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ON THE PROBLEM OF TOTAL RHINOPLASTY WITH A FILATOV'S FLAP STRIPPED OF FAT

V. KAVRAKIROV

A stable cosmetic and functional result of rhinoplasty depends on two factors: 1. the tip, the alae and the septum of the nose must be reconstructed, 2. the inner surface must be lined with skin. Reconstruction of an organ in relief with thin walls and a double layer of skin, has always been one of the most difficult tasks of rhinoplasty, and the subject of research and the elaboration of modifications.

Both the Indian rhinoplasty and that performed with a Filatov's flap, the two competing methods of the past, had serious shortcomings. The former led to numerous scars in the face, the latter required considerable time for treatment which did not always have the desired result.

In 1948 Khitrov made the ingenious suggestion of stripping the Filatov flap of its fat when using it for rhinoplasty. The removal of the fat in a flattened flap permitted the author to mould the nose in a one-stage operation and facilitated the formation of the tip, the alae and the septum. The method of Khitrov made rhinoplasty simpler and improved its functional and cosmetic results. However, the lining of the inner surface of the nose remained a drawback of this method, because the large skin duplication, which Khitrov used for this purpose, frequently sloughed off due to insufficient blood supply. To improve on this part of the operation, some authors (Limberg, Vasilyev, Rudko) have elaborated modifications.

Since 1957 the author has used his own modification of rhinoplasty with a Filatov's flap stripped of its fat. In order to avoid obstructing the blood supply of the inner skin lining, reconstruction of the nose is performed with two flaps. Most of the inner wound surface is covered by a tongue-like flap with a nutritive pedicle, prepared from the posterior aspect of the tube, and the remaining parts of the nose are reconstructed from its anterior portions according to Khitrov.

The shape and size of the unfolded flap of skin from which the nose is formed, is illustrated by the diagram in Fig. 1. The dashed line indicates the tongue-like flap to be formed from the posterior aspect of the Filatov's tube. In the unfolded skin flap the author keeps approximately to the following measurements:

- a) the length of the unfolded flap (MN) is about 10 cm., 7 cm. of which is taken up for the dorsum and 3 cm. for the height of the septum;
- b) the width of the unfolded flap at the root of the nose (AA') is 4—5 cm;
- c) the width of the unfolded flap at the level of the fold (BB') is 7.5—8 cm.;
- d) the width of the unfolded flap at the lower margin (CC') is about 9 cm.

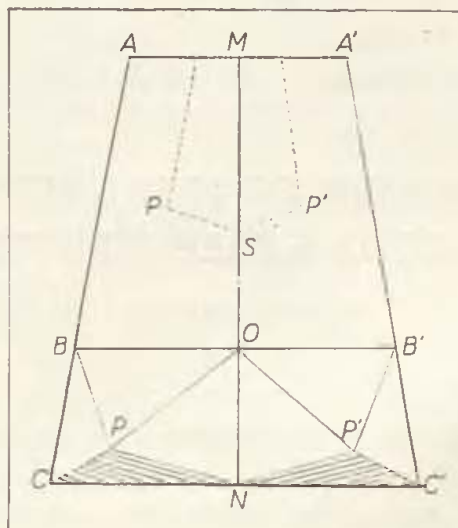


Fig. 1. Diagram of the unfolded skin flaps for the reconstruction of the nose (for explanation see text).

The distance of MN and BB' corresponds to the standard anthropomorphological measurements plus 1—2 cm. to allow for secondary shrinkage. The distance AA' is always taken larger than necessary, because the temporary maintenance of this width guarantees a better blood supply to the nose. Later, when correcting the shape of the nasal root, the superfluous tissue is excised.

The triangles OND and OND' in the unfolded flap as depicted in the diagram, correspond to the sides of the nasal septum, and the length ND and ND' to its height.

The quadrangles OBCD and O' B' C' D' represent the skin sections with which the inner surface of the alae is lined. The triangles CDN and C' D' N' are excised which results in a lengthening of the lower margin of the flap and facilitates the adherence of the inner lining to the inner surface of the alae.

The operation starts with the removal of the superfluous parts of the tubed flap. The length of the tube, which serves for the reconstruction of the nose, is given in practice by the distance between the nasal root and the skin crease below the lower lip. If we assume the sum of the length of the nose and the height of the septum to be that of the distance between the nasal root and the oral fissure then, disregarding the shape of the face (for the time being), the additional length of the unfolded flap of 1.5 to 2.0 cm. below the oral fissure, always provides enough material for the moulding of the nose, even if secondary retraction has to be compensated.

Two side incisions mark the outer limits of the nose (Fig. 2). Both incisions form a trapeze the smaller ends of which, situated at the root of the nose, measures 1.5 to 2.0 cm. and the larger, the base, never more than 3.5 cm. The lower end of each incision is slightly forked (according to Vasilyev and Rudko) which facilitates affixing the alae. The incision for affixing the nasal septum starts at the bottom of the piriform aperture and ends somewhat lower than the side incisions in harmony with the normal anatomical relations. The wound edges are made to gape for a width of 2 mm.



Fig. 2.



Fig. 3.



Fig. 4.

Fig. 2. Diagram of the basic incisions for affixing the nose and the formation of the tongue-like flap. The hatched triangular section next to the tongue-like flap is excised. — Fig. 3. The tongue-like flap and the unfolded skin for reconstruction of the nose have been prepared. Only the parts of the skin designated for the reconstruction of the alae and the septum, have been completely stripped of fat. — Fig. 4. The tongue-like flap has been sutured to the medial wound edges of the side incisions. By duplicating the unfolded flap along the line BB' (see Fig. 1) the alae and the septum are formed.

From the posterior aspect of the tube a tongue-like flap 1.5 cm. wide and never more than 4.5 cm. long is formed with a nutritive pedicle at the base of the tube. The incisions for this flap run as a prolongation of the side incisions in the face. The flap is not stripped of its fat in order to avoid formation of a residual cavity in the upper parts of the nose. The lateral margins of the tongue-like flap are then sutured to the medial wound edges of the side incisions in the face. The lower edge of the flap remains free for the time being (Fig. 3).

From the posterior aspect of the tube a triangular section of skin with its point directed distally and its base towards the nasal root, is also excised. Then the tube is flattened out. The tongue-like flap is cut from a part of the tube which in all other methods is left unused (Fig. 2). Only the parts of the unfolded flap which are designed for the reconstruction of the alae, the tip of the nose and the septum are completely stripped of their fat. In the proximal parts of the unfolded

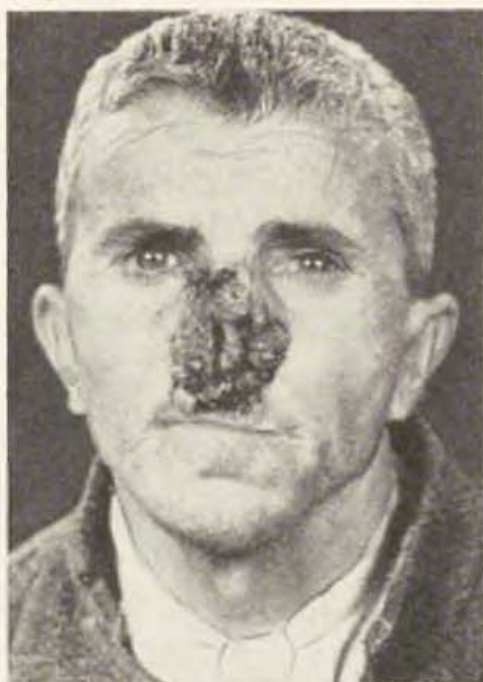


Fig. 5.



Fig. 6.

Fig. 5. Patient G. G. on admission to the Clinic. Rodent ulcer of the nose, upper lip and surrounding tissues. — Fig. 6. Side view of the same patient after radical excision of the tumour. Total loss of nose, upper lip and partial loss of the anterior aspect of the face.



Fig. 7.



Fig. 8.

Fig. 7. Filatov flap, about 30 cm. long, sutured into the region of the glabella. — Fig. 8. The missing parts of the face are reconstructed from the lower parts of the tubed flap thus forming the foundation for the construction of the nose.



Fig. 9.



Fig. 10.

Fig. 9 and 10. The basic lines of incision in the foundation and the tube are marked with a pencil.



Fig. 11.



Fig. 12.

