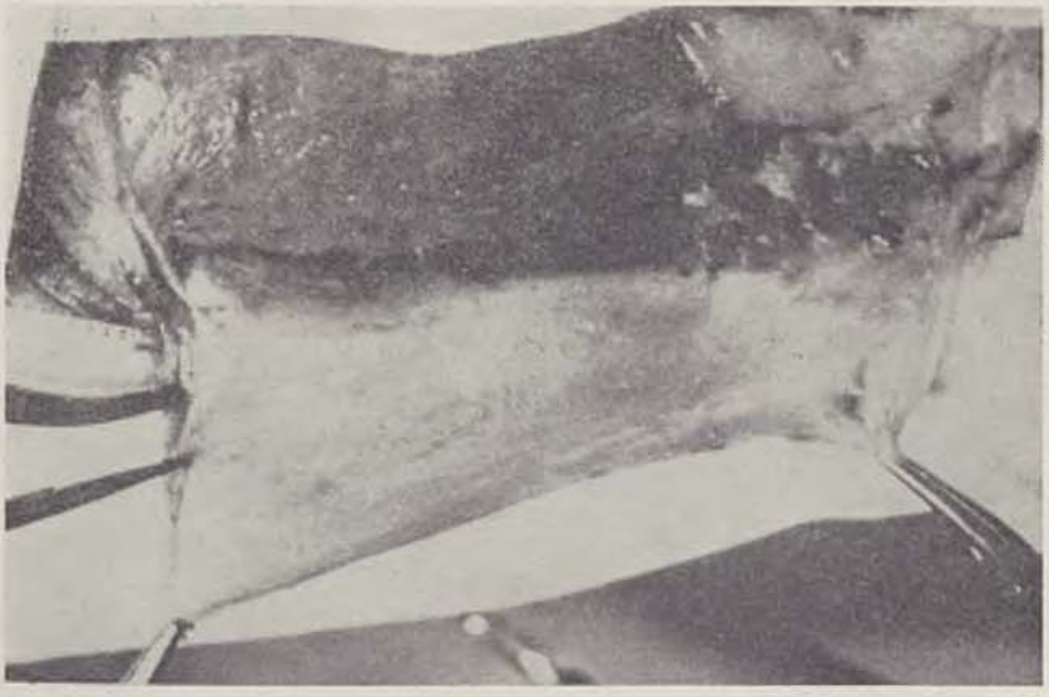

Figure 1.: The flap was cut out from the fascia lata on the external surface in the lower third of the thigh, which was operated on

conclusion that a part of fascia reaching from tendon of its extensor to biceps muscle in the middle and lower thirds of the thigh should be taken for substitution of the arterial wall. In these limits, it is firm, consists of two closely bound layers and its fibres are organized in longitudinal and oblique directions.

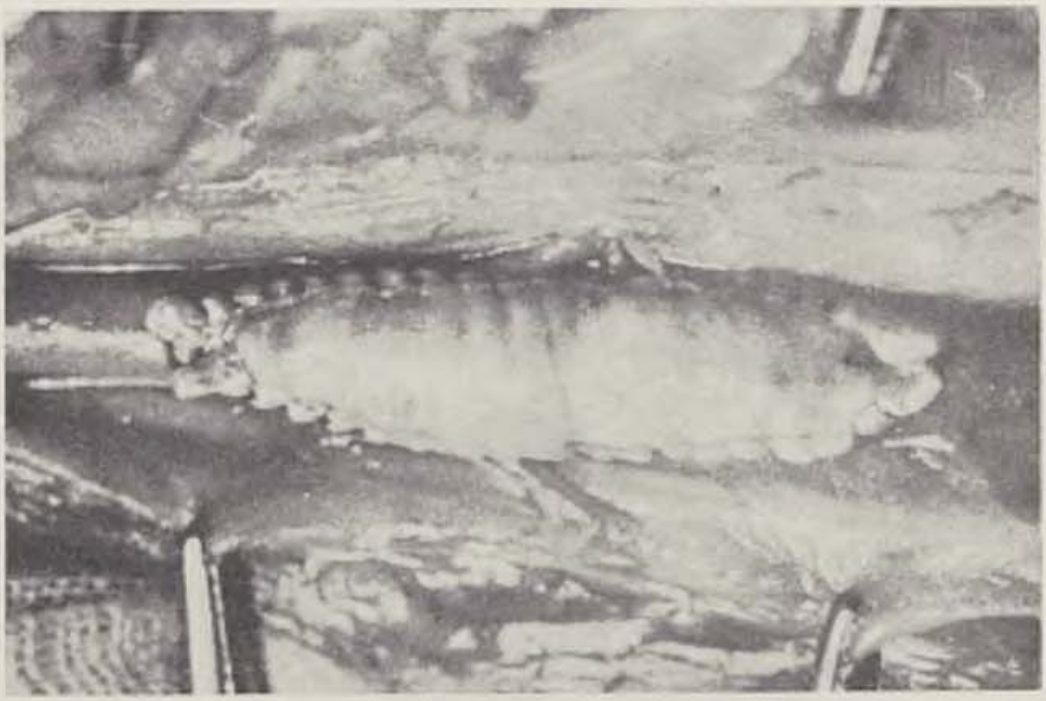

Figure 2.: The artery in the zone of lateral plasty, after renewal of blood flow

Figure 3.: An angiogramm of iliac arteries, 2 years and 3 months after the operation. The broadening of blood vessels, achieved by the plasty, has been maintained

The aim or our study was either to define possibilities of utilization of the autologous fascia for broadening of peripheral arteries, thus securing their permeability, either to follow morphological changes of grafts and arterial walls. The total of 99 operations was performed on dogs of 15—26 kg weight. The three series of experimental plasties were performed on femoral, carotic and iliac arteries.

It did not take long time to prepare the flap from the described part of the femoral fascia lata. Firstly, the layer of a lose connective tissue was removed from the inner surface of the fascial flap, i.e. from the surface turned to the muscles, and then two patches of 4×1.2 cm size were cut out (Fig. 1). An artery, which had been isolated from the blood flow, was split longitudinally in the length of 4 cm. On the contralateral vessel, a similar defect was formed, 4 cm long and 2—3 mm wide. The patch was fixed by two sutures to wedges of the wound on the vessel. A silk or "supramide" thread on an atraumatic needle was used for a turning out and winding around suture. If the flap was thin, then the fascia was duplicated on its external surface in the region of the suture. The plasty resulted in 1.5 to 2 times increased width of the vessel (Fig. 2). The layer of loose connective tissue was left on the external surface of the patch, as it increased, according to our opinion, a firmness of the graft and improved a tightness of the suture.

The results of the experiments were followed by means of an intravital angiography, macro- and microscopic examinations after various time periods ranging from the moment of operation to 2 years and 7 months. From the total of 99 arteries operated on, in 86 arteries the permeability was preserved, while no stenosis or aneurysma developed in the region of plasty. Thrombosis was found in 7 cases, bleeding occurred in 6 experiments — four times as a result of rupture along the suture and once due to loosening of the patch and suppuration. These complications took place during early period of time after

Table 2. Distribution of experiments, controls and complications in respect to groups of arteries

Group of arteries	Total number of experiments	Arterial thrombosis	Permeability of blood vessels	Bleeding			Angiography	Macroscopy	Microscopy
				loosening of a patch	rupture along suture	suppuration			
Femoral	53	1	48	1	2	1	26	53	35
Carotic	31	2	28	—	1	—	25	31	25
Iliac	14	4	9	—	1	—	11	14	9
Aorta	1	—	1	—	—	—	1	1	1
Total	99	7	86	1	4	1	63	99	70

the operation and were mainly caused by technical mistakes, mostly during the time of learning to the technique (Table 2).

It was shown by an angiographic control, that the plastic broadening of iliac arteries usually persisted (Fig. 3). A broadening of carotic arteries was preserved to a lesser degree. In respect to femoral arteries, as soon as 28—35 days after their broadening by means of a patch, their lumen became normal and the zone of plasty was almost indistinguishable in majority of cases (Fig. 4).

Figure 4.: An angiogramm of femoral arteries, 1 year and 9 months after the plasty. The lumen of vessels is equal along their length

The uniform macro- and microscopic changes were observed on blood vessels in the region of plasty after identical periods of time. Among 99 experiments, we did not find serious scar alterations of the operated region in any case. The firmness of the fascial flap became a little higher 2 years and 7 months after the plasty, than was the original value of the region of suture. The size of the graft almost did not change (Fig. 5). Histologic examination of 70 arteries was performed. During thirty minutes after renewal of blood flow, the inner surface of graft was covered by a thin parietal thrombus. On the 7th day after the operation, the parietal thrombus became 1—2 mm thick and thereafter thinned out. It was substituted by a layer of connective tissue 1½—2 months later, which was lined by endothelium in 35—55 days. Organization of the parietal thrombus was brough about by proliferation of connective tissue elements of the vascular wall, mainly of intima, and endothelization proceeded by proliferation of the arterial endothelium. As soon as a month after the operation, thin elastic fibres appeared in the newly formed connective tissue. Their number increased subsequently. Individual spots of

Table 3. Summary table of the operated on patients

Initials and age of patients	Characteristics and localization of a vascular affection	Stage of a disease	Size of a patch, cm	Periods of observations and of a plasty (permeability of a blood vessel)
1. I. M. P., 57 years old	Occlusion of common and superficial femoral artery	III	10.5×1.2	The extremity was preserved for 2 years and $2^1/_2$ months Thrombosis of the superficial femoral artery after $1^1/_2$ months
2. M. N. G., 45 years old	Aneurysma of common femoral artery, occlusion of superficial femoral artery	II—III	3.0×1.2	1 year and 3 months The blood vessel is permeable
3. Yu., T. M., 43 years old	Occlusion of femoral artery	II—III	6.0×0.8	1 year and 1 month The blood vessel is permeable
4. A. K. B. 43 years old	Occlusion of femoral artery	II—III	6.0×1.0	1 year The blood vessel is permeable
5. N. P. N., 51 years old	Stenosis of common femoral artery, occlusion of superficial femoral artery	II—III	3.0×1.0 and 5.0×1.2	9 months The blood vessel is permeable
6. I. G. T., 70 years old	Occlusion of femoral artery	III—IV	7.0×1.2	8 months The blood vessel is permeable
7. E. I. A., 67 years old	Occlusion of superficial femoral artery	II—III	8.0×1.0	6 months The blood vessel is permeable
8. V. F. S., 67 years old	Occlusion of external iliac artery	III	8.0×1.5	$4^1/_2$ months The blood vessel is permeable
9. F. A. K., 64 years old	Stenosis of common iliac artery	II—III	4.0×1.2	3 months The blood vessel is permeable
10. A. N. G., 58 years old	Occlusion of superficial femoral artery	II—III	10.1×1.2	3 months The blood vessel is permeable
11. E. V. V., 65 years old	Occlusion of superficial femoral artery	II	8.0×1.3	2 months The blood vessel is permeable
12. V. A. K., 56 years old	Occlusion of femoral artery	II	2.5×1.0	2 years The blood vessel is permeable
13. Yu. T. M., 44 years old	Occlusion of femoral artery	II—III	2.2×1.3	$2^1/_2$ months The blood vessel is permeable
14. V. I. Kh., 56 years old	Occlusion of femoral artery	II	4.0×1.2	1 year and 4 months The blood vessel is permeable

condensed basophilic ground substance appeared in depth of the newly formed fibrous connective tissue, which replaced the parietal thrombus, and in intima of the artery during the period of 3—5 months after the plasty. Later on, they became similar to a cartilage tissue. The number and volume of such spots did not increase and they were very rare in many experiments. Formation of an osseous tissue was not observed. The results of our experiments confirmed data of other authors, who did not find degenerative changes of aponeurotic and fascial autologous grafts after periods of time longer than a year (Fig. 6). The structure of fascia was maintained to the latest periods of observation. Only insignificant sclerotic changes in the region of suture were noticed. A great number of blood vessels developed in the layer of a loose connective

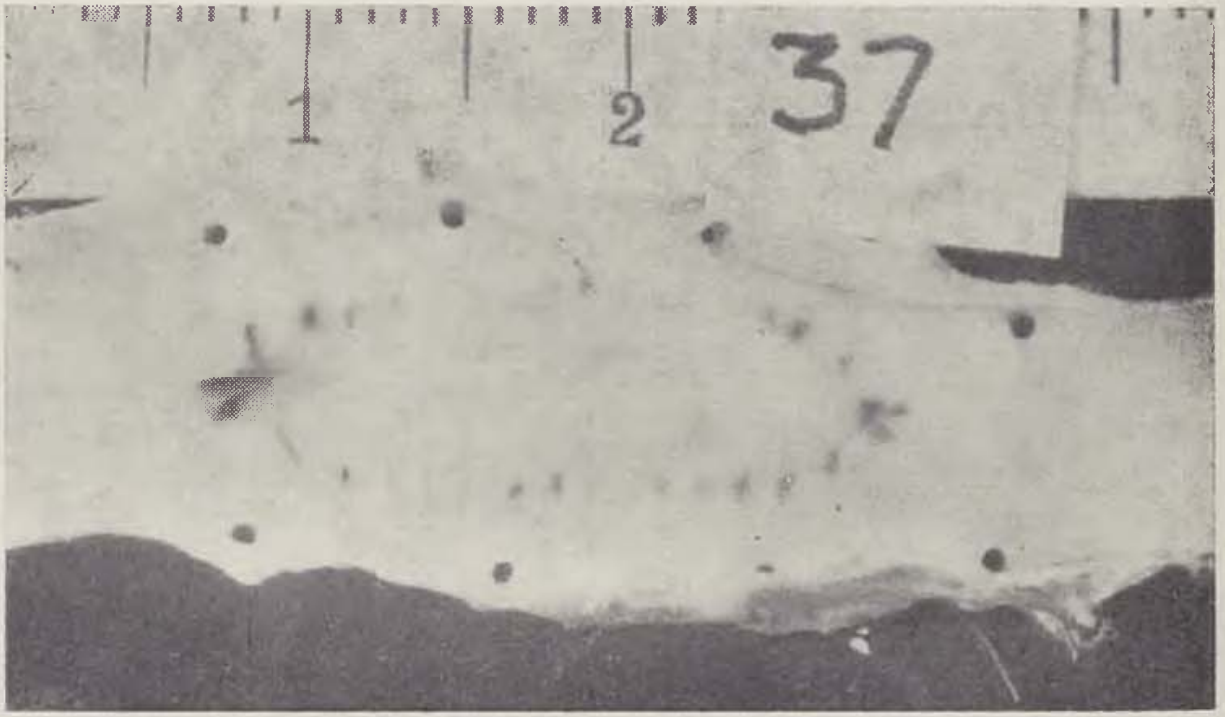

Figure 5.: Macrophotography of the arterial inner surface in the region of lateral plasty, 1 year and 7 months after the operation

tissue on the outer surface of the patch. This layer takes part in organization of necrotic parts in the region of suture and around threads used for a suture, and ensures sufficient blood supply of the fascial tissue.

Thus, the viability and structure of the autologous fascial graft sewn to the lateral arterial defect was maintained for 2 years and 7 months. It became adapted in the arterial bed quickly and without alterations, which could decrease firmness of the patch and lead to a rupture, aneurysmatic dilatation and scarification. The experimental results enabled utilization of the method in the clinical practice.

Until recently, the fascial plasty was performed by 14 patients suffering from obliterating vascular diseases (mainly atherosclerosis) of extremities. Their age was 43 to 70 years. The early and long-term results were recorded

(Table 3). The total of 11 intimothrombectomies, 2 intimectomies combined with removal of atherosclerotic plaques and a resection of an aneurysmatic dilatation were performed by these patients. All the operations were finished by lateral plasty of a 3—11 cm long and 1.0—1.3 cm wide graft, which was taken from fascia lata of the operated thigh. The permeability of the operated vessels was maintained by 10 patients up to the recent time, 7 of them have been working in their special fields.