Fig. 11 and 12. Three months after completing reconstruction of the nose and implantation of the cartilagenous skeleton.



Fig. 13.



Fig. 14.

Fig. 13. Patient R. T. Total loss of the nose. — Fig. 14. Patient R. T. after reconstruction of the nose.



Fig. 15.



Fig. 16.

Fig. 15 and 16. The same patient after implantation of the cartilagenous skeleton.



Fig. 17.



Fig. 18.

Fig. 17 and 18. Patient G. Kh. Subtotal defect of the nose following lupus.



Fig. 19.



Fig. 20.

Fig. 19 and 20. The same patient after reconstruction of the tip of the nose. The patient refused further correction and implantation of cartilage.

flap, which come to lie on the tongue-like flap, a thin layer of fat is left in order to avoid the formation of a residual cavity.

The moulding of the nose starts with making a skin duplication along the line BB'. This duplication serves to supply the material for the septum and the inner lining of the alae (Fig. 4). The septum is then sutured to the gaping wound edges of the middle incision and the inner lining of the alae to the medial wound edges of the side incisions. The free edges of the duplication (CD and C' D') are sutured to the free edges of the tongue-like flap. By this method the whole inner surface of the nose is covered with skin. When suturing the alae and the septum, small incisions are made at the points B, N and B' into which the little triangles previously made at the lower points of the three facial incisions, are placed and fixed by sutures.

The cartilagenous skeleton is never reconstructed earlier than two months after the first operation. For this the author uses the method described by Khitrov.

In conclusion, it may be said that the modification described above, apart from guaranteeing a better blood supply to the inner skin lining of the nose, has the advantage of providing the possibility for reconstruction of the nose from a shorter tubed flap.

In the following, three defects of different extent are reported, in which reconstruction of the nose has been effected by the above described method:

C a s e 1. G. G., casepaper 3876/57 (Fig. 5 to 12). Extensive defect of the nose, upper lip and parts of the anterior aspect of the face resulting from the radial excision of a malignant tumour. For the reconstruction of the missing parts of the face and the nose a long Filatov flap was prepared. In the first stage the anterior aspect of the face and the upper lip were reconstructed from parts of the tubed flap. A few weeks later the nose was constructed on this newly created foundation.

C a s e 2.. R. T., casepaper 2207/58 (Fig. 13 to 16). Total loss of the nose following lupus and X-ray treatment for malignant degeneration. The nose was reconstructed by the method described above.

C a s e 3., G. Kh., casepaper 3753/59 (Fig. 17 to 20). Subtotal defect of the nose as a result of lupus. In the first stage the nasal apertures had to be widened. In the second stage the missing parts of the nose were reconstructed from a Filatov flap. The patient refused implantation of the cartilagenous skeleton.

S U M M A R Y

1. The described modification provides the best possible blood supply to the inner skin lining of the nose.

2. The length of the tubed flap necessary for the reconstruction of the whole nose never exceeds 10 cm.

3. The nose acquires a better appearance if only the parts of the tubed flap, which are to form the septum and the alae are stripped of their fat.

ВЫВОДЫ

К тотальной ринопластике обезжиренным филатовским стеблем

В. Кавракиров

1. Предложенная модификация обеспечивает полноценное питание задней кожной оболочки носа.
2. Длина стебля, идущая на формирование целого носа, никогда не превышает 10 см.
3. Нос получается лучше, если обезжирим полностью только ту часть стебля, которая идет на формирование перегородки и крыльев носа.

RÉSUMÉ

Contribution à la question de la rhinoplastie totale à l'aide du lambeau de Filatov, dépourvu de tissu adipeux

V. Kavrakirov

1. La modification indiquée réalise une alimentation adéquate de la couverture cutanée postérieure du nez.
2. La longueur totale du lambeau qui va former le nez entier ne dépasse pas 10 cm.
3. Le nez se forme plus facilement si le tissu adipeux a été entièrement enlevé de ces parties du lambeau qui vont former la cloison et les ailes du nez.

ZUSAMMENFASSUNG

Zur Frage der totalen Rhinoplastik mittels Filatovschen, vom Fettgewebe befreiten Lappens

V. Kavrakirov

1. Die angeführte Modifikation sichert eine vollwertige Ernährung der hinteren Nasen-Hautdeckung.
2. Die Länge des Lappens, aus welchem die Nase geformt wird, übersteigt nicht 10 cm.
3. Die Nase wird leichter dargestellt, soweit das Fettgewebe aus jenen Lappenteilen entfernt wird, aus denen die Nasenscheidewand- und Flügel geformt werden.

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FREE SKIN GRAFTING IN THE FACE WITH STANDARDIZED PRESSURE

N. I. YARCHUK

A total of 987 free skin transplantations by various methods and for various skin affections of the face, were performed at the Maxillofacial Unit of the Leningrad Scientific Research Institute for Traumatology and Orthopaedics and the State Postgraduate Medical School, during the period between 1919 and 1959.

The basic indications for free skin grafting were the following:

1. Scar deformities of the face after burns, and other injuries, totalling 757;
2. Congenital affections of the facial skin such as naevi and moles, etc., totalling 173;
3. Other conditions, such as covering of granulating areas, reconstruction of auricles, totalling 57.

Tab. 1 shows a classification of skin grafts according to the method of transplantation used:

Tab. 1.

Method of Transplantation	Number of trans- plantations performed	
Full-thickness free skin grafts	638	63.5%
Free split skin grafts	290	30.5%
Free grafts of hair-bearing skin	59	6.0%
Total	987	100.0%

Transplantation of skin of partial thickness, so-called "split skin grafts", taken by means of a razor or special instrument, i. e. dermatome, were mostly used for the repair of scar ectropion of the eye lids and for the covering of granulating areas after burns or other trauma, or after unsuccessful operations.

A total of 59 grafts of hair-bearing skin were transplanted for the reconstruction of eye brows.

The preference for the use of full-thickness free skin grafts is explained by the experience that the skin cover thus produced is the best with regard to both

the cosmetic and the functional results, which is particularly important in reconstructive surgery of the face.

Free full-thickness skin grafts are prone to nutritional disorders and, therefore, are accompanied by more complications, a feature which makes many surgeons give preference to free split skin grafts.

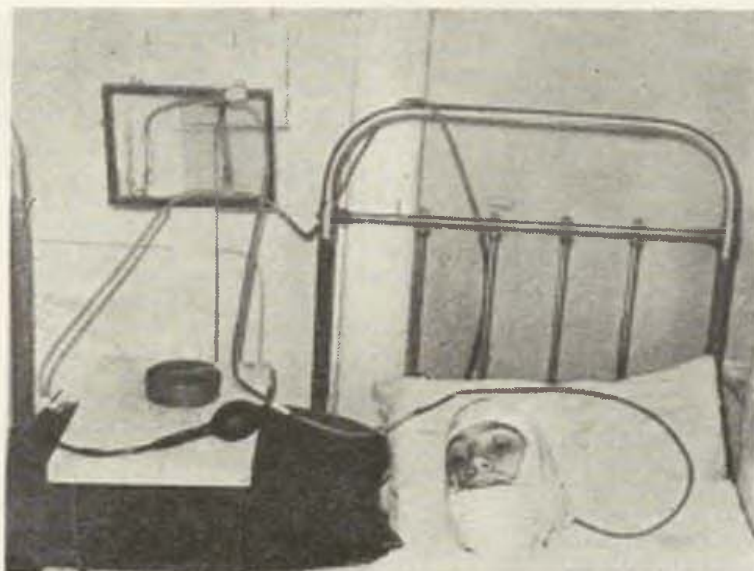


Fig. 1a. Gadget for applying even and standardized pressure within the bandage:

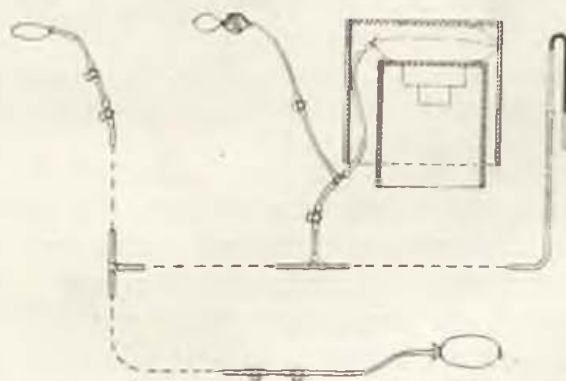


Fig. 1b. Diagram of gadget.