By patient P., 57 years old, an intimothrombectomy from a common femoral artery and from opening of deep and superficial femoral arteries was performed and a 10.5 cm long patch was applied. The superficial femoral artery obliterated 9½ months after the operation, however, the blood flow through a deep femoral artery was continued. By patient G., 58 years old, an intimo-

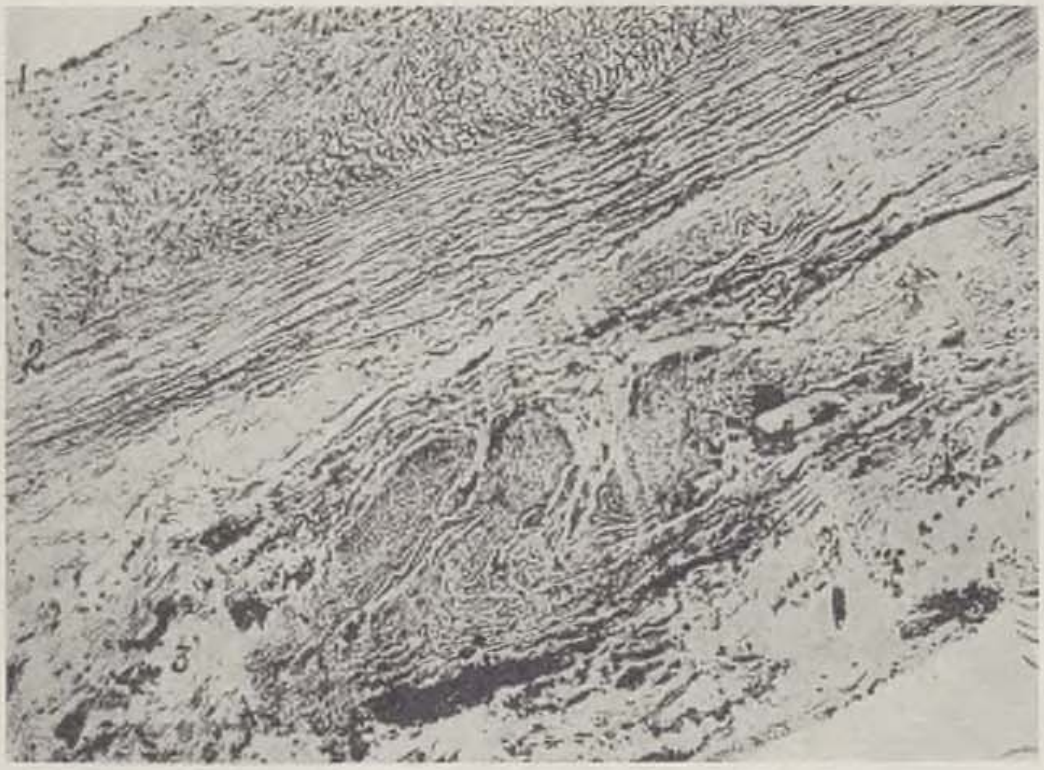

Figure 6.: Microphotography of layers of the graft, 1 year and 9 months after the plasty. 1 — endothelium, 2 — neointima, 3 — layers of the fascial graft

thrombectomy from a femoral artery near its entrance into a Hunter's canal was followed by a lateral plasty of the autologous fascia. Four months later, the artery also obliterated secondarily and a femoral-popliteal venous shunt had to be established. During the second operation, a severe stenosis of a femoral artery was observed, which was caused by an atherosclerotic plaque formed more proximally to the applied patch. It led, apparently, to thrombosis.

We share opinion of many surgeons (Potemkina 1967, Knyazev et al. 1971, Volkolakov et al. 1973, Poul and Bertelsen 1968 and others) on expediency of a segmental reconstruction aimed to renewal of blood flow through deep femoral artery, by diffuse affection of the main arteries. Thus, the patient M.,

43 years old. came to the clinic with sharply expressed pain syndrome during inactivity, which was localized in the left foot and in the lower third of crus. An occlusion of a common femoral artery was shown by angiography. During operation, an obliteration of the femoral and politeal arteries was found. An intimothrombectomy from the common femoral artery and from opening of the deep femoral artery was done and a lateral plasty by autologous fascia was per-

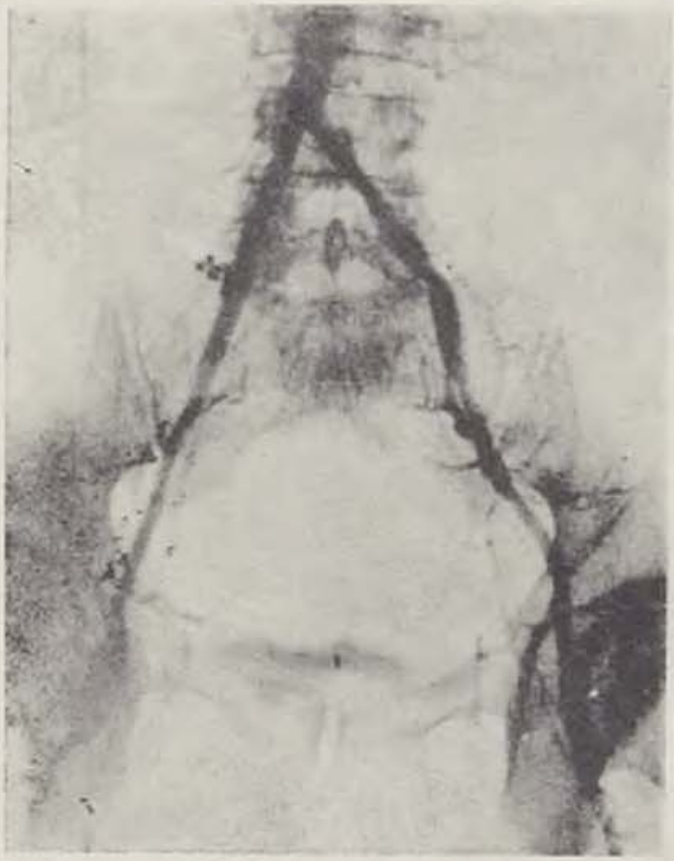

Figure 7.: An angiogramm of femoral artery. The permeability and broadening of the blood vessel achieved by application of a patch has been preserved for 7 months after the operation

formed. As shown on Fig. 7, the permeability and broadening of the vessel achieved by means of a patch were maintained for 7 months after the operation.

The clinical observations fully confirmed our experimental data. The autologous graft of femoral fascia lata could be fully recommended for lateral plasty of the peripheral arteries in both urgent and planned surgery of blood vessels.

M. T.

SUMMARY

A method of lateral plasty of peripheral arteries by means of a graft of autologous femoral fascia lata was worked out during 99 experiments on dogs. As long as 2 years and 7 months after the plasty, the angiographic and morphologic examinations were performed. The autologous fascial graft, which was freely transferred to a lateral defect on femoral, iliac and carotic arteries and aorta, preserved its firmness, elasticity, viability and did not undergo

degenerative changes. It adapted in the arterial bed without alterations, which could decrease firmness of a patch and lead to a rupture, aneurysm and severe scarification. The described method was used in clinical practice by 14 patients in the age ranging from 43 to 70 years, who suffered from obliterating vascular diseases of lower extremities. The early and long-term results were good. The total of 11 intimothrombectomies, 2 intimectomies combined with removal of atherosclerotic plaques and 1 resection of aneurysmatic dilatation were finished by an application of a 11 cm long and 1.3 cm wide patch consisting of an autologous fascia. The clinical observations confirmed our experimental data. The autologous graft of femoral fascia lata could be recommended for lateral plasty of the peripheral arteries by both urgent and planned surgery of blood vessels.

RÉSUMÉ

Plastie latérale libre à l'aide de fascia autologue

Kourbangaleyev, S. M., Krounychev, G. V.

A la base de 99 expériences faites sur les chiens, nous avons élaboré la méthode de la plastie des artères périphériques au moyen de fascia lata autologue du fémur. Les observations angiographiques et morphologiques étaient faites jusqu'au bout de 2 ans et 7 mois après la plastie. La greffe de fascia autologue qui était librement transplantée au défaut latéral de l'artère fémorale, iliaque, carotidienne et l'aorte tient sa solidité, élasticité, vitalité et ne subit pas des altérations dégénératives. Dans l'arbre artériel, elle s'adapte sans modifications qui pourraient atténuer la solidité de la pièce et causer une rupture ou une cicatrisation expressive. Cette méthode a été employée chez 14 patients en âge de 43 à 70 ans souffrant des maladies oblitérantes des vaisseaux sur les extrémités inférieures. Les résultats immédiats même que ceux de longue durée étaient bons. Ce sont au total 11 intimothromectomies, 2 intimectomies avec un enlèvement des plaques athérosclérotiques, 1 résection de la dilatation aneurismatique qui étaient terminées par une application d'une pièce de longueur de 11 cm et de largeur de 1,3 cm de fascia autologue. Les observations cliniques ont prouvé nos résultats expérimentaux et permettent de recommander la greffe autologue de fascia lata du fémur pour la plastie latérale des artères périphériques dans les opérations urgentes et planifiées.

ZUSAMMENFASSUNG

Freie Seitenplastik der peripheren Arterien mittels autologer Faszie

Kurbangalejew, S. M., Krunyschew, G. V.

Wir entwickelten eine Methode für die Seitenplastik der peripheren Arterien mit einem Transplantat aus autologer Oberschenkelfaszie auf Grund von 99 Versuchen an Hunden. Die angiographischen und morphologischen Untersuchungen unternehmen wir in einem Zeitraum von bis 2 Jahren und 7 Monaten nach der Plastik. Das Transplantat der autologen Faszie, das auf den Seitendefekt der femoralen, iliakalen und karotischen Arterie und Aorta frei übertragen wurde, behält seine Festigkeit, Lebensfähigkeit und Elastizität und es unterliegt keinen degenerativen Veränderungen. Im Arterienflussbett adaptiert es sich ohne Veränderungen, die die Festigkeit des Fleckstücks schwächen und zur Ruptur, Aneurysmen oder deutlichen Narbenbildung führen

könnten. Die Methode wurde klinisch bei 14 Patienten im Alter von 43—70 Jahren mit obliterierenden Gefasserkrankungen der unteren Gliedmassen angewandt. Die frühzeitigen und langzeitigen Ergebnisse waren gut. Eine Gesamtzahl von 11 Intimothromektomien, 2 Intimektomien mit Entfernung der atherosklerotischen Herde und 1 Resektion der aneurysmatischen Erweiterung wurde durch das Anlegen eines 11 cm langen und 1,3 breiten Fleckstücks aus autologer Faszie zum Ende geführt. Klinische Beobachtungen bestätigten unsere experimentellen Ergebnisse und erlauben das autologe Transplantat aus der Oberschenkelfaszie für die Plastik der peripheren Arterien bei dringlichen sowie geplanten Gefässoperationen zu empfehlen.

RESUMEN

Plástica lateral libre de arterias periferas mediante una fascia autóloga

Kurbangaleyev, S. M., Krunishev, G. V.

Plástica lateral libre de las arterías periferas por un trasplante de la fascia lata femoral autóloga a base de 99 experimentos en perros fue desarrollada. Observacíones angiográficas y morfológicas seguían hasta 2 años y 7 meses después de la plástica. El trasplante de la fascia autóloga que fue transpuesto libre al defecto lateral de la arteria femoral, iliaca y carótica y de la aorta mantiene firmez, elasticidad y vitalidad y no aparecen cambios degenerativos en él. En el lecho arterial se adapta sin cambios que podrían debilitar la firmez del parche y podrían conducir a una ruptura, un aneurisma y cicatrización pronunciada. El método mencionado fue usado en clínicas en 14 pacientes en la edad de 43—70 años con enfermedades vasculares obliterantes de las extremidades inferiores. Los resultados tempranos y de largo tiempo fueron buenos. En total 11 intimotrombectomias, 2 intimectomias con remoción de las láminas ateroscleróticas y una resección del ensanche aneurismático fueron terminadas por aplicación de un parche de la fascia autóloga del largo de 11 cm y del ancho de 1,3 cm. Observationes clínicas comprobaron nuestras resultados experimentales y permiten recommendar el trasplante autológo de la fascia lata femoral para la plástica lateral de las arterias periferas en intervenciones vasculares urgentes así como en las planeadas.

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NEW MODIFICATION OF Z-PLASTY FOR EPICANTHIC FOLD ELIMINATION

J. HRIVNÁKOVÁ

Epicanthi (Mongolian folds), covering the inner canthus, are a normal physiognomic characteristic of certain Oriental ethnic groups. In others, however, they may be present as signs of certains syndromes (dysmorphia orbitopalpebralis, Crouzon's disease, Down's syndrome, etc.). In such cases, the surgical removal of epicanthi may be highly desirable in order to improve the appearance of patients thus affected.

To serve this purpose, a number of methods have been developed, most of them designed essentially with a view to displacing the overlapping skin fold medialward, the simplest cases involving a rather disadvantageous simple excision of skin at the root of the nose, or else using all sorts of variations of Z-plasty, most of them double or four-fold. However, none of those procedures has proved to be fully satisfactory, either because of the incomplete removal of the epicanthic fold, because of frequent relapses or, in the case

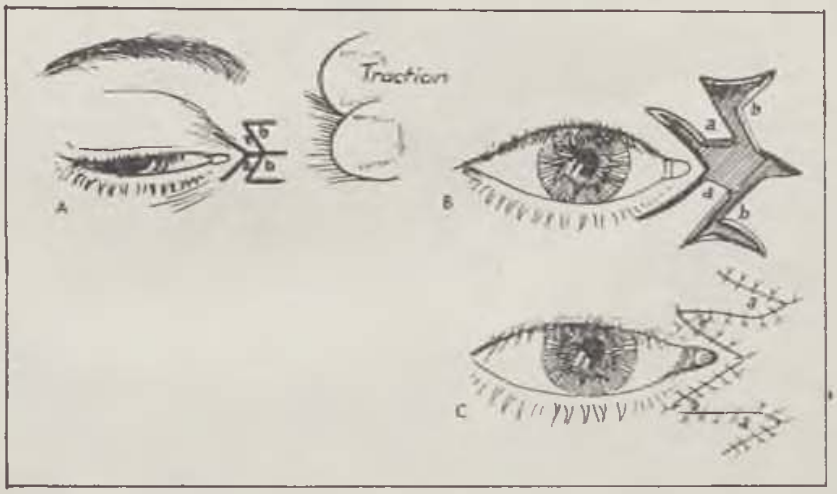

Fig 1: Example of complicated method for removal of epicanthi. Four-flap technique according to Rec. Plast. Surg. Converse, 1977, p. 941

of multiple Z-plasties, because of the dense scarring of the inner canthus area.

Our own unit has been achieving the best results by the simple exchange of wedge-shaped flaps, however, involving what we believe to be a highly significant modification: having made the incision along the edge of the skin fold we go on circumcising a lower, top-pedicled skin flap like in a simple Z-plasty with, however, a blunted top. Once the wedge-shaped flap has been separated from the base, we turn it to insert it into an incision made as

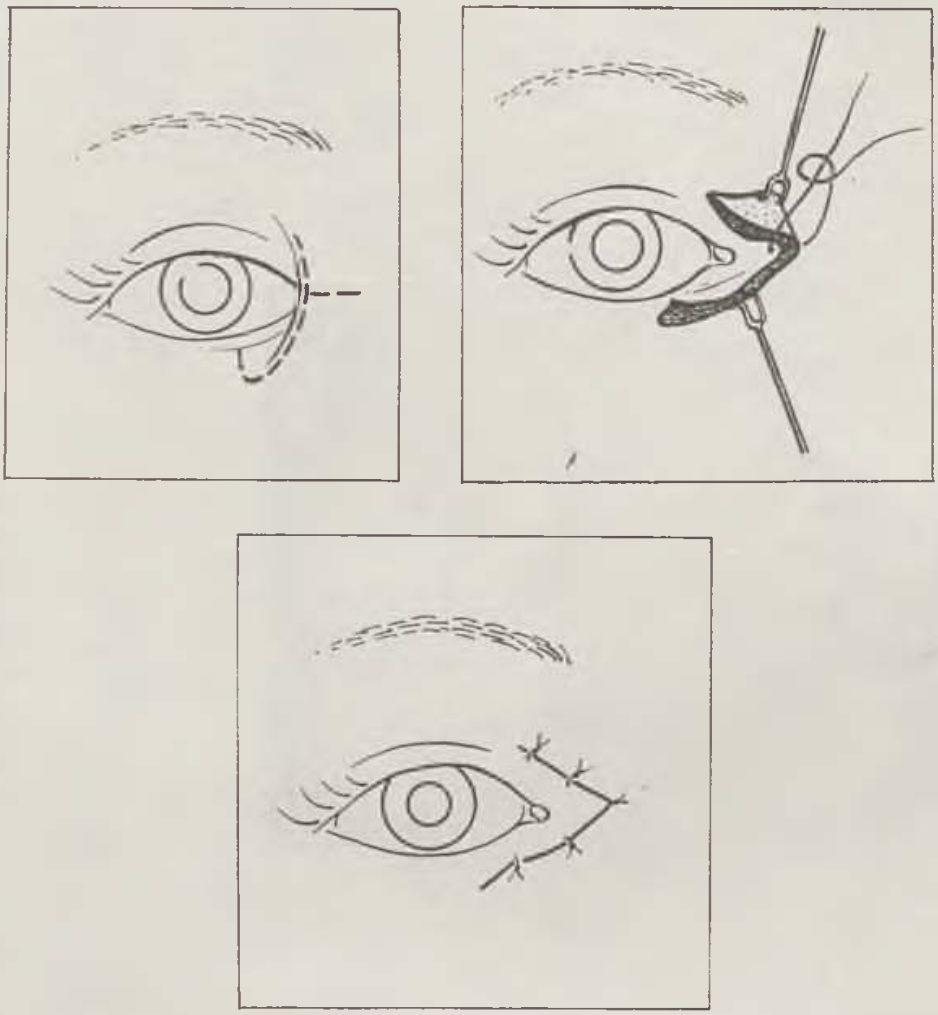

Fig. 2, 3, 4: New technique

a horizontal continuation of the palpebral fissure. This manoeuvre helps to expose the inner canthus. At the same time, however, a greater or lesser individual insertion of the flap medialward in the horizontal direction will control the degree of exposure. Minor portions of skin at the sides of the flap thus inserted can be removed by simple trimming.