An important condition for the take of free skin grafts is the close contact of the graft with the recipient bed. For this purpose various fixation bandages have been recommended, the aim of which is to apply pressure to the graft so that it adheres closely to the floor of its bed.

The fixation bandage for the face after skin grafting is of the utmost importance because the rich blood supply and the particularly free mobility of the facial tissues increase the danger of haematomas forming under the graft, impairing the conditions for its take.

In grafting of full-thickness or hair-bearing skin a bandage with standardized pressure of 25—300 mm. Hg has been used at the Clinic since 1927.

The even and standardized pressure of the bandage is effected by a very simple gadget. It consists of a rubber cushion filled with air and connected by a system of rubber tubes with a mercury manometer and a rubber balloon fixed



Fig. 2a. Patient with capillary haemangioma of the right side of the face.



Fig. 2b. The same after replacing the affected skin by free skin grafts.

to the site of transplantation by means of a bandage. A weight is placed on the oxygen cushion to create the necessary pressure within the cushion which can be measured with the manometer. The same pressure is then transmitted to the rubber balloon fixed to the site of transplantation (Fig. 1).

Full-thickness skin grafts are cut by hand with a scalpel to the depth of the subcutaneous tissue, preferably from the medial aspect of the arm.

The size and shape of the graft is chosen according to that of the defect with the exception of transplantation in the region of the eye lids and lips where the grafts undergo considerable secondary shrinkage and it is, therefore, necessary to take a graft whose size corresponds to that of the wound surface stretched to its maximum in the transverse direction.

When performing a free-skin transplantation on the lower lip, the author deems it indispensable to use a support for the implanted graft. This is effected by a special and individually made splint fixed to the teeth of the lower jaw, consisting of a flat support for the graft in its anterior portion and of feeding holes at the sides.

The application of a bandage with even and standardized pressure is particularly important in transplantation in the mobile parts of the face, such as the lower lip, cheek and neck or when covering the bleeding wound surface with a free graft after excision of a haemangioma and also in grafting hair-bearing skin.

Hair-bearing skin must be transplanted with a thin layer of subcutaneous tissue containing the deep hair roots. This, however, impairs the take of the graft and for the best possible healing it is, therefore, necessary to create conditions which guarantee the closest contact of the graft with its bed.

Evaluation of the take of a transplanted graft is carried out by the following scale:

1. Good result: full take without maceration of epithelium.
2. Satisfactory result: small areas of skin necrosis.
3. Unsatisfactory result: area of the necrosis exceeding 30% of the surface of the graft.
4. Sloughing of the entire graft.

The results of grafting of full-thickness and of hair-bearing skin using even and standardized pressure are given in Tab. 2.

Tab. 2.

Free grafts	Results				
	good	satisfactory	unsatisfactory	total slough	Total
1. Full-thickness skin grafts	518 81%	95 15%	19 3.1%	6 0.9%	638 100%
2. Free graft of hair-bearing skin	96%		4	2	59

The author's results from full-thickness free skin grafting, which are estimated as good or satisfactory in 96%, permit the conclusion to be drawn that the application of a bandage with even and standardized pressure for such operations in the face is of considerable practical advantage.

Fig. 2 shows patient before and after free skin grafting.

SUMMARY

1. Of all methods of transplantation of free skin grafts in the face, full-thickness free skin grafts are used preferably, because they give a skin cover which is by far the best both with regard to function and appearance.

2. To ensure close contact of the transplant with its recipient bed, which is indispensable for its take, the author recommends a bandage with even and standardized pressure.

3. The use of a bandage with even and standardized pressure is particularly important in transplantation of skin to the mobile parts of the face, such as the

lower lip, cheeks, neck, and also when covering the bleeding surface after the excision of an haemangioma.

4. The use of a bandage with even and standardized pressure gives 96% good and satisfactory results for full-thickness free skin grafts implanted in the face.

ВЫВОДЫ

Свободная пересадка кожи на лице под нормированным давлением

Н. И. Ярчук

1. Из всех способов свободной пересадки кожи на лице преимущественное применение имеет свободная пересадка кожи всей толщей, т. к. создаваемый этим способом кожный покров является наиболее совершенным в косметическом и функциональном отношении.

2. Для достижения тесного соприкосновения кожных трансплантатов с раневой поверхностью, что необходимо для приживления кожи, рекомендуем применять повязки с постоянным нормированным давлением.

3. Применение повязки с постоянным нормированным давлением является особенно важным при пересадке кожи на такие подвижные участки как нижняя губа, щеки, шея, а также при закрытии кровоточащих поверхностей после иссечения гемангиом.

4. Применение повязки с постоянным нормированным давлением дает 96 % приживления свободных лоскутов кожи всей толщей при пересадке на лице.

RÉSUMÉ

Grefte libre de la peau faciale sous pression réglée

N. I. Yartchouk

1. De toutes les méthodes de greffe cutanée faciale libre, c'est la greffe libre de la peau dans son épaisseur entière qui est la plus appropriée, car la couverture cutanée ainsi obtenue est la plus parfaite du point de vue fonctionnel et cosmétique.

2. Pour réaliser un contact étroit entre le greffon et la surface de la plaie, ce qui est indispensable pour obtenir une bonne cicatrisation de la peau, nous recommandons d'employer un pansement dont la pression sera constamment réglée.

3. L'emploi d'un pansement à pression constamment réglée est surtout important s'il s'agit de greffes de la peau en des endroits d'une grande mobilité, tels que la lèvre inférieure, la figure, le cou et aussi s'il faut couvrir la plaie sanglante après excision d'un hémangiome.

4. Après emploi de pansements à régulation permanente de la pression, la cicatrisation des lambeaux libres de la peau entière, greffés sur la figure, s'effectuait dans 96% des cas.

ZUSAMMENFASSUNG

Freie Hauttransplantation in das Gesicht bei Anwendung eines Verbands mit gesteuertem Druck

N. I. Jartschuk

1. Von allen Arten der freien Hautübertragung ins Gesicht kommt der freien Transplantation von Haut in ihrer ganzen Schichtdicke die grösste Bedeutung zu, da das so erzielte Resultat in funktioneller wie auch in kosmetischer Hinsicht am vollkommensten ist.

2. Der Verfasser empfiehlt die Verwendung eines Verbands mit konstant gesteuertem Druck, um den für die Anheilung der übertragenen Haut unerlässlichen engen Kontakt der Hauttransplantate mit der Wundfläche zu erzielen.

3. Die Anwendung des Verbands mit konstant gesteuertem Druck ist von besonderer Wichtigkeit für die Hauttransplantation an derart bewegliche Orte wie die Unterlippe, die Wange, den Hals, aber auch für die Deckung der blutenden Wundfläche nach Exzision eines Hämangioms.

4. Bei Verwendung des Verbands mit konstant gesteuertem Druck fand bei Übertragung ins Gesicht eine Anheilung frei transplanterter Hautlappen mit Haut in ihrer ganzen Schichtdicke in 96% der Fälle statt.

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EINE NEUE METHODE ZUR SENSIBILITÄTSPRÜFUNG REPLANTierter FINGERGLIEDER

J. LADÁNYI, R. KÓS

An der oberen Extremität treten die Fasern des Sympathikus hoch oben im zervikalen Bereich in den plexus brachialis ein und ziehen gemeinsam mit den sensorischen Nervenfasern zur Peripherie. Deshalb geht der Verlust der Hautsensibilität und des Tastsinnes an der Hand stets mit dem Ausfall der sudomotorischen Funktion einher. Folglich wird durch den Nachweis der sudomotorischen Funktion der Finger gleichzeitig die sensible Nervenversorgung der Hand dargestellt. Als erster hat Moberg den Nachweis der sudomotorischen Funktion, — in erster Reihe das Fingerabdruckverfahren mittels Jod-Stärke und Ninhydrin, — zu Sensibilitätsprüfungen an der Hand benützt.



Abb. 1.

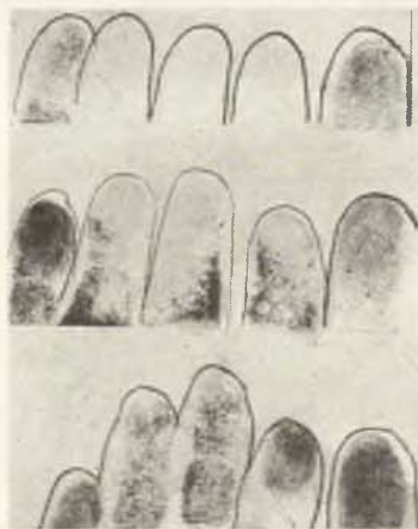


Abb. 2.