The advantages of this method, which has now been used for several years — even in some types of scar epicanthus, include simplicity, speed of operation, and substantially reduced risk of relapes.

J. H.

Fig. 5, 6, 7: Patient L. P., clin. notes No. 105725, prior to surgery and on day 4 after operation after the removal of all but the edge stitches, thus giving a clearer idea of the incisions made and the flaps exchanged

Acknowledgement

My thanks are due to Dr. J. Moserová, CSc, a research worker of the Department of Plastic Surgery, for her drawings showing the operation.

SUMMARY

The report presents information on a technique for the removal of congenital and scar epicanthi introduced by the authoress at the Department of Plastic Surgery, Prague, and used for already three years with good cosmetic effect and without relapses.

The technique consists in simple Z-plasty modified as follows: a lower, top-pedicled wedge-shaped flap rounded at the top, instead of being interchanged with the lower flap, is inserted into a horizontal incision pointing in the direction of the median line of the nose.

RÉSUMÉ

Nouvelle modification de la Z-plastie destinée à supprimer les épicanthus

Hrivnáková, J.

L'article renseigne sur la façon de faire supprimer les épicanthus cicatrisés congénitaux. Celle-ci a été introduite à la clinique de chirurgie plastique de Prague et, à présent, elle est employée avec un bon effet cosmétique et sans récidives.

Le procédé consiste en une Z-plastie simple ainsi modifiée: le coin inférieur muni en haut de tiges ayant la pointe émoussée n'est pas échangé avec le coin inférieur, mais il est mis dans une incision horizontale se dirigeant vers la ligne médiane du nez.

ZUSAMMENFASSUNG

Neue Modifikation der Z-Plastik zur Aufhebung der Epikanthen

Hrivnáková, J.

Der Artikel informiert über das Verfahren zur Aufhebung angeborener und narbiger Epikanthen, das von der Autorin an der Klinik der plastischen Chirurgie in Prag eingeführt wurde und seit drei Jahren mit gutem kosmetischem Effekt und ohne Rezidiven benutzt wird.

Das Verfahren beruht auf einer einfachen Z-Plastik, die so modifiziert ist, dass der untere, oben stielartige Keil eine abgestumpfte Spitze hat und nicht gegen den unteren Keil ausgetauscht, sondern in einen horizontalen Einschnitt eingeschoben ist der zu der mittleren Nasenlinie führt.

RESUMEN

Modificación nueva de la plástica Z.

Hrivnáková, J.

La obra informa del procedimiento para quitar epicantos congénitos y cicatriciales el que fue iniciado por la autora en la clínica de la cirugía plástica en Praga y ha sido empleado durante estos tre años con un efecto cosmético bueno y sin recidivas.

El procedimiento consiste en la simple plástica Z modificada de tal modo que la cuña inferior pediculada en lo alto tiene la punta redondeada y no se la cambia con la cuña inferior, sino se la mete a la incisión horizontal que conduce a la línea central de la nariz.

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DERMOEPIDERMAL AND CORIUM TRANSPLANT: CHANGES IN BASIC COMPONENTS OF CONNECTIVE TISSUE DURING ALLOGRAFT HEALING IN GUINEA-PIGS

J. POSPÍŠILOVÁ, J. SAMOHÝL, V. KUBÁČEK, M. KAFKOVÁ

INTRODUCTION

The need to cover extensive skin surface defects resulting from a variety of causes urges the plastic surgeon to look for suitable skin replacements. However, as clinical practice continues to confirm, biological material is more suitable than artificial covering. While biological material can, under suitable conditions, develop into an integral part of the organism, foreign, man-made material can, at best, be reasonably tolerated. The latter can, to some advantage, be used for the temporary covering of minor defects prior to the autotransplantation proper, or for the provisional covering of defects developing in certain types of flap plastic operations (Curtis, 1972).

The greatest demand for good repair material occurs in large burns. As there is never enough skin tissue in such cases, the idea is prompted of multiplying the area of the piece of skin used by splitting it into more layers [Zellner, 1975 a), b)].

The problem of making use of split thickness corium grafts in surgery has been dealt with by a number of specialists. A general assessment of their significance was made by Kubáček (1962) and supplemented by a plastic surgeon's experience.

The aim of the present study was to employ biochemical methods with a view to following up changes in the basic components of skin tissue in the course of allograft taking in guinea-pigs. Comparisons were made between dermoepidermal and corium grafts and their effects on tissues adjacent to the skin defect.

MATERIAL AND METHODS

The experiments were made on male guinea-pigs (excluding albinos), average b. w. 584.5 ± 37.3 g, fed on ordinary diet with vitamin C added at the time of the experiment (100 mg s.c. 2× weekly). To obtain the allografts,

1 animal in each group had its back skin sliced off and split into the dermo-epidermal and corium grafts. Both grafts were divided into smaller portions, 3×3 cm in size, and kept in cold storage, moistened with saline solution. Meanwhile, animals of the experimental group had a defect of the same size made in the milddle of the back, by excision. The defect was covered with the prepared dermoepidermal or corium grafts freely sutured on by circumferential stitches. Tulle gras was applied together with compression bandage, which was left in place until the taking of specimens. Transplants were taken off the animals for biochemical assay simultaneously with specimens of adjacent tissue on days 3, 8, and 15 after application. All the above operations were performed while the animals were under ether narcosis. There were 5 to 6 animals in each experimental group. The specimens obtained were homogenized frozen on a MSE homogenizer (20,000 rpm) and subsequently processed, using routine methods described by Pospíšilová (1976).

a) Cell quantity was estimated according to the tissue contents of desoxyribonucleic acid (DNA). Gradual heat extraction made it possible to separate the proportion of low molecular DNA (70 ^{0}C).

b) Changes of substances in basic intercellular matter were assayed, following isolation, according to the contents of hexosamine and uronic acid as representatives of acid glucosaminoglucanes, or on the basis of the contents of sialic acid as a representative of glucoproteins.

c) The proportion of the main tissue protein, collagen, was assayed by means of hydroxyproline. Attention was also paid to the contents of acid solube collagen (ASC).

The results were processed by the usual statistical methods.

RESULTS

Fig. 1 is a graphic representation of cell reactions in the dermoepidermal and corium grafts through DNA estimation as well as adjacent tissue reaction to both grafts throughout the 15-day period of healing in. In the dermoepidermal graft (Fig. 1A), the proportion of cells remained nearly the same until the 15th day of healing in when it was seen rising. Low molecular DNK continued to be represented in equal proportions. The adjacent tissue began to respond to the graft by a maximum number of cells as early as 8 days after the operation, coinciding with a maximum proportion of low-molecular DNA. After that, adjacent tissue cell reaction began to abate. The corium graft (Fig. 1B), unlike the dermoepidermal ones, showed a large proportion of young cells (high proportion of soluble DNA); however, by day 15, the cell volume had begun to diminish, with the adjacent tissues responding through the number of cells to the corium graft almost indentically as tothe dermoepidermal transplant except on day 15 when the number of cells in the former remained higher.

Fig. 2 shows changes in the saccharide components of the intercellular connective tissue of the dermoepidermal or corium grafts and their surroundings until day 15 of healing. If the two types of grafts are compared, there are no great deviations as to the contents of the basic glucosamino-

glucane components in the course of their development, the only exception being hexosamine in the corium graft (Fig. 2B) which reached its top value at the same time (day 8) when it was proved to contain a high quantity of active fibroblasts (Fig. 1B). Also of interest, however, is the course of curves showing the concentration of sialic acid as a representative of glycoproteins. High sialic acid values were recorded in the dermoepidermal graft (Fig. 2A) on day 15. In the adjacent tissue the values were even higher at the same time interval. The course of sialic acid contents in the split skin corium grafts showed no conspicuous increase, though the curve did rise on day 15.

The initial hydroxyproline content value proved to be much higher in the corium graft (Fig. 3B) than in the dermoepidermal transplant. However, the

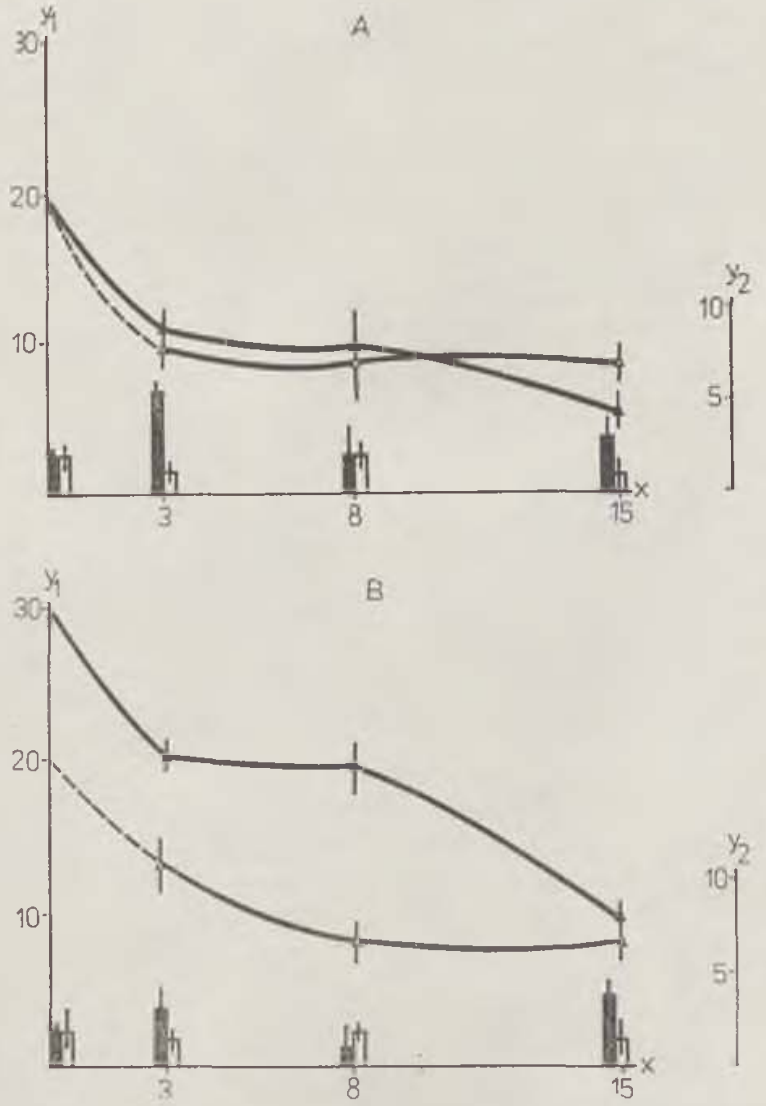

Fig. 1. Average values (± S.E.) of total DNA contents in the graft (▲) and in the adjacent tissue (△) in μg/mg m.v. and the percentile proportion of low molecular DNA (■ □) are plotted on axis y. Axis x indicates graft age (in days)

A = dermoepidermal graft, B = corium graft

contents in both grafts kept decreasing throughout the period of observation. The decrease was less prominent in the dermoepidermal transplant (Fig 3A) although it was relatively equal. The adjacent tissue showed an almost identical time course of the curve of hydroxyproline contents in both grafts. The proportion of acid soluble collagen (ASC) was seen rising whenever the total amount of collagen (hydroxyproline) dropped.

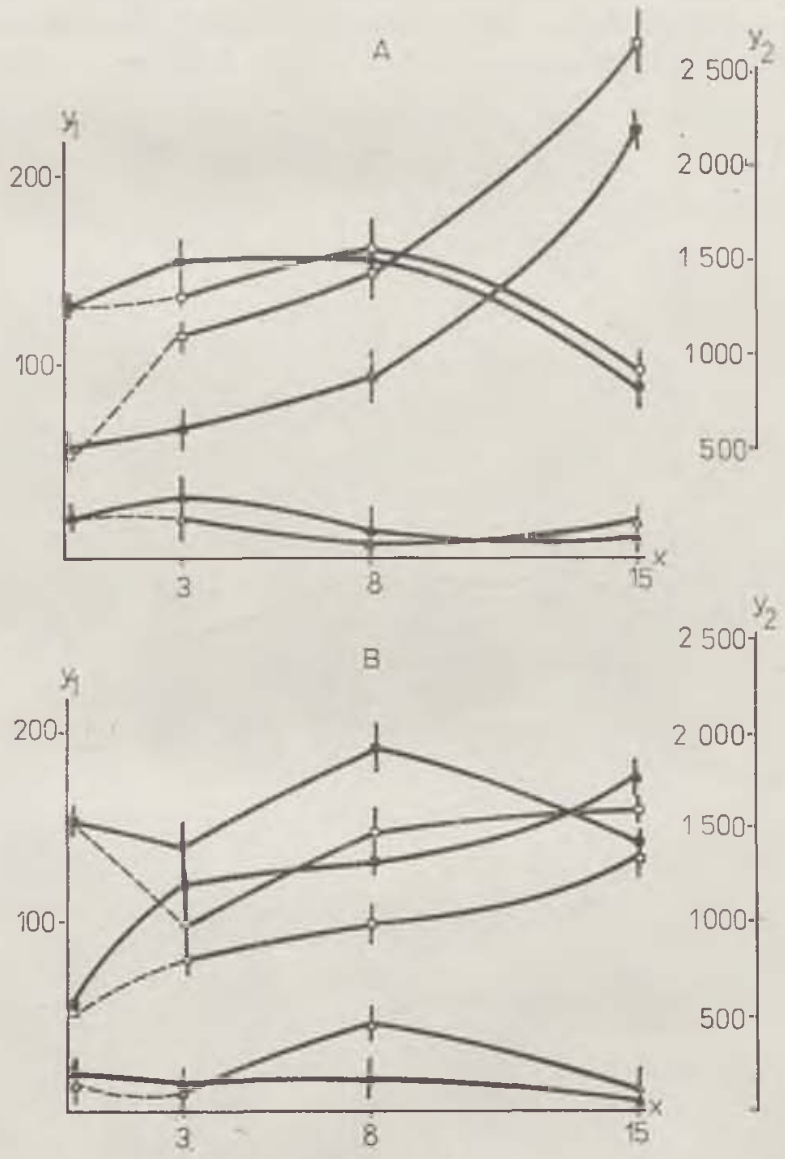

Fig. 2. Average values (± S.E.) of uronic acid (▲) and hexosamine (●) in the graft and in the adjacent tissue (△ ○) plotted in μg/g m.v. on axis y_1, the content of sialic acid (■ □) in μg/g m.v. on axis y_2. Graft age is plotted on axis x (in days)
A = dermoepidermal graft, B = corium graft

DISCUSSION

Some new knowledge has been derived from basic biochemical observations of the changes occurring in the dermoepidermal or corium grafts in the course of their taking and also from changes in adjacent tissue response.