Abb. 1. Dieser Abdruck zeigt am Gebiet des Medianus eine normale sudomotorische Funktion. Am beschädigten Gebiet des Ulnaris ist kein Abdruck zu finden. — Abb. 2. An diesem Bild sind die oberen N. Abdrücke infolge Handtellernervenbeschädigung am zweiten, dritten und vierten Finger leer geblieben. Die mittleren Abdrücke zeigen vier Monate später fortgeschrittene Regeneration. Die untere Reihe zeigt 7 Monate später die fast vollkommene sudomotorische Funktion.

Mit der Ninhydrin-Fingerabdruckmethode bezweckt man, die an der Haut der Fingerkuppen vorhandenen Schweissdrüsenausführungsgänge als gefärbte Pünktchen darzustellen.

Anfangs wurde das die Fingerabdrücke in sich bergende Papier, — mittels eines Spray-Apparates — mit dem Ninhydrin enthaltenden Reagens bespritzt,



Abb. 3. Dieses Bild ist ein Beispiel des auf dem Filatovschen Lappen wiederkehrenden sudomotorischen Regeneration. Am N. Abdruck sind die Schweissdrüsenausführungspunkte unregelmässig.



Abb. 4. Dieses Bild zeigt uns die Hand eines neunjährigen Kindes, das sich vor 7 Jahren mit einem Beil die Nagelkuppe vom Zeigefinger und das mittlere Glied vom dritten Finger abgehackt hat. Die replantierten Fingerteile zeigen fast normalen Abdruck.

nachher wurde das Papier bei 120° C etwa 3—4 Minuten erwärmt. Nun sind die abgesonderten Aminosäuren in Form eines violettfarbigen Fleckes zum Vorschein gekommen.

Wir haben das Verfahren von Oden-Hofstein-Moberg noch weiter vereinfacht, indem wir die ausgetrockneten Papierstücke noch vor dem Gebrauch

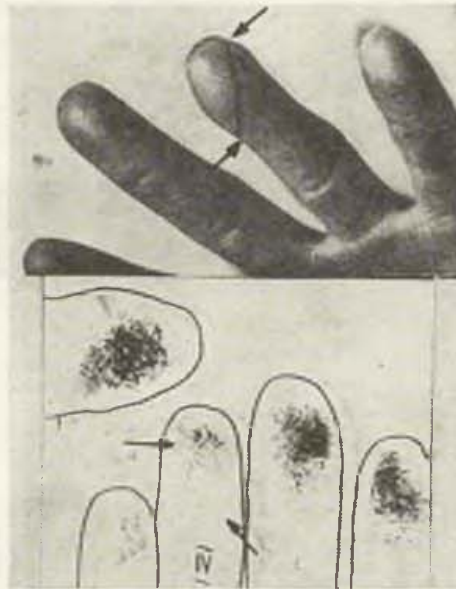


Abb. 5. Das Bild zeigt den Ringfinger eines 31 jährigen Mannes, dessen Fingerkuppe wir vor einem Jahr replantiert haben. Der Abdruck zeigt jetzt gute sudomotorische Funktion.

mit dem das Ninhydrin enthaltenden Reagens impregniert haben. Dadurch wurde uns das Ablesen der Resultate nach ein paar Minuten Erwärmung immer ermöglicht.

Nach der Verletzung von peripheren Nerven, in denen sympatische und sensible Fasern gemeinsam verlaufen, kommen diese Punkte an den Papierabdrücken nicht zum Vorschein (Abb. 1). Einige Monate nach einer gelungenen Nervennaht erscheinen allmählich, — zuerst nur spärlich, dann immer dichter, — diese Punkte gleichlaufend mit der Rückkehr der Innervation und der Funktion des n. sympathicus. (Abb. 2.)

Demgegenüber kommen im Bereich von frei überpflanzten dünnen Epidermisläppchen und im Bereich von überkreuzten Hautläppchen die Schweissdrüsenöffnungen als spärlichere und unregelmässige grössere Punkte zum Vorschein (Abb. 3), die Sensibilität bleibt ebenfalls reduziert. Moberg nimmt an, dass in die frei überpflanzte Haut neue Sympathikusfasern mit neuen Gefässen zu den denervierten Schweissdrüsen hineinwachsen, infolgedessen muss in freien Hauttransplantaten die Sensibilität und die Schweissabsonderung nicht parallel verlaufen.

In Kenntniss dieser Grundbegriffe haben wir an unseren Patienten mit replantierten Fingergliedern die Rückkehr der sudomotorischen und sensiblen

Nervenfunktionen ins Auge gefasst. Es konnte vorausgesetzt werden, dass regelmässige Fingerabdrücke nach einer gelungenen Nerven-naht das Zeichen einer Regeneration der sympathischen und sensiblen Funktionen sind, finden sich aber unregelmässige sudomotorische Punkte an den Abdrücken vor, so kann die Reinnervation der replantierten Fingerteile mit dem Typ der freien Hauttransplan-

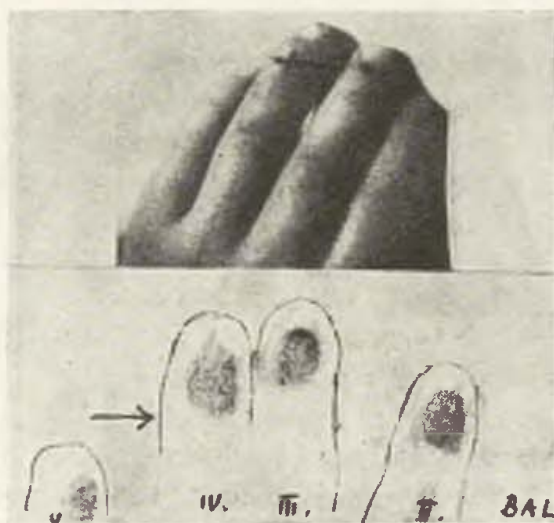


Abb. 6. Das Bild zeigt uns den Abdruck von einem 4 jährigen Kinde, bei dem am Ringfinger vor 3 Wochen die Replantation durchgeführt wurde.

tate verglichen werden. Als Kontrolle und Ergänzung wurde die Webersche Zweipunkt Diskriminationsprobe und die Moberg'sche Aufleseprobe mit geschlossenen Augen ("the picking up test") benutzt.

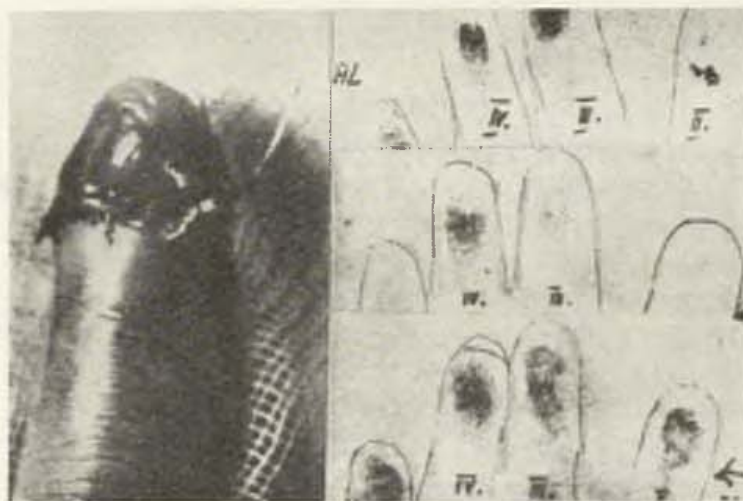


Abb. 7. Das Bild zeigt uns den Zeigefinger eines 12 jährigen Mädchens. 3 Tage nach der Replantation genommener Abdruck konnte noch überhaupt keine, an den Abdrücken 8 Tage nachher eine minimale, an der dreissig Tage nach dem Unfall erfolgten Kontrolle schon eine einwandfreie sudomotorische Funktion registriert werden.

Von den Autoren besitzt P r o f. L a d á n y i 52 replantierte Fälle, davon sind einige Replantationen an den Zehen erfolgt. Wir haben bei 12 Patienten mit an der Hand replantierten Fingerteilen Sensibilitätsuntersuchungen mittels der Ninhydrinabdruckmethode durchgeführt. In sämtlichen Fällen haben wir einheitlich dasselbe Ergebniss gewonnen, so dass wir als Beispiel nur 4 Fälle bekanntgeben.

In den Fällen, wo die Ninhydrin-Untersuchungen ein normales Ergebniss zeigten, haben die parallel durchgeführten W e b e r s c h e n Diskriminationsproben und die Mobergsche Aufleseprobe "the picking up test" ebenfalls eine funktionsfähige Sensibilität der Finger ergeben. Diese objektiven Sensibilitätsprüfungen der replantierten Fingerkuppen beweisen also, dass in die wieder eingepflanzten Fingerglieder die Sensibilität und die sudomotorischen Funktionen so wie bei gelungenen nn. digitalis nähten und nicht wie bei den freien Hautüberpflanzungen, zurückkehren. Durch diese Tatsache kann der funktionelle Wert der Replantationen an der Hand höher bewertet werden.

ZUSAMMENFASSUNG

Verfasser haben zur Durchführung der O d é n - H o f s t e i n - M o b e r g Ninhydrin-Fingerabdruckmethode ein schnelles Verfahren ausgearbeitet. Die Fingerabdrücke werden auf in vorherein impregnierte Papierstücke aufgenommen und nach einer Erwärmung von etwa 15—20 Sekunden kann man die Ergebnisse sofort ablesen. Mit dieser Methode kann die sudomotorische Tätigkeit der Hand und parallel damit auch die Sensibilität objektiv geprüft werden, — wie dies die Arbeiten von M o b e r g erwiesen haben. Wir haben mit dem bei uns angewandten "ninhydrin printing test" 12 Patienten, bei denen eine Fingergliedreplantation vorgenommen wurde, einer Kontrolle unterzogen. Diese Untersuchungen haben uns über die Späterfolge der replantierten Fingerteile hinsichtlich der Rückkehr der sudomotorischen Tätigkeit und der Sensibilität Aufschluss gegeben. Bekanntlich geht die Rückkehr der sudomotorischen Tätigkeit und der Sensibilität nach der Regeneration von Fingerverletzungen parallel einher. Demgegenüber kehren im Falle von freien Hautüberpflanzungen diese beiden Funktionen nicht gleichlaufend zurück und an den Abdrücken sind die sudomotorischen Punkte ungleichmässig verteilt. Wir konnten mittels dieser objektiven Methode bei den 12 Fingergliedreplantationsfällen feststellen, dass die Rückkehr der sudomotorischen und sensiblen Funktionen gleichlaufend vor sich geht und dass die erreichte Reinnervation einen hohen funktionellen Wert besitzt. Die gleichzeitig durchgeführten W e b e r s c h e n Diskriminationsproben und der M o b e r s c h e "picking up test" haben die Ergebnisse der Ninhydrinuntersuchungen vollauf bestätigt.

ВЫВОДЫ

Новый метод исследования чувствительности приживленных фаланг пальцев

J. L a d á n y i, R. K ó s

Авторы разработали модификацию ускоренного получения оттисков пальцев с помощью нингидрина по методу Оден—Гофштейн—Моберга. Оттиски пальцев снимались на заранее импрегнированную бумагу и после нагревания ее в течение 15—20 секунд можно

было тотчас же произвести оценку результатов. При помощи этого метода можно произвести объективное исследование потоотделения на руке, а вместе с тем исследовать и чувствительность, как это было доказано работами Моберга. Авторы проверили, применив „ninhydrin printing test“, состояние у 12 пациентов, у которых была произведена реплантация фаланг пальцев. Эти опыты пояснили нам поздние результаты приживления фаланг пальцев в отношении восстановления потоотделения и чувствительности. Как известно, восстановление потоотделения после регенерации ранений пальцев происходит параллельно с восстановлением чувствительности пальцев. Обе эти функции в случае применения свободных кожных трансплантатов не восстанавливаются параллельно и на оттисках точки потоотделения бывают разбросаны нерегулярно. Посредством этого объективного метода авторы установили в 12 случаях приживления фаланг пальцев, что восстановление потоотделительной функции происходит параллельно и достигнутое восстановление иннервации в функциональном отношении является высококачественным. Произведенные одновременно различительная проба Вебера и „the picking up test“ Моберга вполне подтвердили результаты проб с помощью нингидрина.

SUMMARY

A New Method for Examining Sensitivity of Reimplanted Phalanges

J. Ladányi, R. Kós

The authors have elaborated a rapid method for carrying out the ninhydrin printing test according to Odén, Hofstein and Moberg. The finger prints are made on impregnated paper and the result may be registered after 15 to 20 seconds' warming. As was proven by Moberg, the sudomotor function and, at the same time, also the sensitivity of the hand, can be examined objectively by this method.

The authors tested the method on 12 patients, in whom reimplantation of phalanges had been performed. These experiments supplied information about the sudomotor function and sensitivity and are suitable for evaluating the late results after reimplantation of phalanges. As is well known, in the process of regeneration after finger injury, sudomotor function returns together with sensitivity. After free skin grafting the return of these two functions does not take place simultaneously, and the sudomotor points in the finger prints are scattered irregularly.

Using this objective method in 12 cases of phalanx reimplantation the authors ascertained that the reappearance of both the sudomotor function and the sensitivity takes place simultaneously and that the reinnervation achieved has a high functional value. Weber's "differentiating test" and Moberg's "picking-up test", carried out at the same time, fully confirm the results of the ninhydrin printing test.

RÉSUMÉ

Une nouvelle méthode pour le test de sensibilité des phalanges greffées

J. Ladányi, R. Kós

Les auteurs ont mis au point une modification de la méthode d'Odén-Hofstein-Moberg qui permet de réaliser rapidement des empreintes digitales à la ninhydrine. Les empreintes digitales se font sur des papiers imprégnés d'avance et, après les avoir chauffés 15—20 secondes, on peut lire immédiatement les résultats. Par cette méthode, on peut évaluer objectivement l'activité sudomotrice de la main et ainsi en même temps la sensibilité, ce qui a été démontré par les travaux de Moberg. Nous avons contrôlé ainsi 12 malades, où le "Ninhydrin printing test" a été utilisé après transplan-

tation des phalanges. Ces essais nous ont permis de nous rendre compte des résultats tardifs des greffes des phalanges en ce qui concerne le rétablissement de l'activité sudomotrice et de la sensibilité. On sait que l'activité sudomotrice se renouvelle parallèlement à la régénération de la sensibilité des doigts blessés. Ces deux fonctions ne se rétablissent pas parallèlement dans les cas des greffes cutanées libres et sur les empreintes, la répartition des taches sudomotrices est irrégulière. A l'aide de cette méthode objective, nous avons pu constater que, dans les 12 cas où des phalanges avaient été greffées, le retour de la fonction sudomotrice a lieu parallèlement et la reinnervation présente une valeur fonctionnelle élevée. L'application simultanée de l'épreuve de différenciation de *Weber* et du "picking up test" de *Moberg* ont entièrement confirmé les résultats de l'épreuve à la ninhydrine.

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VOLKMANN'S ISCHAEMIC CONTRACTURE

Notes and suggested operation

J. VEJVALKA

Volkmann's contracture starts suddenly with an acute pathological process which rapidly causes a certain degree of damage. This damage becomes stabilized in the further course of the disease. Incorrect treatment, however, may cause further damage on the basis of the former changes.

The onset and course of the disease is characterized by two stages: the period of the acute onset and that of chronic changes. The acute stage starts with trauma which — under well known circumstances — is followed by immediate ischaemia leading to pathological changes which seriously affect the viability of the tissue. Clinically, this is mainly characterized by acute pain lasting for many hours. Irreparable damage develops already after four to six hours.

The period of chronic changes can also be divided into two stages. The first stage comprises the completion of the destructive process, i. e. necrobiosis of tissues, followed by degenerative processes and scar formation, and on the other hand, by partial spontaneous restoration of the milieu interne and partial recovery of muscles and nerves. This stage lasts many months. The second stage of the chronic period is that of permanent changes.

Volkmann's ischaemic contracture $\begin{cases} \text{acute stage} \\ \text{chronic stage} \end{cases}$ $\begin{cases} \text{partial recovery} \\ \text{final stage of perm. changes} \end{cases}$

This division is based both on the course of the disease and on the analysis and delimitation of the final stage.