In the first place, there is a noteworthy difference in the cell contents of the two transplants. As for the dermoepidermal graft, the course of the curve representing cell increment is very much like that in wound healing observed on models based on the experimental granuloma method (Peacock, 1973). Only the individual resulting values are different throughout the course of healing and delayed. These changes can easily be attributed to the composition

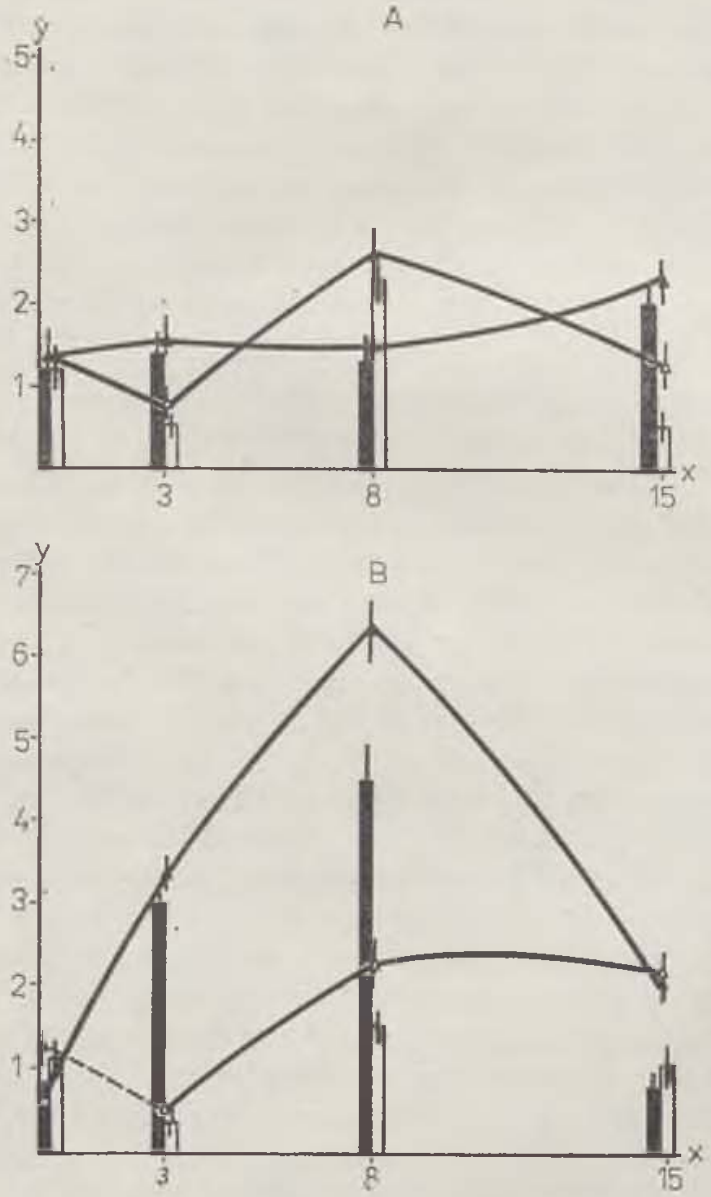

Fig. 3. Average contents (± S.E.) of total hydroxyproline (▲△) in μg/mg m.v. — axis y_1 and its acid-soluble fraction (■□) in per cent — axis y_2 given in their dependence on graft age — axis x (in days). Solid symbols stand for graft values, empty ones for the adjacent tissue

A = dermoepidermal graft, B = corium graft

of the dermoepidermal graft, which is considerably compact and constitutes a temporary block for cell division. Given rapid revascularization, this particular circumstance need not be any obstacle for graft taking, provided the transplant is very thin. A corium graft is made of much less compact tissue which does not act as quite so great an obstacle to invading and dividing cells as in the skin transplant. This is evidenced by our mesaurements showing high contents in the corium graft on day 8 after transplantation. These were obviously young cells in view of the proportion of low molecular DNA. The corium graft then enjoyed an advantage in comparison with the skin transplant because of the large proportion of active cells. However, an opposite, extreme situation may also develop with the high number of newly developed cells deprived of an adequate supply of nutrients due to delayed tissue revascularization. In such a case the cells would die away without being able to build up substances necessary for healing, i.e. new collagen, in particular, or to catabolyze waste and damaged material alien to the body (denaturated tissue proteins). The adjacent tissue cell reaction is not much different in either of the two grafts so that the degree of surrounding tissue irritation appears to be the same in either case.

The active cells in the transplants will then primarly give rise to intercellular matrix, the proportion of which was estimated by means of hexosamine and uronic acid. In the dermoepidermal grafts, the course of the curve indicating the contents of the two substances was again the same as in experimental wound healing. In the corium graft, a high proportion of hexosamine in particular can serve as evidence of synthetic cell activity at a time when the quantity of these cells in the tissue is the highest. Measuring the sialic acid contents provides information on the proportion of glycoproteins. In the tissue under investigation, the glycoproteins can be expected to give rise to α^1-globulins and immunoglobulins supplied to the tissue areas through the blood stream. α^1-globulins, in particular, are known to be on the increase if there is a rapidly growing tissue in the body (= inflammatory or tumorous local reaction — Musil, 1975). The impulse to their increase in the circulation is given from the site of lesioned tissue integrity via a highly involved neurohormonal reaction (Koj, Subin, 1974). Increased quantities of immunoglobulins appear to be due to a reaction to damaged or heterogenous cells or tissues which it is necessary to eliminate from the organism. Our experiments showed that a more prominent defence reaction was caused by the skin graft, in which the sialic acid content was seen rising until day 15. The corium transplant reacted in a more balanced way in keeping with clinical experience. In either case, the proportion of these substances (glycoproteins) in the surrounding tissues is somewhat higher, or equal, which is only natural as glycoproteins are not built up in the grafts themselves but are carried there by way of the blood stream. Their site of origin is in the hepatocytes (Musil, 1975).

Collagen in the grafts and in the surroundings undergoes a great deal of reconstruction. Throughout the 15 days of observation, the curve indicating the contents of this protein shows a downward trend. Its decrease is again more

pronounced in the corium graft because the initial level of collagen is higher in the corium. In this part of the experiment, there are considerable differences between graft taking and wound healing. It appears that in the graft the body must first get rid of the old protein and gradually replaced it by newly built protein. In a wound there is practically no old collagen, or only a minute quantity of it, so that anabolic processes, i.e. the synthesis of new collagen, can follow immediately. It is for this reason that in wounds the process of healing is made shorter by just that difference in time. The curves produced by our experiments cannot be regarded as merely the curves of collagen catabolism. The are, in any case, also the products of anabolic process in the tissues concerned. Catabolic processes, however, predominate in grafts, proof of which is the inrease in the amount of acid soluble collagen always accompanying any drop in total collagen levels. In view of the methodical approach chosen, little if any attention was paid in the present paper to newly built collagen. A study of collagen metabolism would necessitate the incorporation of specific radionuclides, a subject of our next study.

J. H.

SUMMARY

Basic components of connective tissue respond differently in the course of dermoepidermal or corium allograft healing.

Dermoepidermal graft taking is similar in nature to wound healing with, however, all stages of the healing process delayed as opposed to the latter. The time lag is best discernible during the stage of collagen synthesis as in transplants synthesis is preceded by collagen catabolism. The catabolized collagen can only then by replaced by newly synthetized collagen.

In corium graft healing, the initial stage of the healing process is at an advantage. The invasion of dividing cells into the graft is made eaiser by their temporary preponderance in the tissue. The synthesis of basic intercellular tissue of non-protein character, effected by the cells present, takes place earlier. However, as the corium transplant contains more collagen than the skin graft, the catabolism of old collagen is prolonged.

The adjacent tissue responds to either transplant in much the same way, except for the higher glycoprotein supply in the dermoepidermal graft where glycoproteins are indicative of more pronounced inflammatory or defence reactions.

RÉSUMÉ

Greffes dermoépidermales et greffes de chorion: modifications des éléments fondamentaux du tissu conjonctif pendant la prise d'une allogreffe chez les cobayes

Pospíšilová J., Samohýl J., Kubáček V., Kafková M.

Les éléments fondamentaux du tissu conjonctif réagissent d'une manière différente pendant la prise d'une allogreffe dermoépidermale ou celle de chorion.

La prise de la greffe dermoépidermale est d'un caractére analogue à la cicatrisation d'une plaie. Cependant tous les stades de la prise sont en rétard en comparaison avec la cicatrisation d'une plaie. C'est dans le stade de la synthèse du collagène, où la différence du temps est la puls rémarquable, parce que dans le cas d'une greffe, la synthèse se réalise après la réduction du collagène présent dans la greffe. Celui-ci ne peut être substitué que par le collagène nouveau-créé par la synthèse.

Dans la prise de la greffe de chorion c'est le premier stade qui est plus favorable. La pénétration des cellules se divisant dans la greffe est plus facile et à cause de ca, passagèrement, il y en a plus dans le tissu. La synthèse du tissu intercellulaire fodamental qui n'a pas le caractère albumineux faite par les cellules présentes se réalise plus tôt. Mais la greffe de chorion contient plus de collagène que la greffe cutanée ce qui prolonge les phases de la réduction du collagène originaire.

Le tissu voisin réagit à tous deux greffes également, excepté que, dans le cas de la greffe dermoépidermale, la quantité de glycoprotéines augmente. Celles-ci y signalisent une plus grande réaction inflammatoire ou défensive.

ZUSAMMENFASSUNG

Dermoepiderm- und Koriumtransplantat: Veränderungen der grundlegenden Bindegewebskomponenten während der Anheilung des Allotransplantates bei Meerschweinchen

Pospíšilová J., Samohýl J., Kubáček V., Kafková M.

Die grundlegenden Komponenten des Bindegewebes reagieren während der Anheilung des Dermoepiderm- oder Koriumallotransplantates in unterschiedlicher Weise.

Die Anheilung des Dermoepidermtransplantates hat einen ähnlichen Charakter wie die Heilung der Wunde. Alle Stadien der Heilung sind jedoch im Vergleich zu der Heilung der Wunde verzögert. Am stärksten ersichtlich ist diese zeitliche Verschiebung im Stadium der Kollagensynthese, da bei dem Transplantat der Synthese ein Abbau des im Transplantat vorhandenen Kollagens vorangeht, das erst durch das neusynthetisierte Kollagen ersetzt werden kann.

Bei der Anheilung des Koriumtransplantates wird das erste Stadium der Heilung begünstigt. Das Eindringen der sich teilenden Zellen in das Transplantat ist leichter, deshalb ist ihre Zahl im Gewebe vorübergehend höher. Die Synthese des grundlegenden interzellulären Gewebs nichteiweissartigen Charakters durch vorhandene Zellen tritt ein früher. Das Koriumtransplantat enthält jedoch mehr Kollagen als das Hauttransplantat, wodurch die Abbauphase des alten Kollagens verlängert wird.

Das umliegende Gewebe reagiert auf beide Transplantate in gleicher Weise, mit Ausnahme der höheren Zufuhr der Glykoproteine, wo diese eine intensivere Entzündungs- oder Abwehrreaktion signalisieren.

RESUMEN

Trasplante dermoepidermal y de corion: cambios de los componentes fundamentales del tejido conectivo durante la adhesión del alotrasplante en el cobayo

Pospíšilová J., Samohýl J., Kubáček V., Kafková M.

Los componentes fundamentales del tejido conectivo reaccionan diferentemente en el transcurso de la adhesión del transplante dermoepidermal o del alotransplante de corion.

La adhesión del transplante dermoepidermal tiene carácter similar como la cicatrización de una herida. Todos los estados de la cicatrización son, sin embargo, atrasados en tiempo en comparación con la cicatrización de la herida. Esta diferencia en tiempo es más pronunciada en el estadio de la síntesis del colágeno, porque en el trasplante antecede la síntesis de le disociación del colágeno presente en el trasplante, el que sólo después puede ser reemplazado por el colágeno neuvamente sintetizado.

Durante la adhesión del traspalente de corin lleva ventaja el primer estadio de la adhesión. La penetración de las células a divisíon al trasplante es más fácil, por eso en el interín hay mayor cantidad de las mismas en el tejido. La síntesis principal del tejido intercelular del carácter no albuminoso por células presentes ocurre más temprano. Pero el transplante de corion contiene más colágeno que el transplante cutáneo, por lo que se prolonga la fase de la disociacion del colágeno primario.

El tejido circunvecino reacciona a los dos trasplantes igualmente con excepción de abastacimiento mayor de glicoproteínas en el trasplante dermoepidermal, donde estas signalizan una reacción mayor de inflamación o de defensa.

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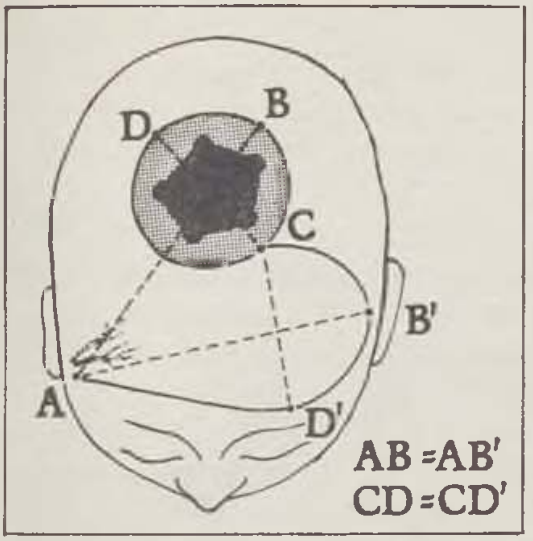
SURGICAL TREATMENT OF ADVANCED TUMOURS OF SOFT CRANIAL COVERS

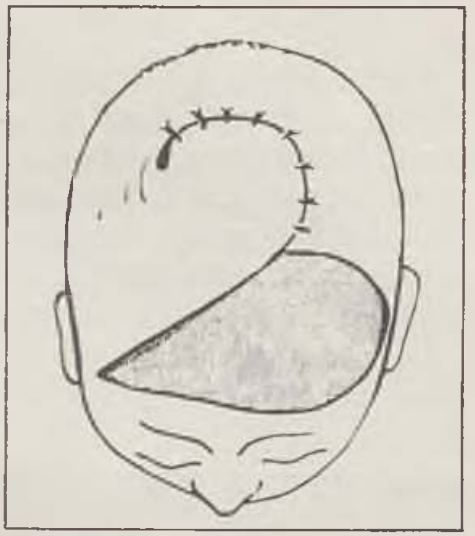
J. RUS, P. KAČER

Skin tumours, with the possible exception of malignant melanoma, are not very malignant as they are visible from the very beginning, thus making early diagnosis possible. Unfortunately, even in countries with good medical services, presentation is sometimes delayed until the cancer has reached a considerably advanced stage.

The histology of these tumours involves different forms of basalioma and spinocellular carcinoma or mixtures of both. The patient's prognosis cannot be defined exactly on the basis of the histological picture alone. This is because a non-metastasizing basalioma in its invasive form may sometimes be responsible for insidious continual tumours lymphangitis and thus prove to present a problem far worse than a potentially metastasizing prickle-cell carcinoma. The latter still offers the chance of saving the patient by removing the nodes already invaded, should such regional involvement occur, unless, of course, distant metastases have already developed.

Important factors in patients with these tumours include advanced age and generally deteriorated condition with arteriosclerosis combined with possible dementia often causing more difficulty than the actual condition of the cardiopulmonary system. Surgical operation of such tumours, though a major one, will never immobilize the patient to the extent encountered in abdominal operations and has no effect on pulmonary ventilation being reduced by algic mechanisms. Mobilization in these old patients is early and well feasible. In contrast, advanced arteriosclerotic dementia is a contraindication for radical surgery as the case of one of our patients showed. Also another patient, an old woman, made us worried if she were able to survive not the operation but hospitalization. Adaptability in these arteriosclerotic patients is, indeed, minimal. For more details, see case reports.





Drawings: 1. Prior to operation, 2. After operation

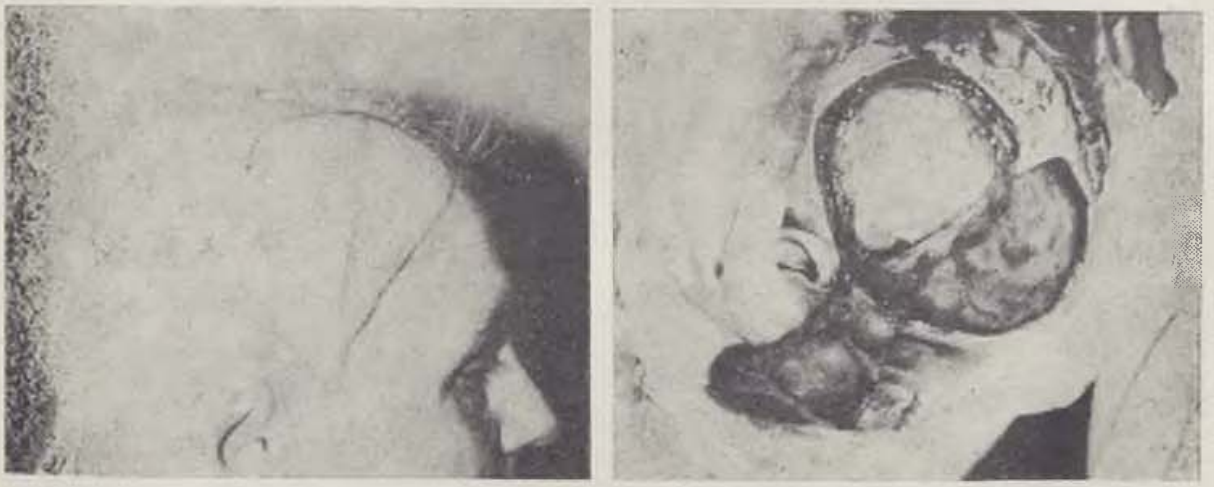


Fig. A. Prior to operation, B. During operation

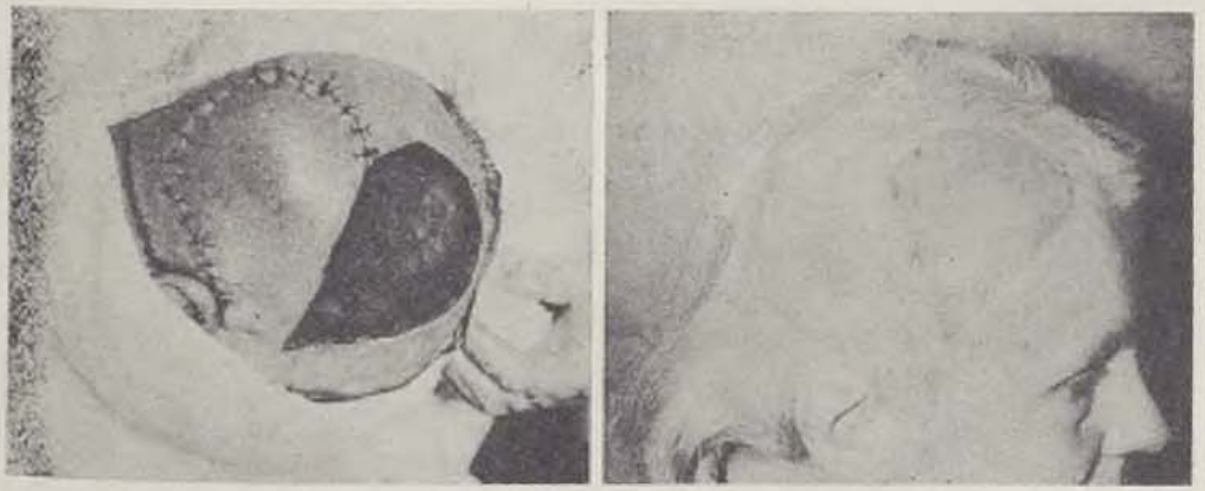


Fig. C. After operation, D. After healing

It is one of the aims of the present paper to show the possibilities and certain basic techniques of radical surgery in advanced cancers of this type. Since, as our experience shows, the decisive factors for an emergency surgical operation and for the patient's prognosis are neither the size of tumour nor its histology within the predetermined range (basalioma and spinocellular carcinoma) but whether on not the tumour is freely mobile to the base, we recommend to classify the extent and type of operation in these advanced cancers so as to distinguish between tumours perfectly mobile to the base and tumours entirely or partially fixed to the base.

Fig. 1 a. Patient, a woman of 65. Relapse of basalioma partially convered by previous rotation flap in orbital wall. — Fig. 1 b. Relapse in bone after removal of soft tissues

Fig. 1 c. State after removal of part of the frontal bone, upper orbital wall, frontal and ethmoidal sinuses. — Fig. 1 d. Rotation flap of the face and retroauricular region


Fig. 1 e. Defect closure using two more cranial flaps. — Fig. 1 f. State after healing

Fig. 1 g. Patient with epithesis. Patient surviving for 5 years with no signs of relapse. Presence of tumour in the bone proved by histology


Fig. 2 a. Patient, a woman of 52. Ulcerated fixed basalioma in the middle of the forehead. — Fig. 2 b. Area of cranial bone removal

1. Tumours freelly mobile to the base.

Total excision, including the periosteum, is indicated regardless the size of the tumour. This should be made 1—2 cm from the edge of the tumour perfectly illuminated by operating lamp. Closure of the defect depends on

Fig. 2 c. 2 weeks after operation. — Fig. 2 d. State after healing

Fig. 2 e. X-ray of cranial defect. Surviving for 3 years; no relapse, no proof of tumour in the bone

the size and shape but also on the nature of the surrounding soft tissues. Local sliding according to Limberg will seldom be sufficient in most cases, a rotation flap will be necessary and a graft to cover the secondary defect. (See secondary tumour in patient No. 9.) However, there were only isolated cases of relapse in this type of tumours.

2. Tumours fixed to the base or not entirely freely mobile.

The procedure in this type of tumours is the same as if the base were invaded. This is difficult to tell macroscopically during the operation while there is no possibility of trying a simultaneous histological investigation of resected part of the bone. Nevertheless, an operation of this kind should not be carried out in tumours other than those corresponding to the previously listed histological types. We had a bad experience in a tumour of a different histology.

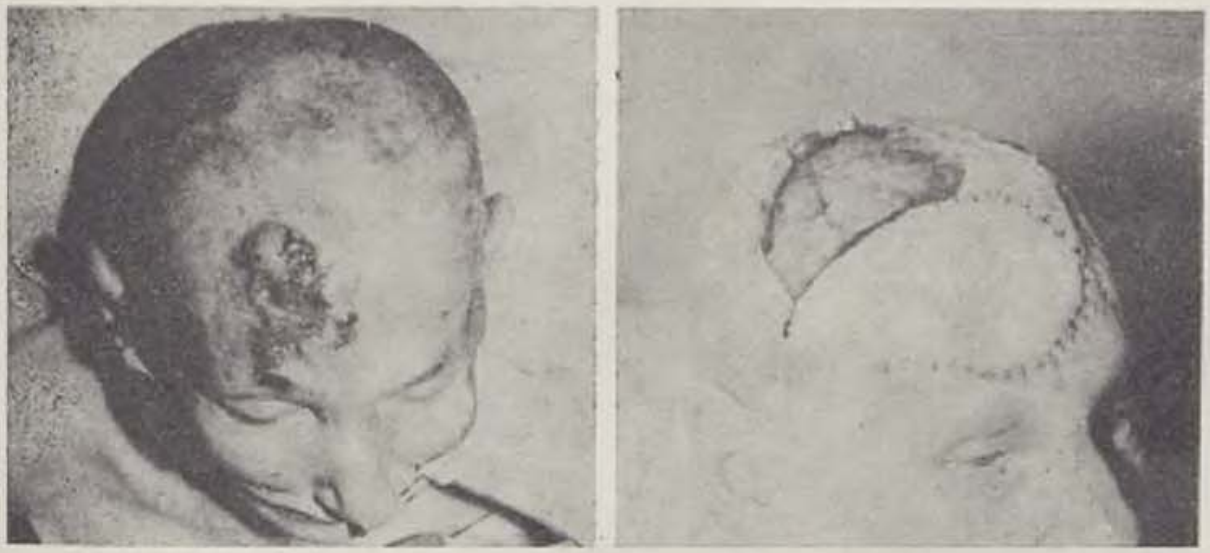


Fig. 3 a. Patient, 80 years old, considerably arteriosclerotic. Ulcerated basaloma of the forehead fixed to the base. — Fig. 3 b. State after soft tissue excision at the base, and rotation flap covering

Fig. 3 c. After healing. Patient surviving for 3 years after operation with no signs of relapse. Tumour in the bone demonstrated by histology

Fig. 4 a. Patient, a man of 84, with major arteriosclerotic dementia. Ulcerated basalioma on the left side of the forehead. — Fig. 4 b. Bone change under the tumour

Fig. 4 c. Cranial defect after operation. — Fig. 4 d. Rotation flap to cover the defect

Fig. 4 e. X-ray of bone defect. Patient died on 8th day after operation due to pulmonary embolism and generally deteriorated condition. There was no proof of tumour in the bone

Fig. 5 a. Patient, a man of 53, with spinocellular carcinoma at the site of the vortex, fixed to the base. — Fig. 5 b. Soft tissue excision

Fig. 5 c. Defect after resection and part of the flap lifted. — Fig. 5 d. State after dermoepidermal graft application with the patient in bed, one day after operation

Fig. 5 e. State after healing. Patient surviving for more than 2 years after operation with no signs of relapse or metastasis. There was no evidence of tumour in the bone

Each patient should have a general examination, X-ray of the lungs, internal preoperative investigation, X-ray of the skull according to localization, and, if necessary, X-ray of the orbits, paranasal sinuses, or also tomography.

Depending on the localization, the operation should be consulted by a neurosurgeon, an ENT specialist, or an ophthalmologist. In case some of their respective areas are involved, the incision within the framework of radicality is determined by the specialists concerned; surgical operation on the cranium itself is planned by the surgeon himself. All those concerned must proceed from the assumption that the bone will have to be removed to about the extent

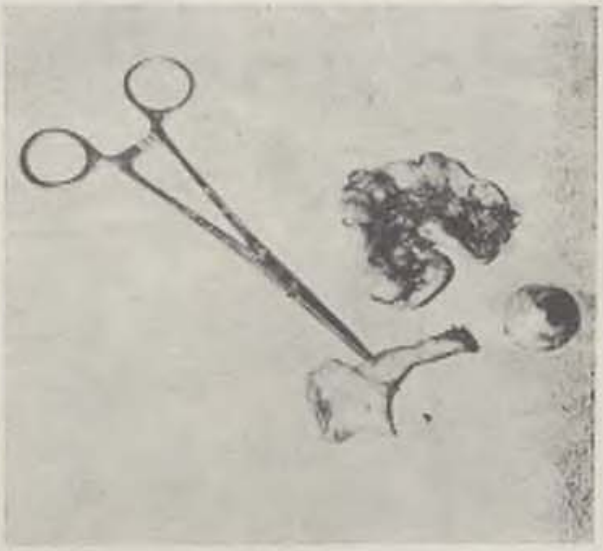


Fig. 6 a. Patient, a woman of 78, highly arteriosclerotic. Basocellular carcinoma fixed to the bone in the temporal and right upper eyelid region. — Fig. 6 b. Tumour removed, the bulb and part of the zygomatic arch and bone

Fig. 6 c. Resulting defect. — Fig. 6 d. State after operation

of the tumour, or about 1 cm more, so that the incision in the soft tissues must be made at least 2 cm away from the circumference of the tumour. The incision is made as deep as the periosteum which, too, should be incised within the exent concerned and all the soft tissues complete with the tumour removed. Periosteum adhering to the bone underneath the tumour gives rise to some suspicion, though it may prove to be no more than a reaction to long-term

Fig. 6e. State after healing and after minor out-patient correction for skin wrinkling above the nose. Patient was released on 8th day after surgery, her general state of health deteriorated, but improved at home. Now, surviving for over 2 years with no of relapse. The bone was tumour-invaded

Fig. 7 a. Patient, a woman of 60. Histologically hardly definable malignant mesenchymal tumour above the right eye. — Fig. 7 b. Relapse in rotation flap after operation without bone removal because of the histological character of the tumour

mechanical irritation or lasting infection. Then follows the removal of the underlying bone, as already indicated, about 1—2 cm smaller in size than that encompassed by the soft tissue incision. The cranial bone is removed in its full thickness reaching as far as the dura mater. Depending on localization, the frontal or, if need be, ethmoidal cavities are removed at the same time. Once bleeding has been stopped, the first — destructive phase of the operation is finished.

In other words, a sufficiently wide and deep radical incision, regardless of possible difficulties involved in covering the defect, is an essential condition of success.

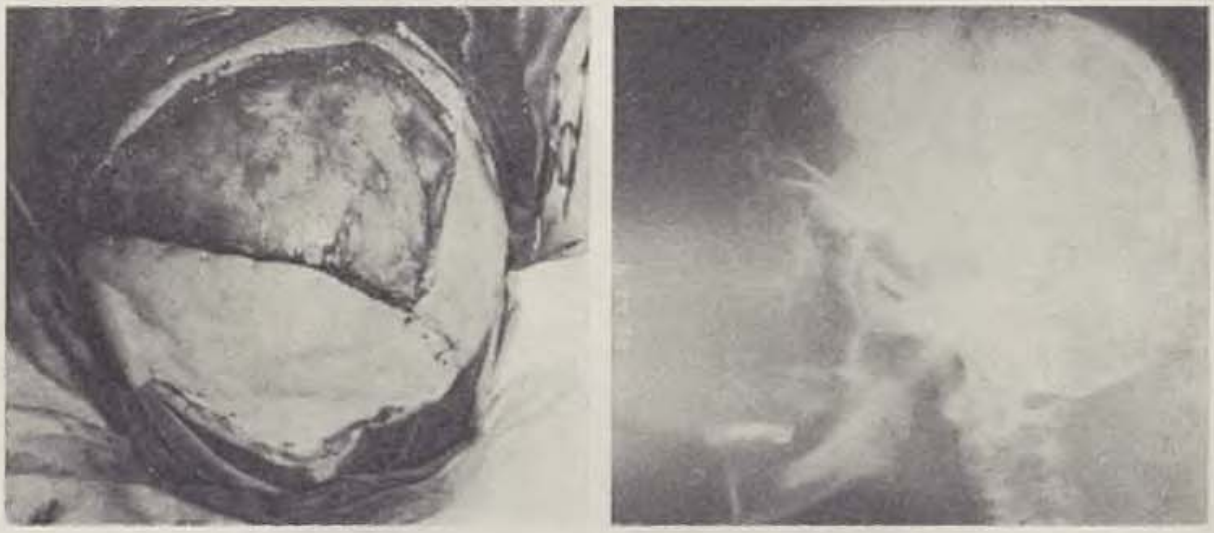


Fig. 7 c. In the absence of signs of other than local progression, a new operation was performed removing the full thickness of underlying bone. A new rotation flat was used. — Fig. 7 d. Resulting bone defect

Fig. 7 e. New local (!) relapse in flap. Following death due to general cachexia with no tumour found elsewhere. Removed bone was infiltrated with tumour. Postmortem showed the local metastasis just beginning to invade the frontal lobe of the brain. (Note: Radiologists rejected the idea of local therapy for their own reasons)

In the subsequent — reconstructive — phase of the operation, one or two direct rotation flaps, sized according to need, proved to be adequate in covering the defects in all our cases. There was no need for distant flap transfers. The exploitation of local flaps in this area makes for a generally satisfactory blood supply to the soft cranial covers and, in most flaps, for the use of some of the larger vessels to ensure good supply to the flap, thus permitting maximum narrowing of the pedicle and, consequently, greater range and mobility of the flap. There is no need to mark the planned reconstruction prior to surgery; instead, just a basic idea is formed beforehand. Once the destructive phase is over, a rotation flap, exactly the size and shape of the defect, is prepared. To ensure success, a sufficiently broad pedicle is need, or, failing that, a narrow

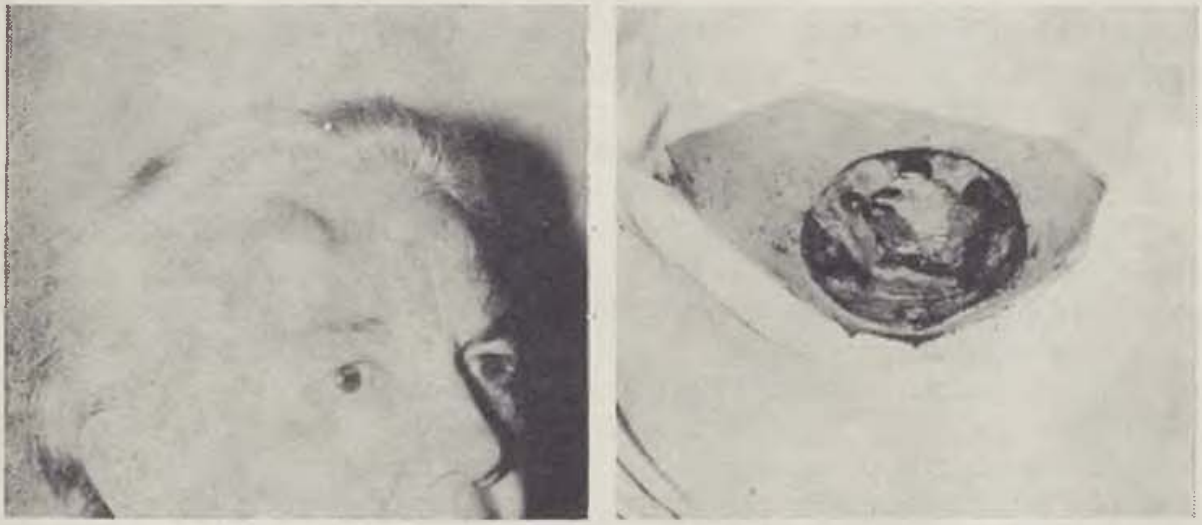


Fig. 8 a. Patient, a woman of 71. Local relapse of spinocellular carcinoma fixed to the base, after minor resection and suture. — Fig. 8 b. State after soft tissue and bone removal at the base

Fig. 8 c. Removed parts. — Fig. 8 d. Patient released, healed, 2 weeks after operation. Surviving a year with no signs of relapse or metastasis. Histologically, bone remained unaffected by cancer

pedicle with ample vascular supply. Another rule to observe is to ensure that the distance from the edge of the flap cut out at the farther end of the pedicle to the tip of the defect is the same as that between the same point and the tip of the rotation flap. Also the width and the basic shape of the flap must match the width and the shape of the defect in soft tissues.

The situation can better be illustrated by two drawings and an example of surgery on a tumour freely movable against the base.

1. 2.
A. B.
C. D.