Some patients have been followed up for many years and the final stage is also well known from the conditions found in reconstructive operations.

In the final stage following the most severe acute changes and subsequent inadequate treatment, the findings on operation show great damage to all structures. The losses in soft tissue, mainly of the muscle belly, may be so great that the skin, particularly on the volar aspect of the forearm, only covers bone, although small remnants of muscle tissue are sometimes found near the elbow. Frequently, even the muscles of the dorsal aspect are not much bigger. On the volar aspect a broad scar running across the forearm and firmly adherent to bone, can often be found. The subcutaneous tissue, if preserved at all, thereby

permitting movement of the skin, is sparse, atrophic, thin, poorly supplied with blood, and its connective stroma is inelastic, showing thin and rigid strands. The soft elastic tissue, normally found in the depth around each structure has disappeared altogether or may be found in this layer only around the vessels and nerves. In lieu of muscles there are bands of connective tissue having the same appearance as that of the threadbare tendons, so that distinguishing between them becomes quite impossible unless some muscle fibres with partial capacity for contraction, have remained preserved. Around these bands, thin, rigid and taut threads of connective tissue of varying thickness may be separated on dissection which roughly maintains the direction of the former muscle fibre bundles. Where at least parts of muscle with some contracting power have been preserved, the tendons, too, are in better condition and appear as long cords traversing the length of the forearm. The degree of adherence of the tendons to their surroundings depends upon the extent to which the muscle has been exercised.

The median and ulnar nerves are flattened out into thin ribbons, and are sometimes also threadbare and thus difficult to distinguish from other structures; they are often only discernible by the different colour imparted to them by the preserved central vessels.

This severe pathological condition is in keeping with the clinical picture which is generally known. The loss in soft tissue of the volar aspect makes it possible to palpate the bones along the whole length of the forearm. Considerable atrophy of the extensor muscles causes loss in tissue, resembling the ischaemic loss on the volar aspect.

The resting position of the contracted hand is characterized by hyper-extension of the proximal phalanges of digits II to V, flexion of the middle phalanges of digits II to V, and fixed flexion of the wrist joint. The thumb with its metacarpal adducted and the terminal phalanx flexed, has lost the capacity for opposition. Active movements are but rudimentary. Severely limited passive movements in all joints and the loss of sensation in the fingers completes the picture of the condition following severe ischaemic changes.

The condition described above is that following the most severe changes. By a detailed analysis of the pathology and the clinical picture of this condition we arrive at the conception of the complex nature of the individual signs. At the same time it becomes evident that one group of changes takes its origin in the ischaemic process itself whilst the other, though connected with and dependent on the former, has its origin elsewhere. The first group of symptoms may differ in degree and quality according to the pathological process and the mechanism of the injury, i. e. whether ischaemia was caused by a gunshot wound, fracture through impact or torsion, through obstruction of blood supply by pressure from within (oedema) or outside (bandage) etc. The second group cannot be understood on the basis of the original acute process only, i. e. the injury and the ischaemia, but by other mechanisms developing in the course of healing and manifested in the chronic stage. Whether this will develop or not depends only on the conditions and circumstances of the reparation and

regeneration of tissues with reversible damage, and on undamaged tissues. This, therefore, does not belong to the actual picture of the disease.

For better orientation it is possible to divide the signs according to the structures affected, into the following five groups:

- a) contracture of muscles affected directly
- b) ulnar nerve palsy
- c) median nerve palsy
- d) joint stiffness
- e) atrophy of the remaining, originally not affected muscles.

The latter two groups are added for practical purposes only. They do not belong to the disease proper. Joint stiffness is not at all characteristic of Volkmann's contracture. The basic pathological process gives no cause for atrophy and fibrous degeneration of the soft articular capsules to reach such a degree that joint stiffness develops.

Both these groups of changes develop in the later reparative stage. In the acute stage not only the anatomical structure of the extremity as a whole but also the functional entity of the motor stereotypes, are disrupted. Not only are anatomical losses caused by the acute process, but also the functional associations show such gaps that, in the beginning, even the structures that have been preserved are almost completely functionally incapacitated. After the acute phase has subsided, unnecessarily protracted immobilization and the lack of early functional stimuli cause both the deterioration of the remnants of the affected structure and also their further atrophy, gradually leading to fibrous degeneration. Where atrophy has reached such a degree that the extremity is quite incapable of spontaneously regaining what is left of its mobility even gradually, and if no rehabilitation is available, even completely healthy structures undergo the same changes. The fine tissue between the structures, which makes movement possible, loses its elasticity and becomes rigid through fibrosis. The extensor and small muscles of the hand atrophy and the soft joint capsules become rigid. The reparative stage, where the capacity for restoration is preserved for many months, passes unutilized leading to the irreparable changes of the final stage. The only possibility of saving the muscle tissue, the elastic elements in the connective bundles, the interstitial tissue and the soft joint capsules, is by functional stimulation. Without this nothing can be saved. Rehabilitation, i. e. functional treatment, is of the utmost necessity at this stage. Rehabilitation is the modern remedial instrument and only by its application can a real response of the tissues, i. e. functional regeneration of organs, be expected. It not only brings about the preservation of the remnants of both the damaged and the intact, healthy structures but also leads to the formation of some new, functionally potent fibres based on the regeneration of capillaries and nervous connections. Rehabilitation is capable of preventing secondary changes derived from atrophy and degeneration and thus also joint contractures and the deterioration of unaffected muscle, i. e. changes which should never be permitted to become permanent.

Therefore, only the first three groups can, at the utmost, be regarded as the direct consequence of the acute process, and even here it may sometimes be questioned whether the nerve damage of the final stage was not based on an originally transient change, capable of nerve fibre regeneration, which did not materialize for lack of suitable conditions. Bearing in mind that nerves are

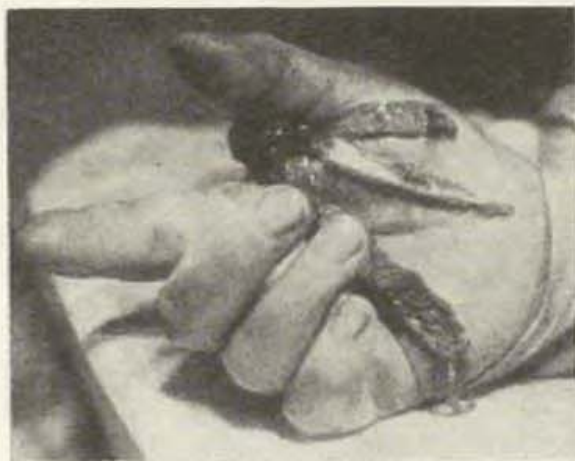


Fig. 1.



Fig. 2.

Fig. 1. Patient M. B., injury prior to treatment. — Fig. 2. Patient M. B., after healing and rehabilitation.

very sensitive to prolonged pressure caused by contracting tissue surrounding them, and that in other injuries neurolysis, if carried out correctly and early enough, is capable of restoring function of a completely paralysed nerve, these doubts are fully justified.

The fact that disorders of the nerve trunks in Volkmann's contracture are often only partial or even absent altogether, indicates that here, too, conditions may be analogous.

Complete median and ulnar nerve palsy represents one of the most severe pictures in Volkmann's contracture described hitherto. Mostly the sensory function has been preserved and the sensitivity of the fingers has remained intact or is, at least, adequate. Frequently, even signs of motor paresis are absent. Median nerve conductivity in its motor component has been preserved and the thumb is capable of opposition. If conductivity of the ulnar nerve has remained intact and the interosseal muscles have been well exercised, hyperextension of the basal phalanges does not develop and both flexion and extension of the fingers remain preserved though limited by the shortening of the muscles.

This gives the optimal picture of a least affected extremity. On operation it can be shown that in such cases changes in the flexor muscles of the fingers are the predominant or even the only finding. Part of the muscle tissue has been destroyed by ischaemia and the degenerative process. The loss in tissue is most marked in the distal portions of the muscle bellies, i.e. at the site where the muscle belly passes into the tendon. The destroyed muscle fibres, which had undergone necrosis, were probably resorbed and had disappeared

completely. Whereas muscle fibres had been resorbed a new section of the tendon was formed. This section takes its origin both from the tendinous elements of the solid tendon imbedded in the muscle and from the fan-like convergent fascial fibres denuded by the atrophy of their respective muscle fibre bundles. The fibres are drawn together and thus form a proximal prolongation of the tendon. The muscle has remained an anatomical entity but its belly has become shorter and the tendon longer. The actual shortening of the distance between the origin of the muscle and the insertion of the tendon is the direct consequence of the loss in the muscle tissue and the basic disorder causing the loss of function.

The variety in degree and picture of Volkmann's contracture is caused by the fact that not all flexor muscles of the fingers are affected equally. In the author's clinical material the deep layer of the muscles, i. e. the flexor digitorum profundus, was usually most affected. Slighter changes (and less shortening) were found in the superficial flexor muscles. The flexor pollicis longus or the deep flexor of the index finger are not shortened in every case.

Clinically, the sign of shortening is quite characteristic. With the wrist joint in the position of 180° or in hyperextension (over 180°), the fingers are flexed in all joints and can be extended neither actively nor passively. With the wrist joint in full volar flexion the fingers can be extended in all joints both actively and passively. Only when the shortening of muscles is very great, is it necessary to flex the metacarpophalangeal joints in order to be able to extend the interphalangeal joints.

This condition, with nerve function intact and joint movements limited only by the shortening of muscles, (though much less serious than that with nerve palsy and joint stiffness described above), is, nevertheless, a serious handicap to the patient so that he either uses the hand very little or not at all.

For this degree of ischaemic contracture of the flexor muscles various methods of surgical correction have been suggested, among these three main operations which are being performed with varying success.

The least favourable results are given by the oblique or stepwise tenotomy carried out at the site of origin of the tendon from the muscle belly. The author thinks this operation ought already to have been abandoned because it contravenes one of the basic principles of the surgery of tendons that no cut tendon fibre should ever be left uncovered. In these operations the entire cut surface of the tendon remains denuded. The tendon fibre is extremely capable of regeneration and on growing takes hold of anything in its vicinity. Thus massive adhesions develop rapidly which cannot be loosened by any rehabilitation procedure.

In another method an attempt to achieve relative lengthening of the flexor muscles is made by shortening the forearm bones. Shortening of bones by operation is in itself one of the most difficult chapters of surgery. When carried out in a condition such as Volkmann's contracture, shortening of the forearm bones brings about a much greater disproportion between the length of the flexor and that of the extensor muscles. The extensor muscles must, therefore,

either be shortened, too, or else their spontaneous shrinkage through the inadequate usage of their contracting power must be relied upon, i.e. their deterioration must be taken into account. The results of these operations are not at all encouraging.

At the present time the method of transposing of the muscle origin distally is being elaborated, and, according to the reports, is supposed to give good results. The author has no experience with this operation.

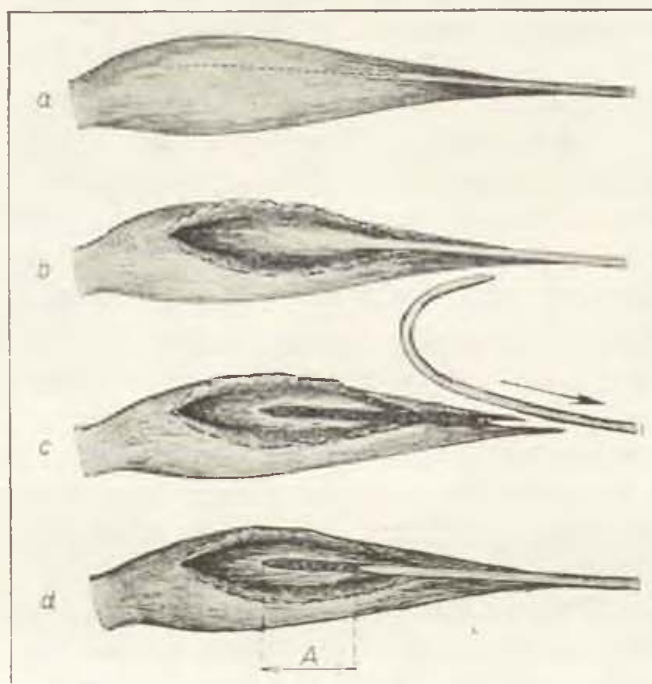


Fig. 3a, b, c, d shows diagram of tendon lengthening of a single muscle in ischaemic contracture of finger flexor muscles. The tendon is excised within the muscle belly, disconnected and shifted distally. It is then retained in the new position by sutures and the wound in the muscle closed.

In an endeavour to find a safer and easier method of lengthening tendons, the author took note of two cases with interesting injuries which he selected from among his own patients. Neither case had anything in common with ischaemic contracture but the analysis of both indicated the correct solution for the lengthening of tendons in Volkmann's contracture.

The first patient, M. B., a woman aged 50 (Fig. 1), was injured in 1949 by the hot rollers of an ironing press into which her hand and forearm was drawn up to the elbow. The arm was freed by putting the machine into reverse gear, so that it was pulled through the pullers once more but in the opposite, i.e. proximo-distal direction. The powerful pressure applied by the rollers, in the first onslaught caused contusion of the muscles of the forearm. Then, on freeing the arm, the pressure tore the tendons out of their muscle bellies and squeezed them distally. Due to the excessive pressure, the skin of the palm burst open and the torn off ends of the tendons prolapsed from the wound. These tendon

ends did not show a smooth surface but were covered with little pieces of muscle tissue adhering to them in a feather-like fashion. The section of the tendons running through the palm and the fingers escaped damage. The tendon ends protruding from the wound were identified as those of the flexor sublimis of the second, third and fourth finger. The function of the flexor profundus was, on the whole, preserved. The surgical problem was solved by the removal of the tendon ends protruding from the wound and by simple suture

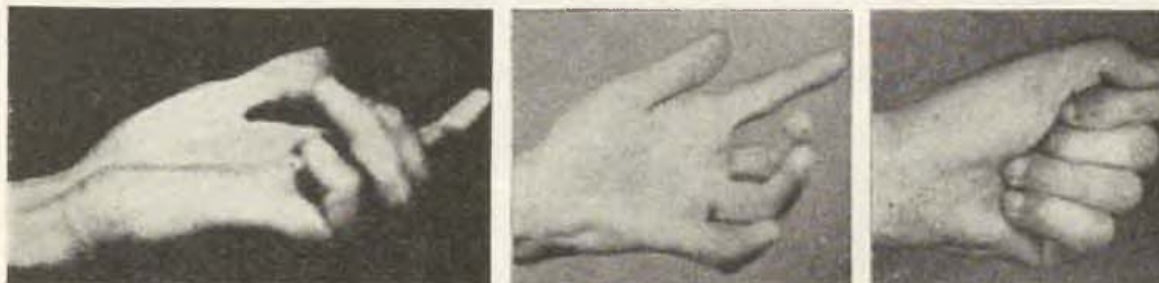


Fig. 4a.

Fig. 4b.

Fig. 4c.

Fig. 4a. Condition of hand prior to operation. — Fig. 4b, c. Condition after lengthening of tendons.

of the skin. The ultimate result after rehabilitation was good: full flexion of all fingers, except the index finger, was obtained. In the latter a cursory examination disclosed that flexion of the middle and terminal phalanges was absent (Fig. 2). This finding was explained as follows: whereas the tendons of the flexor profundus muscle for the third and fourth finger had actually remained intact and could thus regain function by exercises, the tendon of flexor profundus II had been torn out of the muscle in the same way as those of flexor sublimis, but had not been squeezed out of the wound on freeing the arm from the machine but remained within the muscle belly, slightly displaced distally and had healed in this position. The lengthening of the tendon thus effected prevented transmission of the muscle pull to the middle and terminal phalanges. Active flexion of the middle and terminal phalanges could actually be achieved by tightening the tendon to its maximum, i. e. bringing the wrist and metacarpophalangeal joints into hyperextension.

The second patient, J. S., a woman aged 29, was not treated by the author immediately after injury. She was recommended for consultation because she was unable to flex the middle and terminal phalanges of the third finger. The patient did not show a scar from any injury, but gave a history of a bus accident in which she had held onto the strap to the very moment when the bus turned over. She remembered that her fingers had gradually slipped off the strap until she lost hold even with the last one. During the period of recovery she had observed a long, band-like haematoma under the skin of the volar aspect of the forearm, and after recovery she was unable to flex the third finger. This patient, too, could attain active flexion of the terminal phalanx if all the proximal joints were hyperextended.