Since we are having to deal not with a plane, but with a convexity in case the flap is to be rotated over an orbital resection, and a concavity, the distance over an unevenly shaped base can be measured by applying a piece of dressing, thus indicating the actual distance regardless of whatever convexity or concavity there may be. The flap on the scalp is lifted complete with the galea aponeurotica in the layer of loose connective tissue underneath. Great care is needed to avoid exposing the bare bone and to preserve the pericranium well supplied with blood so as to facilitate on graft application. Haemorrhage should be arrested only if it is too profuse. The flap is the rotated into the defect and sutured in, thus stopping whatever bleeding there still is. Redon's drain is inserted underneath the flap to make it lead across the bone defect and rest on the dura mater. Fibrin heamostatics failed to prove their worth in our practice. Major haemorrhage, if any, at the edges of the secondary defect is then stopped and the defect compressed, using a quantity of moist mull. Immediate application of split-skin grafts proved to be inadequate in our practice owing to bleeding from the base, which is why in similar cases we usually delay the procedure until the next day. This calls for keeping the dress-

Fig. 9 a. Patient, a man of 73. Ulcerated invasive basalioma fixed to the bone and orbital arch. Another ulcerated basalioma, freely mobile to the base, on the forehead to the left. — Fig. 9 b. Resected orbit, orbital arch, upper part of the orbital cavity, part of the frontal bone and nasal bones. Bone defect covered with Palakos. Also pictured: lifted and turned flap

ing soaked with saline, i.e. adding more of it every two hours after the operation, throughout the night, so as to keep the surface of the dressing wet all the time. This is the only way of preventing the pericranium from getting dry, which it is extremely prone to. The grafts, which had been excised already during the operation, are then applied on the following day. Efforts should be made to have the whole transplant of one, or at most, two parts. The grafts are applied to patients lying in bed in whatever position is necessary. No narcosis is needed as the application is painless. Another advantage of this type of delayed graft application is that there is no bleeding from the base which might otherwise interfere with immediate application. The graft is not

Fig. 9 c. Rotation flap sutured into the defect. Left: state after removal of freely mobile tumour with no bone resection, and suturing in of the rotation flap. — Fig. 9 d. Soft tissue removed

Fig. 9 e. Defect in bone. — Fig. 9 f. Patient, already released home, 3 weeks after operation. 1 year after operation surviving with no sings of relapse. Removed bone — macroscopically clearly involved was found to be free from histological sign of cancer

sutured in but left free, i.e. with no dressing. There is, as a rule, a complete healing in. Only once, as a result of part of the area getting dry before application, a small unhealed defect developed. However, after a longterm spontaneous demarkation of the lamina externa at the site, healing in was subsequently achieved by the application of another small graft.

Figures 1—9

DISCUSSION

Of our nine patients operated on for advanced fixed tumours of soft cranial covers only two died. One (No. 4) owing to an aggravation of his arteriosclerotic dementia and also to his general condition terminating in pulmonary embolism, the other (No. 7) as a result of progression in the tumour itself, which, however, was diagnosed as different from the types of skin tumours mentioned above. In both cases indication for surgery appeared to have been incorrect. Two more patients (No. 3 and 5) experienced a deterioration of their arteriosclerotic manifestations and general condition but early release from hospital was soon followed by a return to their original condition. Of special interest is a histologically rare bone affection in macroscopically suspected (No. 4) or entirely unambiguous findings (No. 9). None of the surviving patients have so far developed any signs of local or general progression, allowing for the fact that relatively little time has elapsed since surgery. This, in our opinion, should be attributed to the considerable radicality resorted to, to the single-phase operation and simple technique of defect covering, as well as to postponed free application of dermo-epidermal grafts. This also contributed to reducing the period of hospitalization to a minimum. And last but not least, teamwork involving all the specialists concerned proved to be a contributing factor, too.

J. H.

SUMMARY

It is recommended that advanced tumours of soft cranial covers should be classified according to whether they are freely movable against the base or fixed or not entirely freely mobile. Ample resection of soft tissues including the periosteum is recommended for the former. In addition to that, the latter type (fixed or partially movable) calls for the simultaneous cranial bone resection involving full bone thickness underneath the tumour, including the removal of frontal and ethmoidal sinueses if necessary. Nine photographic-treatment and its results. The degree of arteriosclerosis in old patients and of the histology tumour should be decisive for indication treatment. Emphasis is also laid on teamwork, radicality, single-phase operation, delayed free application of dermoepidermal grafts without dressing, and short-term hospitalization as conducive to a lasting success.

RÉSUMÉ

Rus, J., Kačer, P.

Traitement chirurgical des tumeurs progressives des teguments mous du crâne

Les auteurs recommandent de diviser les tumeurs cutanées progressives des teguments mous du crâne en tumeurs bien mobiles contre la base et en celles qui sont fixées ou qui ne sont pas tout à fait librement mobiles. Pour le premier type, ils recommandent une excision large des tissus mous le périoste y compris, pour le seconde même une excision large des tissus mous, mais celle qui est faite à la fois avec un enlèvement de la calve en toute son épaisseur sous la tumeur et, s'il en est besoin, l'enlèvement des sinus frontaux et des cellules ethmoïdales. Neuf photographies des patients de cette catégorie montrent le procédé du traitement opératoire et ses effets. Dans l'indication de ce traitement-ci, on recommande surtout de prendre en considération le degré de l'athérosclérose chez les patients trop vieux et l'image histologique de la tumeur. Enfin, pour obtenir un bon et durable effet, on souligne l'importance de la collaboration en équippe, l'intervention radicale en une étape, l'application libre des greffes dermoépidermales sans pansement et une hospitalisation de courte durée.

ZUSAMMENFASSUNG

Chirurgische Lösung der fortgeschrittenen Tumoren der weichen Schädeldecken

Rus, J., Kačer, P.

Fortgeschrittene Hauttumoren der weichen Schädeldecken empfehlen die Autoren einzuteilen in Tumoren, die gegen die Basis sicher beweglich sind, und Tumoren, die fixiert oder nicht ganz frei beweglich sind. Beim ersten Typ empfehlen sie eine breite Exzision der weichen Gewebe einschliesslich des Periosts, bei zweitem Typ ebenfalls eine breite Exzision der weichen Gewebe mit gleichzeitiger Entfernung des Schädeldaches in voller Stärke under dem Tumor, nach Bedarf auch Entfernung der Frontal- und Ethmoidalhöhlen. An neun Photokasuistiken von Patienten dieses Typs wird die Methode der operativen Behandlung und ihre Ergebnisse aufgezeigt. Bei der Indikation für diese Behandlung wird empfohlen, vor allem den Grad der Arteriosklerose bei den überalterten Patienten und die Histologie des Tumors zu erwägen. Abschliessend wird für das dauerhafte gute Ergebnis die Teamarbeit, Radikalität, einmalige Operation, aufgeschobene freie Anlegung von Dermoepidermtransplantaten ohne Verband und kurzzeitige Hospitalisierung hervorgehoben.

RESUMEN

Realización quirúrgica de los tumores progresivos de las cubiertas blandas del cráneo

Rus, J., Kačer, P.

Los autores recomiendan dividir los tumores cutáneos progresivos de las cubiertas blandas del cráneo en tumores infaliblemente móviles frente a la base y en tumores fijados o en los no completamente móviles. En el primer tipo recomiendan una excisión ancha de los tejidos blandos incluso el periósteo, en el segundo tipo también una exción ancha de los tejidos blandos con ectomía simultánea de la calva en espesor total bajo el tumor, si sea necesario también la ectomía de los senos frontales y etmoidales. El procedemiento del tratamiento quirúrgico y los resultados del

mismo quedan mostrados en nueve fotocasuísticas de los pacientes. Al indicar este tratamiento se recomienda considerar el grado de la arterioartrosis en los pacientes muy viejos y la histología del tumor. En fin, para conseguir un resultado bueno duradero, se destaca colaboración en team, procedimiento radical, intervención de una sola etapa, aplicación libre de los injertos dermoepidermales sin fajas y hospitalización de corto tiempo.

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THE TREATMENT OF ANORECTAL DEVELOPMENTAL ANOMALIES BY ADULTS

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K. N. SALAMOV, YU. B. KUGAEVSKII, A. P, TUPIKOVA

The incidence of rectal and perineal developmental anomalies is equal in boys and girls; their frequency is 1 : 1500—1 : 5000 of newborns (Murashkov 1957, Gross 1953, Santulli et al. 1965, Stevenson and Smith 1963, Nixson 1974). There are special difficulties in treatment of such patients, as the surgeon should cope with two complicated tasks, i.e. saving of the newborn's life and preservation of the rectal supporting apparatus in a functional state.

The embryogenesis of anorectal developmental anomalies has been explained by several hypotheses. Some authors (Bill et al. 1972, Johnson et al. 1972) consider a "failure of migration" as their cause. According to this hypothesis, the rectal end normally moves caudally, following the developing urorectal septum, in order to unite with a cloacal membrane in the anal depression. Underdevelopment of the cloacal septum leads to discontinuation of the rectal end migration and it might open into another organ. Other investigators (Duhamel 1973, Gross et al. 1966) suggest a theory of a "caudal regression syndrome", which is manifested by a failure of cloacal division and by a more expressed regression of the caudal intestine. However, neither of these hypotheses has been able to explain thoroughly the causes leading to development of the anorectal anomalies. In dependence on pathologic-anatomical features, the developmental anorectal anomalies are divided into different groups.

Anal and rectal atresias form 70—85 % of all existing types of the anorectal developmental anomalies. It can be corrected only surgically. In vital indications, the surgery is done during the first hours of the newborn's life. The radical operation or the temporary colostomy followed later on by the proctoplasty can be performed. The method of treatment is chosen in each case individually. Most frequently, the perineal proctoplasty is indicated by patients suffering from the anal and rectal atresias. This operation consists in formation of an anal channel and in bringing the mobilized rectum down.

Rather rarely are found inborn rectal fistulae communicating with vagina, urinary bladder or urethra, which are accompanied by a normally formed anus

and its supporting apparatus. Such patients are treated only surgically, usually in 3—5 years of age.

Anal and rectal stenoses occur by 10—15 % of patients with anorectal developmental anomalies. The stenosis is most frequently localized in the region of an anal ring crest line, i.e. in the place of transition of an endodermal part of the intestine into an ectodermal one. The length of a stricture is several millimetres to 2—4 cm. Such patients may be treated conservatively or surgically, in dependence on the degree of the stenosis. A secondary megarectum or megacolon may develop, if the treatment is not made in time.

As a rule, all mentioned anorectal developmental anomalies should be treated in an infantile age. If the surgery is made without respecting the functional peculiarities of the rectum, or if the surgery is not performed at all, an insufficiency of an anal constrictor may arise and a stricture, a rectal fistula or a fistular form of an anal atresia are retained.

In the available literature, we found only solitary descriptions of these pathologic conditions by adults. The problems connected with the treatment of adults suffering from such developmental anomalies or from their consequences are bound to their rare incidence and to special features of the rectal closing apparatus. In this study, we are going to report on the treatment of such patients according to the experience gained in our Institute.

The total of 27 patients in the age of 15 to 32 years (8 men and 19 women) suffering from various types of anorectal developmental anomalies were treated

A table: The treatment of anorectal developmental anomalies by adults (according to data obtained in the Clinic of the Scientific Laboratory of Proctology)

Diagnosis	No. of observations	Type of the operation
The anal or rectal atresias, anal constrictor insufficiency due to:		
sphincter injury	5	plasty of sphincter and levator ani
underdevelopment of the anal constrictor	3	conservative treatment
	4	plasty of sphincter and levator ani
	2	plasty of sphincter and gluteal muscle
sphincter atresias	6	plasty by muscular gluteal flap
The fistular forms of anal atresias	3	Stone's operation
Inborn rectovaginal fistula	2	excision of the fistula and bringing down the rectal mucosa and vestibulum vaginae
Inborn anal strictures	2	excision of the stenosing ring according to Hartman
Total	27	

since 1970 to January 1976 in our Laboratory with a Clinic. The anal and rectal atresias occurred by 23 patients after birth. They came to our Clinic with the features of the anal constrictor insufficiency. The inborn rectovaginal fistulae were present by 2 women, the inborn stenoses of anal channel were found by 2 men (see a table).

In 20 patients of the total number examined, the anal constrictor insufficiency occurred as a consequence of a perineal proctoplasty, performed immediately after birth as a treatment of anal or rectal atresia. The anal constrictor was normal by 5 of them, however, the muscle fibres of the sphincter were damaged during the operation. It led to the anal constrictor insufficiency of the second degree (the patients were not able to retain the intestinal gases and the liquid faeces). The sphincterometric data indicated a lower voluntary and tonic activity of the sphincter. A plasty of sphincter and levator ani was performed by these patients. The operation consists in suturing of the dehiscent margins of the rectal constrictor and, more superficially, suturing of the medial portions of the muscles elevating anus. The immediate and long-term results of treatment were good by 4 patients and satisfactory by one patient (he was not always able to retain the gases).

The inborn underdevelopment of the anal constrictor together with the anal and rectal atresia was observed by 9 patients. The usual perineal proctoplasty, which was performed sooner, did not eliminate the sphincter's insufficiency, of course. The 3 patients with incontinency of the Ist degree were treated conservatively, i.e. by an electric stimulation of the anal constrictor and perineal muscles and by an exercise therapy strengthening the muscles of the pelvic fundus and perineum. The good results were seen in all the 3 patients. By 4 patients suffering from the IInd degree of the anal constrictor insufficiency, the sphincter was sharply attenuated on the anterior half of its circumference. The plasty of sphincter and levator ani was performed by patients in this group. Its special features consisted in the application of crimping sutures on the attenuated sphincter along the anterior half of the anal channel and in their stregnthening by levators. There were no complains on the intestinal content retainment by all 4 patients long periods of time after the operation.

The treatment of patients with inborn insufficiency of the anal constrictor due to absence of sphincter muscles on the lateral wall along $^1/_3$ of its circumference was rather more complicated. It occurred by 2 patients, who were unable to retain even solid intestinal content (the IIIrd degree of insufficiency). In such cases, good results were achieved by means of plasty of sphincter and gluteal muscles. The operation consists in mobilization of the medial margin of the major gluteal muscle in the length corresponding to the size of the sphincter's defect. The margins of sphincter are sutured together with a flap on a pedicle prepared from the major gluteal muscle. During the postoperational period, an electric stimulation of the muscles belonging to the rectal closing apparatus was applied, thus improving the effect of the operation. The combined treatment led to satisfactory functional results by these patients.

The treatment of patients suffering from a full inborn absence of the rectal sphincter was especially complicated. The patients did not retain liquid and solid faeces (the IIIrd degree of insufficiency). The attempts of surgical treatment of such patients according to known techniques were usually unsuccessful. All the 6 patients with absence of the rectal sphincter were several times unsuccessfully operated on before their admission to our Clinic. In 3 of them, a sigmoideostomy was formed on some stage of their treatment.

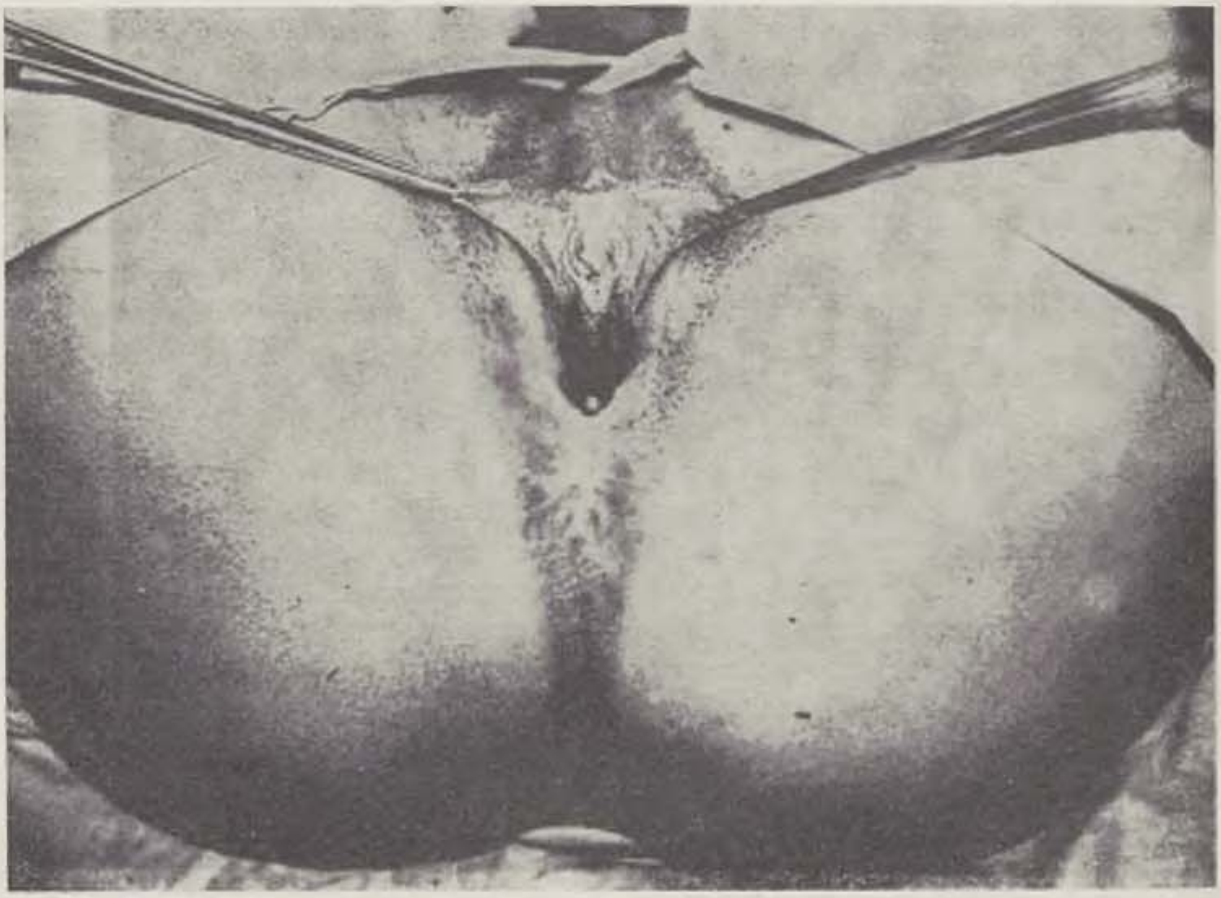

Figure 1.: The fistular form of anal atresia (before the operation)

A plasty of the anal constrictor by means of a flap formed from the major gluteal muscle according to a technique modified in our Clinic, was performed by these patients with inborn absence of the rectal sphincter and was obligatorily controlled by an electromyography. The operation consisted from one stage by 2 patients and from two stages by 4 patients. During the one-stage operation, the flap of 20×10 cm size was isolated from the major gluteal muscle, split and put through a subcutaneous tunnel around the distal part of the rectum. The ends of the introduced flaps were sewn together. In the course of the two-stage operation, the flap was mobilized from the major gluteal muscle on one side and was lead through a subcutaneous tunnel to a ventrolateral circumference of the rectum. About 3—4 months later, a similar operation was performed on the other side. On the next, final, stage, the ends of the gluteal flaps were sewn together and thus a muscular closing ap-

paratus was formed around the rectum. The one-stage operation was indicated by patients with colostomy. It was possible to remove a sigmoideostomy by the 3 patients due to the good results of the operation. The results of the operations were satisfactory by 2 patients and unsatisfactory by one patient.

The fistular forms of anal and rectal atresia could be considered as anal ectopies, because the functional alterations may be missing or remain often unrecognized long time after the child's birth. Unretainment of faeces is clearly expressed in the adult age. The external observation of perineum reveals a

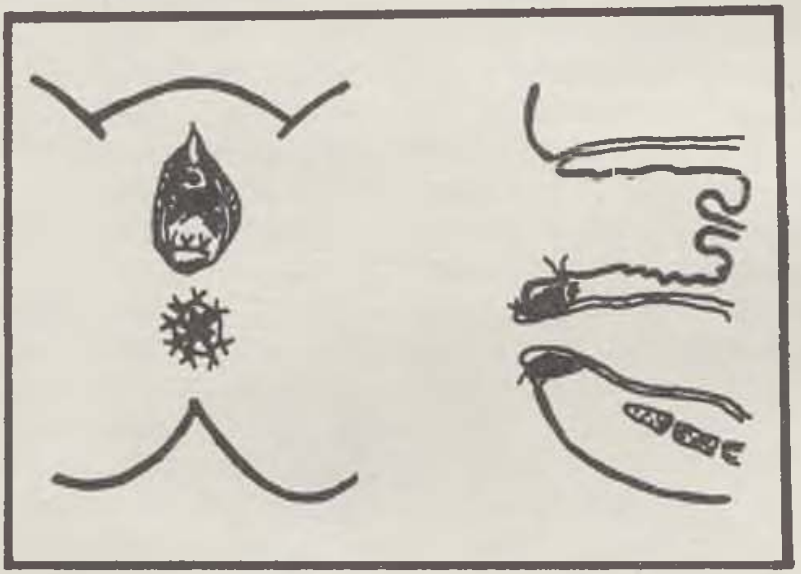

Figure 2.: Mobilization of the rectum and its introduction into a wound on the perineum

funnel-shaped depression in the place, where the anal orifice is normally localized. The examination of the anal reflex shows contractures of the external sphincter there. We had 3 such patients. The anal orifice was localized in the vaginal vestibulum (Fig. 1). The electromyography confirmed presence of the concentric muscle fibres of sphincter about 4—6 cm apart from this anal

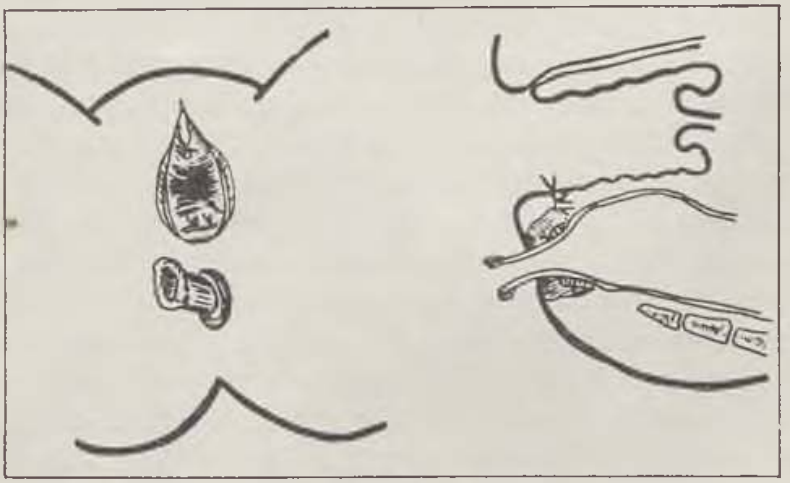

Figure 3.: The anal channel was moved to perineum and fixed there by separate stitches

orifice. An operation according to Stone was performed by all the 3 patients.

A circular section was cut around the ectopic anal orifice in distance about 2 cm from margin of the rectal mucosa. The margins of the orifice were kept by the holders. Using the knife, the rectum was mobilized in the length 5—6 cm. In the place of the anus' usual localization, where a depression and sphincter contractions were observed, a cutaneous ring of 1 cm diameter was cut out. A tunnel was made in a muscular layer below the skin and the end of the mobilized rectum was led through it into the wound formed on perineum, using the holders (Fig. 2). The margins of the transferred rectum were sutured to the margins of the skin, the intestinal walls having been preliminarily fixed to the perineal tissues by separate catgut stitches. The defect of the vaginal vestibulum was sewn gradually in the layers (Fig. 3).

The postoperational period proceeded without disturbances by all the 3 patients. The patients were examined 6 months and 1½ years after the operation. The function of the anal constrictor was satisfactory, as shown by objective examination (sphincterometry, electromyography).

The inborn rectovaginal fistulae occur rarely. The children with rectovaginal fistulae are usually regularly followed and operated on in the age of 3—4 years. The infrequent occurrence and difficult diagnosis may, however, result in the long-term persistence of the fistula and the patients come to a physician only when the complications like inflammations of the genital organs are already expressed. By the 2 patients observed by us, the rectovaginal fistula was revealed in the ages of 15 and 16 years. The inborn rectovaginal fistulae are characterized by absence of ramifications in the course of the short and wide fistular duct, mostly of diameter 1 cm or more, by internal orifice localized about 2—3 cm above the border of anus and by absence of suppurative swellings and cavities in the pararectal connective tissue spaces. These special circumstances enable to perform a plasty by means of the rectal mucosa transfer. Both patients were operated on. The fistula was cut out and the rectal mucosa and the vaginal vestibulum were brought down. The technique of the operation consists in the following: The mucosa is mobilized along the anterior anal circumference and is brought down together with the inner orifice of the fistula. The superfluous mucosa and the internal orifice are cut off and the margins of the mobilized mucosa are sewn without stretching it to the skin wound. The fistular duct and the scar tissues on the vaginal side are cut off economically. Then the vaginal wall is mobilized and moved down axially, followed by fixation using separate catgut stitches.

The patients were examined long time after the operation. No communication between rectum and vagina was revealed.

The inborn anal stenoses are rarely seen by adults, as in most cases the patients are operated on in the early infancy. Only the compensated forms of the disease remain untreated. A decompensation may develop in different time periods. In dependence on severity and length of the stricture, the patients are treated conservatively or surgically. According to opinion of Lenyushkin (1976), the membraneous form of stenoses may be successfully treated by a bougieurage. If the conservative treatment does not lead to a healing during

1—2 months, the surgical treatment takes place. An anal stenosis hardly letting the finger tip to pass through and 2—3 cm long was found by our 2 patients. The bougieurage seemed to be hopeless, as the tissues surrounding the stenosed part of the anal channel became rigid during the time and the muscles were substituted by a scar tissue. An excision of the stenosing ring, approached from the perineal side according to Hartman, was indicated by both patients. The section was led around the narrowed anal orifice and the stenosing fibrous ring was separated and kept in holders. The stenosing part was separated along the rectal wall upto the level of the normal intestine. The rectum was mobilized so far, as its end could reach the skin wound without stretching it. Conglomeration of scar tissues was cut off and the margins of rectum were sewn to the margins of skin incision by knotted stitches. The good immediate and long-term results were observed by our patients after this operation.

By the use of different modes of treatment in dependence on the type of the anomaly, the good and satisfactory results were achieved by 26 patients. The surgical correction was ineffective only by one patient with the inborn absence of the rectal sphincter.

CONCLUSIONS

1. The anorectal developmental anomalies, i.e. anal and rectal atresias, rectovaginal fistulae and anal stenoses are usually corrected in the infancy. However, the unhealed anomalies cause the patients to come into the surgical clinic in the age of 15—16 years.

2. The inadequate operations performed during infancy may damage the sphincter muscle fibres. It ensues in the insufficiency of the anal constrictor expressed by adults.

3. The plasty of sphincter and levator ani is indicated by defects of sphincter muscles along the anterior or posterior half of the anal circumference, the size of which is less than the length of the anal channel. The plasty of sphincter and gluteal muscle is indicated by larger defects of the anal constrictor muscles. The very long defects may be corrected by use of a flap formed from the major gluteal muscle.

4. The anal stenoses and fistular forms of rectal atresias are successfully corrected by excision of pathologic structures and by bringing of a normal portion of rectum down into the muscular ring of the sphincter (operation according to Stone).

M. T.

SUMMARY

An analysis of an extremely rare disease, i.e. of anorectal developmental anomalies by adults, was performed. It was found that the anorectal anomalies are usually corrected in infancy. Some patients come to a physician in the age of more than 15—16 years.

The insufficiency of the anal constrictor, as expressed by adults who suffered from inborn anorectal anomalies and were surgically treated in the early infancy, apparently seems to be a consequence of both the developmental anomaly and the inadequate surgical correction of the anomaly, by which not

only rectal atresia is removed, but aslo the immature sphincter muscle fibres are damaged.

In respect to the anatomical and physiological characteristic features of the anal constrictor insufficiency by adults, a conservative treatment was indicated by the Ist degree of the insufficiency and surgical treatment, i.e. plasty of sphincter and levator ani and plasty of sphincter, levator ani and gluteal muscle, were indicated by the IInd and the IIIrd degree of insufficiency, respectively.

The fistular forms of the anorectal developmental anomalies require identification of the constrictor ani muscles and bringing down of the rectum according to Stone.

RÉSUMÉ

Traitement des anomalies anorectales de développement chez les adultes

Fedorov, V. D., Doulcev, Ju. V., Bogouslavkyi, L. S., Salamov, K. N., Kounagayevkyi, Ju. B., Toupikova, A. P.

On a fait l'analyse d'une maladie très rare, c'est-à-dire des anomalies anorectales de développement chez les adultes. On a constaté que, normalement, les anomalies anorectales étaient corrigées en enfance. Beaucoup de malades cherchent des soins médicaux à l'âge de plus de 15—16 ans.

L'insuffisance du sphincter anal se traduisant chez les adultes qui étaient opérés à l'âge de l'enfance à cause d'une anomalie anorectale, résulte évidemment du trouble de développement ou bien d'une correction chirurgicale inadéquate de ce défaut pendant laquelle on enlève non seulement l'atrésie rectale, mais on abîme aussi les fibres musculaires du sphincter n'étant pas encore mûres.

Suivant les caractéristiques anatomiques et physiologiques de l'insuffisance du sphincter anal chez les adultes, on indique soit le traitement conservatif, s'il s'agit de 1er degré d'insuffisance, soit le traitement chirurgical, c'est-à-dire la plastie du sphincter et levator ani ou la plastie du sphincter, levator ani et du muscle fessier, s'il s'agit de 2e ou 3e degré d'insuffisance.

Les formes des défauts du développement du conduit anal et rectum avec des fistules exigent une identification des muscles du sphincter anal et une transposition du rectum en bas selon Stone.

ZUSAMMENFASSUNG

Behandlung der anorektalen Entwicklungsanomalien bei Erwachsenen

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Die Autoren befassten sich mit der Analyse einer sehr seltenen Erkrankung, nämlich mit den anorektalen Entwicklungsanomalien bei Erwachsenen. Es wurde festgestellt, dass die anorektalen Anomalien in der Regel im Kindesalter korrigiert werden. Eine Reihe von Patienten suchen Hilfe im Alter von über 15—16 Jahren.

Die Insuffizienz des analen Schliessmuskels, die bei Erwachsenen, die im Kindesalter wegen angeborener anorektaler Anomalien operiert wurden, zum Vorschein kommt, ist offensichtlich eine Folge sowohl der eigentlichen Entwicklungsanomalie als auch ein Ergebniss der inadäquaten chirurgischen Korrektur des Defektes, bei der nicht nur die rektale Atresie beseitigt, sondern auch unreife Muskelfasern des Sphinkters geschädigt werden.

Nach anatomischen und physiologischen Merkmalen der Insuffizienz des analen Schliessmuskels bei Erwachsenen sind indiziert: entweder konservative Behandlung im Falle einer Insuffizienz des 1. Grades, oder chirurgische Behandlung, d. h. Plastik des Sphinkters und levator ani oder Plastik des Sphinkters, levator ani und des Gesassmuskels im Falle einer Insuffizienz des 2. oder 3. Grades.

Die Formen der Entwicklungsanomalien des analen Kanals mit Fisteln erfordern die Identifizierung der Muskeln des analen Schliessmuskels und die Übertragung des Rektums nach unten nach Stone.

RESUMEN

Tratamiento de anomalias anorectales developmentales en los adultos

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Fue hecha un análisis de una enfermedad muy rara, es decir de la anomalia anorectal developmental en los adultos. Fue hallado que las anomalias están corregidas generalmente en la infancia. Muchos pacientes buscan ayuda en la edad de más de 15—16 años.

La insuficiencia del esfíncter anal que se revela en los adultos operados en la infancia por causa de anomalias anorectales congenitales es evidentemente consecuencia tanto del defecto developmental mismo como del resultado inadecuado quirúrgico de la corrección del defecto, en la cual se elimina no solamente la atresia rectal sino también las fibras no maduras del esfíncter están dañadas.

Según las características anatómicas y fisiológicas de la insuficiencia del esfíncter anal en los adultos está indicado el tratamiento sea conservativo en el 1er grado de la insuficiencia o una intervención quirúrgica, es decir la plástica del esfíncter y del levator ani o la plástica del esfíncter, del levator ani y del músculo gluteal en el 2o o 3er grado de la insuficiencia.

Las formas de los defectos developmentales del canal anal y del recto con pístulas exigen identificación de los músculos del esfíncter anal y transposición del recto hacia abajo según Stone.

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AN EXPERIMENTAL AUTOLOGOUS PLASTY OF TRACHEAL DEFECTS

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A reconstruction of large tracheal defects, if formation of a direct anastomosis is impossible, remains to be a recent and not yet solved problem. An alloplasty used experimentally, or in emergency cases in clinical practice, still has not brought desirable results.

There were published reports on utilization of free autologous grafts of bronchus, which was taken from a resected lung and used for substitution of small transversal tracheal defects (Carter and Strider 1950, Mac Hale 1972).

Vyrenkov (1965) reported good results of free autologous transplantation of a tracheal neck part by 7 dogs that were followed for 120 days. A histologic examination revealed preservation of cartilaginous semi-rings of the graft and full recovery of mucosa. However, similar experiments of Bicflavi (1970) were unsuccessful: all 10 dogs, who the autologous neck part of trachea was grafted to, or a piece of the neck part was transferred to an intrapectoral part, died in 19—49 days after the operation, which was indicated by tracheal stenosis. Necrotic changes, superfluous development of a granular tissue and calcification of cartilage were discovered histologically by the author.

A plasty of tracheal defects by means of an autologous tracheal or bronchial graft (if connection by direct anastomosis is impossible) remains to be a very promising method. However, the number of experiments performed with this aim is small and their results are contradictory.

A posibility of reconstruction of the tracheal defects by autologous free grafts of tracheo-bronchial tree was studied in three series of experiments on animals (see a Table).

The experiments were done on rabbits of 2.0—2.5 kg weight and on normal dogs weighting 14—26 kg. Hexenal anaesthesia and neuroleptics were used. A spontaneous breathing was maintained during operation on rabbits, while

an artificial ventilation of lungs was maintained by means of a respirator RO-2 in dogs. Listenon was used for myorelaxation.

An estimation of the experimental results was based on clinical follow up of a state of the operated animals, x-ray examination and morphologic examination of the tracheal preparations in various terms after the operation (see a Table).

The first series of experiments on 43 rabbits consisted in total resection of a piece of trachea, 6—8 cartilaginous semirings long, which was taken from the neck part of trachea and immediately sutured back into the original place, without any preliminary preservation (Fig. 1a). Interrupted sutures from black "Supramice" No. 4/0 on an atraumatic needle were put through all the layers of the tracheal wall 2—3 mm apart and the knots were tied up on the external side. During the first 2 weeks after the operation, a flabbiness and short breath by a minimal physical activity were clinically observed in all the rabbits. Later on, the operated rabbits did not differ from the intact ones, if the un-

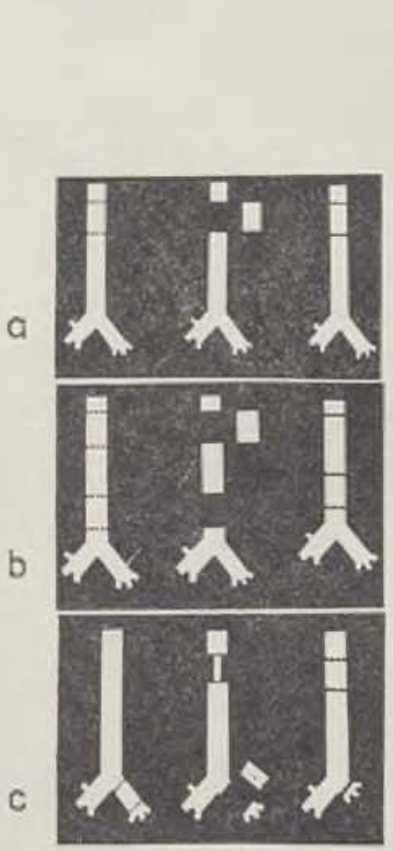

Figure 1.: Diagramm of the operation. a — The first experimental series (isotopical grafting of autologous trachea in the cervical part by rabbit). b — The second experimental series (heterotopical grafting of an autologous cervical tracheal segment to its intrapectoral part by dog). c — The third experimental series (plasty of a tracheal defect by means of a free autologous graft taken from the left main bronchus by dog)

Figure 2.: Macroscopical preparation of trachea of the rabbit. No. 47, one year after the isotopical autologous grafting of trachea. The limits of graft are marked by arrows

A table: Characteristics of the performed experiments in respect to series, results and time periods of observations

Types of operations (in brackets — series of experiments)	Species of animals	Number of animals	Time periods of observations														Surviving animals after more than 6 months
			0—2 days		3—7 days		8—14 days		till 1 months		till 3 months		till 6 months		more than 6 months		
			d	s	d	s	d	s	d	s	d	s	d	s	d	s	
Auotlogous grafting of trachea:																	
isotopical (I)	rabbits	43	4	1	9	2	4	2	5	3	—	5	3	1	—	2	2
heterotopical (II)	dogs	18	5	—	1	—	—	1	1	1	1	1	—	2	—	2	3
Plasty of tracheal defect by free autologous bronchial graft (III)	dogs	18	1	—	1	—	2	1	—	2	1	1	—	2	—	3	4
Total		79	10	1	11	2	6	4	6	6	2	7	3	5	—	7	9

Explanation: d — died, s — sacrificed

complicated cases were concerned. In various periods of time after the operation, the total of 25 rabbits died. The main reason of death during the first 2 days were technical mistakes that occurred during the operation, later on, it was caused by suppurative processes in lungs and pleura. In 2 cases, a phlegmon of paratracheal and neck connective tissue was seen. In the first 2—3 weeks after the operation, a more or less expressed inflammation of graft mucosa was observed macroscopically. It progressed and spread to other parts of the tracheo-bronchial tree in the more complicated cases. In the uncomplicated cases, the inflammation gradually subsided later on, and the graft did not apparently differ from other parts of trachea after time periods longer than 1 month (Fig. 2). The histologic examination showed destruction and exfoliation of epithelium, varied degree of leukocytic infiltration of mucosa and submucosa layers and also (in some cases) of perichondrial zone near anastomoses and suture materials (Fig. 3) in the graft during the first 2—3 days after the operation. Beginning from the middle of the first week after the operation, an epithelization of graft mucosa took place in the uncomplicated cases. Simultaneously, an acute inflammatory reaction gradually ceased. In the time period ranging from 2 weeks to 3 months, a lymphoplasmocytic infiltration increased, sometimes a granular tissue appeared both in the anastomotic ends of trachea and in the graft. A focal metaplasia of the regenerating epithelium into a multilayered flat epithelium was observed in sporadic cases during time periods from 2 weeks to half-a-year after the operation. About 2—3 weeks after the operation, a full recovery of graft mucosa was seen in the uncomplicated cases; in the beginning, the epithelium consisted of one layer of cells and flat, small cells were present. About 1 to 1½ months after the operation, the epithelial layer of the graft developed into such an appearance that resembled the appearance of the epithelium on ends of trachea.

In the second series, a circular resection of the cervical part of trachea in the length of 6—7 cartilaginous semirings was performed in 18 dogs and an end-to-end tracheal anastomosis was formed. The resected part of trachea was immersed in a solution used for preservation of kidneys, which was designed by the All-Union scientific institute of clinical and experimental surgery, or into a blood with citrate taken from the same dog. It was stored in 4 to 6 ^{0}C for 80—90 minutes. In the second step of the operation, a ventilation of lungs by means of a shunt-breathing system was introduced. Under these conditions, a circular defect of the intrapectoral part of trachea was formed, which was reconstructed by the autologous graft, previously taken from the cervical part of the trachea (Fig. 1b). The sutures were put 5—6 mm apart and tracheal mucosa should minimally, but necessarily, have been taken by the stitches. The woven threads "Lavsan" No. 3 and No. 1 on atraumatic needles were used. If the connection was not tight enough, then complementary sutures were added, which did not penetrate into lumen of trachea.

In this series, 6 dogs died during the first three days after the operation due to overdosis of a narcotic agent and to technical mistakes that occurred during the operation; deaths of 2 dogs in the period from 1 to 3 months after

Figure 3.: Microscopical preparation of trachea of the rabbit No. 90 (sacrificed 3 days after the operation). Necrosis and leukocytic infiltration of graft mucosa, sharp dilatation and partial thrombosis of submucosal blood vessels can be noted. Stained by haematoxylin-eosin, magnification 350×

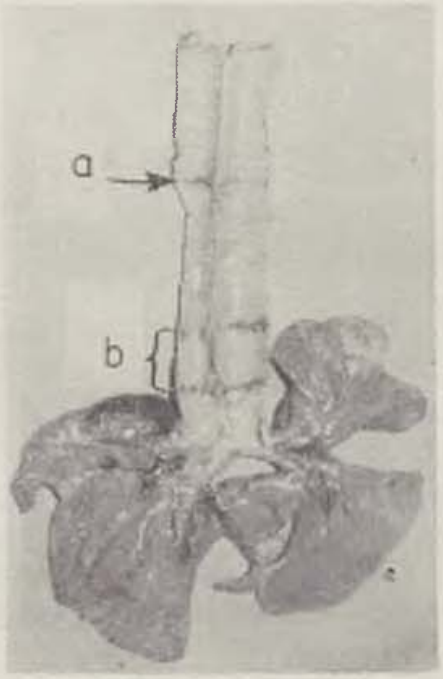

Figure 4.: Macroscopical preparation of trachea of dog No. 46, 1 month after heterotopical autologous grafting of a cervical tracheal segment to the intrapectoral part of trachea. a — line of an anastomotic connection in the cervical part. b — a graft

the operation were caused by inflammatory changes in lungs. In respect to clinical observations, the dogs took in a food only a little, were less active, quick movements were followed by short breath and a periodical cough occurred during the first 2 weeks after the operation. Later on, a state of animals gradually improved and the cough disappeared in the uncomplicated cases; there was no difference between experimental and intact animals one month or longer time after the operation. In the time periods ranging from 14 days at 8 months after the operation, 7 dogs were sacrificed. By one of them, an insignificant narrowing of trachea was noticed, which was caused by scar formation in the membranous part of the transplantation region. In the other cases, a rigid cartilaginous framework of graft was fully preserved, as observed macroscopically, and the graft mucosa did not differ from mucosa of other tracheal parts in time periods longer than one month after the operation (Fig. 4). Histologically, a destruction of the graft mucosa with exfoliation of the epithelium was observed during the first three days after the operation, and also leukocytic infiltration of the graft wall and of the anastomotic ends of trachea was more or less expressed. About 2—3 weeks later, a full epithelization of the graft was seen. Simultaneously, a degree of inflammatory changes decreased and, as usual, a very weak sclerotization developed in the anastomotic region and also in the submucosal layer of the graft. A focal metaplasia of the regenerated epithelium into a multilayered flat one, lacking signs of keratinization, was observed in some cases.

In this series, three dogs have been still under observation for more than 8 months and have been in a good shape. A x-ray examination of lungs and trachea did not reveal any pathological alterations.

In the third experimental series, a circular resection of a piece of the left main bronchus was followed by formation of an end-to-end interbronchial anastomosis by 18 dogs. As a second step, a cervical part of trachea was resected, while a strip of the membraneous part was left in the place, and the defect was reconstructed by means of a free autologous bronchial graft (see Fig. 1c).

Techniques of suture and preservation of the graft were the same, as in the second series. In the third series, from the total of 18 animals operated on, 5 died; one of them died due to overdosis of anaesthesia one hour after the operation. Pneumonia was the cause of death of 3 dogs, who died on the 3rd, 12th and 39th day. A tracheal stenosis in the graft zone occurred by the dog that died on the 39th day. It should be mentioned that a relatively thick suture material ("Lavsan" No. 3) was used in these three cases. A macroscopical examination revealed sharply expressed inflammatory and destructive changes of the graft. One dog died on the 13th day after the operation due to phlegmon of the pectoral wall, which led to break into a pleural cavity. Nine dogs were sacrificed in the time periods ranging from 14 days to 1 year after the operation. A moderate stenosis of the bronchial anastomosis and a chronic abscess in the left lung were found in one of them. Macroscopically, the rigid cartilaginous framework of the graft was preserved in all cases and the graft mucosa did not differ from mucosa of other tracheal parts in the

time periods longer than 1 month (Fig. 5). Histologically, the same phenomena were revealed in tissues of the graft and in tissues of the tracheal ends, as they were described in the second series. About 1—1½ months after the operation, the epithelium of the graft became identical to the epithelium on the tracheal ends (Fig. 6). An x-ray examination of 4 dogs in this series, who were under observation for more than 8 months, showed absence of pathological changes in lungs and trachea.

The changes occurring in cartilaginous rings near the anastomosis consisted in fragmentation of cartilage, that resulted from stretching by the sutures, and in more or less expressed atrophy of cartilage cells in the cortical zone, which preceded development of small necrotic foci observed together with regenration of young cartilage cells. These histological features were common to all the experimental series. In later terms (2 weeks and more), a perichondrial sclerotization process, usually only slightly expressed, took place in the anastomotic zones, while a rather prominent sclerotization occurred sometimes around the suture materials. The cartilaginous rings in the other

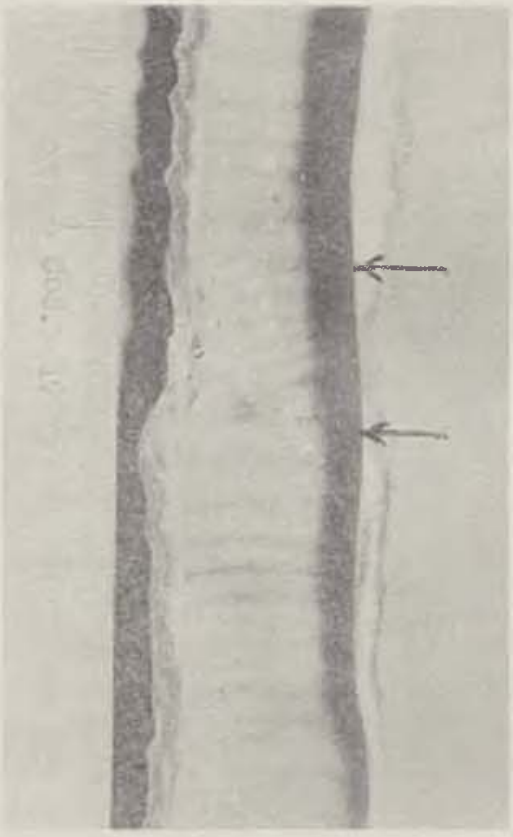

Figure 5.: Macroscopical preparation of trachea of dog No. 17, 1 year after the plasty of a tracheal defect by free autologous graft taken from the left main bronchus. The limits of the graft are marked by arrows

Figure 6.: Microscopical preparation of trachea of dog No. 44 (sacrificed 1 month after the plasty of a tracheal defect by free autologous graft of the left main bronchus). Full regeneration of mucosal epithelium of the graft and moderate sclerosis of the submucosal layer can be seen. Stained by haematoxylin-eosin, magnification 350×

parts of the graft and in the anastomotic ends of the trachea were not significantly changed.

Thus, based on our observations and on data from literature, it can be concluded that the free autologous grafts of the tracheo-bronchial tree, which are 6—8 cartilaginous semi-rings long, survive well. A great number of complications, which occurred in the first series, may be explained mainly by anatomo-physiological peculiarities of rabbits (relatively small diameter of trachea, easy acquirement of infection, absence of cough reflex). In addition to it, many complications were caused by technical mistakes. In the second and in the third series, the complications developed mostly by animals, in which a relatively thick "Lavsan" (No. 3) was used as a suture material.

The results of plastic reconstruction of trachea by free autologous grafts taken from the tracheo-bronchial tree depend, according to our opinion, on degree and severity of changes developed in the graft, which are related in the first place to traumatization and to quality of the sutures.

CONCLUSIONS

1. A free autologous graft taken from the tracheo-bronchial tree can be used for plasty of tracheal defects. The graft heals well.

2. In the uncomplicated cases, the structure of tracheal and bronchial autologous grafts is preserved even for long time periods after the operation.

3. The complications are mostly caused by technical mistakes during the operation and by use of too thick suture material.

M. T.

SUMMARY

In experiments on 43 rabbits and 36 dogs, the authors demonstrated possibility of plastic reconstruction of tracheal defects by means of a free autologous graft taken from a tracheobronchial tree (6—8 cartilaginous semi rings long). The grafts healed well and the long-term results were also good. The complications were related in many cases to technical mistakes accurring mostly during sewing of trachea and to unfortunate choice of a suture material.

RÉSUMÉ

Plastie autologue expérimentale des défauts de traché

Khamidov, R. J., Kiseleva, N. P., Galkina, T. V.

A la base des expériences faites sur 43 lapins et 36 chiens, les auteurs ont montré la possibilité d'une plastie des défauts de trachée à l'aide des greffes autologues libres prises de l'arbre trachéobronchial (de longueur de 6 à 8 anneaux cartilagineux). Les greffes ont bien pris et les résultats de longue durée étaient également bons. Dans plusieurs cas ce sont surtout les erreurs de technique de suture de la trachée et le choix défavorable du matériel de suture par lesquels les auteurs expliquent l'apparition des complications.

ZUSAMMENFASSUNG

Experimentele autologe Plastik der Trachealdefekte

Chamidow, R. I., Kiselewa, N. P., Galkina, T. V.

Auf Grund von Experimenten an 43 Kaninchen und 36 Hunden zeigten die Autoren die Möglichkeit der Plastik der Trachealdefekte mit Hilfe von freien autologen Transplantaten, die aus dem Trachea-bronchialstamm (in einer Länge von 6—8 Knorpelringen) gewonnen wurden. Die Transplantate heilten gut an und die Langzeitergebnisse waren ebenfalls gut. Die Entstehung der Komplikationen erläutern die Autoren in einer Reihe von Fällen vor allem durch technische Fehler bei der Sutur der Trachea und durch unglückliche Wahl des Nahtmaterials.

RESUMEN

Plástica autológa experimental de los defectos traqueales

Jamidov, R. I., Kiseleva, N. P., Galkina, T. V.

A base de los experimentos en 33 conejos y 36 perros los autores mostraron la posibilidad de una plástica de los defectos traqueales mediante trasplantes libres autólogos tomados del tronco traqueo-bronquial (en el largo de 6—8 anillos carilaginosos). Los trasplantes adhirieron bien y los resultados de largo tiempo también fueron buenos. Los autores explican el origen de las complicaciones en un número de los casos sobre todo por errores técnicos en el suturar la tráquea y por elección desfavorable del material de coser.

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