In both cases the injury was evidently as follows: a tendon was torn out of its muscle belly, shifted distally and finally healed in its new position, i.e. that a lengthening of the tendon had taken place. This uncomplicated and spontaneous course of healing without any special treatment suggested the possibility of easy recovery of function and good results even after intentional, surgical disconnection of the tendon from its muscle belly performed in an analogous manner.

The author, therefore, suggested that the mechanism of these injuries could be imitated by operation in cases of ischaemic contracture of the flexor muscles, thus achieving the necessary lengthening of the tendons.

TECHNIQUE OF OPERATION

(Fig. 3a, b, c, d)

After the muscles of the volar aspect of the forearm have been exposed, the bellies of all shortened flexor muscles, particularly those of the deep layer, are isolated. If possible, the tendons of the deep flexor, which is usually more affected, are disconnected. First of all, the muscle fascia is severed, then the muscle fibre bundles are separated proximally in the direction of the prolongation of the tendon and the tendon fibres, lying flat, exposed. In the distal part of the muscle these fibres already form a solid tendinous cord. A long, V-shaped incision is made in the flat part of the tendon exposed in the muscle and a narrow strip excised in the direction of the prolongation of the distally already formed tendinous cord, and the muscle fibres adhering to it are cut off with scissors one by one. Care must be taken not to injure the part of tendon which will protrude from the muscle after the tendon has been shifted distally.

The disconnected tendon is then shifted distally so that the corresponding finger can be stretched almost to the full extent. The tendon is then fixed to the muscle by three rows of fine catgut sutures placed through the middle and on both edges. One by one all disconnected tendons are thus fixed in their new position. Finally, the wound is closed and the extremity immobilized by the usual splint for a period of three weeks with the wrist in volar flexion.

Provided the extremity is placed in an elevated position the postoperative course is without pain or oedema. Rehabilitation is not very difficult nor does it last very long — usually six to eight weeks. For this mainly exercises with an elastic splint as from the third week after operation, and pressure massage of the operation field, are used.

Lengthening of tendons in the way described above has so far been performed in three patients with ischaemic contracture.

Patient R. A., a man, aged 27, No. of casepaper 30815/54 had ischaemic contracture of the flexor muscles of the fingers which had developed after a gunshot wound high up in the forearm. The contracture was of such a degree that he was unable to use his hand for work for a total period of ten years. The last three fingers were bent almost to the shape of a hook; the middle phalanges flexed to an angle of 70 degrees and, with the wrist in the position of 180 degrees, could not be extended more than 90 degrees. Only with the wrist and the metacarpo-

phalangeal joints in the position of extreme flexion could the middle phalanges be extended but even then not quite completely, i. e. to an angle of 160 degrees. After the operation (performed as described above) and remedial exercises, the patient regained extension of his fingers to such an extent that he was able to return to his original occupation as a blacksmith. The third finger, which after



Fig. 5a. Shortening of muscles prior to operation.



Fig. 5b.



Fig. 5c.

Fig. 5b, c. Condition after lengthening of tendons.

the first operation had still remained slightly flexed, was freed by subsequent operation. The hand has regained its working capacity although the result of the operation is not quite a hundred percent. Full extension of fingers can be performed only with the wrist in slight flexion; with the wrist in hyperextension the fingers cannot yet be stretched (Fig. 4a, b, c).

The second patient, K. H., a man aged 52, No. of casepaper 30778/54, contracted osteomyelitis in the region of the elbow joint 30 years previously which resulted in bony ankylosis of the joint and ischaemic contracture of the flexor muscles of the fingers. With the wrist in the position of 180 degrees, extension of the basal and middle phalanges of the second to fifth fingers was actively and

passively limited to 135 degrees, as can be seen in the X-ray. Even on full flexion of the wrist joint the middle phalanges lack 30 degrees to full extension. This patient, too, could not use his hand for work. After lengthening of the tendons by the operation described above, he regained normal extension of the fingers (Fig. 5a, b, c).



Fig. 6a. Condition prior to operation.

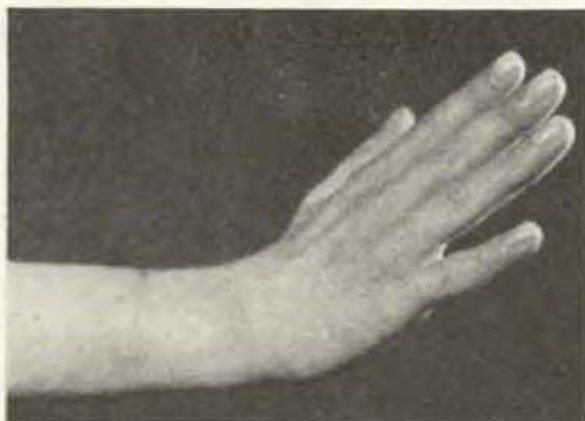


Fig. 6b.



Fig. 6c.

Fig. 6b, c. Condition after operation.

Ischaemic contracture in the third patient, E. H., a girl aged 17, No. of case-paper 533/57, developed as a result of the pressure of a plaster cast applied for the immobilization of a fracture of the forearm bones five years previously. Here the disorder was not as obvious as in the first two patients. Full active extension of the fingers could be performed, but only when the wrist joint was in the position of full flexion. The flexion contracture however, impeded, the movements of the wrist joint to the extent that extension could not be carried out above 180 degrees.

In this patient difficulties arose on operation because of changes in the muscles which proved to be very interesting. Each muscle was divided into two

bellies by a tendinous band. The contracting power of the muscles was well preserved. The middle portions of the muscles had evidently atrophied due to the pressure of the plaster cast which had left an extensive scar in the skin and subcutaneous tissue. On operation the tendons had to be shifted distally from the more proximal parts of the muscle bellies which appeared to be broader. After rehabilitation the patient was able to extend her fingers, even with the wrist in slight hyperextension (Fig. 6a, b, c).

EVALUATION

The solution of the problem of ischaemic contracture given above is theoretically satisfactory for two main reasons. The problem has been solved directly and completely, and thus the main cause of the motor disorder removed in the same way as when the tendons are lengthened beyond the muscle bellies. The method described here, however, is without the disadvantage of the older methods. No severed tendon fibres, or only a minimum number, are left uncovered.

In the first patient the opportunity arose for a biopsy of the operation field, since a second operation had to be performed to correct the insufficiently lengthened tendon of the third finger which had remained more flexed than the others. The findings on biopsy were very satisfactory. Apart from fine scars in the skin, the subcutaneous tissue and the fascia, not the slightest trace of scars or adhesions could be found in the muscles or tendons. The scars of the superficial layers were mobile in relation to the surrounding tissue. The scar in the fascia had the appearance of an opaque band without any thickening.

To a certain extent, these findings are rather surprising, since they come very near to the ideal condition of healing without a scar, i. e. where the union of severed tissue has been effected by regeneration. Thus the postulation formulated by Sudicky, following his experimental work on the regeneration of tissues and organs in 1952, has almost been fulfilled.

Special conditions evidently exist for the regeneration of different tissues at different sites. From the point of view of regeneration it seems that the junction between the tendon and the muscle is one of the favourable sites. Bunnell, who was the first to make a correct evaluation of the various methods of tendon suture and also correctly laid down which type of suture should be used in the various conditions, also used muscle for one type of safe tendon suture. His method of joining the transplant with the tendon at the site of one lumbrical muscle of the palm has given the best results.

The idea of lengthening a tendon by severing it at the site of its origin from the muscle and then shifting it distally has been used in other muscles many times previously. In 1953, Rank and Wakefield suggested it in their monograph on accidents for the lengthening of the tendon of the flexor pollicis longus even in primary treatment.

The results of the treatment in the three patients described above have only proved that this method is applicable to all muscles of the forearm.

The distance, by which the tendons were lengthened in the cases referred to above, was on an average 3—4 cm. The final result will always depend both on the extent to which the tendon has to be lengthened and on the degree to which the mesotendons which bind the tendons together in the carpal canal have remained free: If there is very considerable shortening of the muscles, it will probably not be possible to attain extension of the fingers without severing these structures. Thus both the operation and subsequent rehabilitation will be more difficult. In none of the patients referred to above were the mesotendons severed. The author, however, assumes that the unsatisfactory result in the first case should be ascribed to this circumstance.

SUMMARY

The author discusses the problem of Volkmann's ischaemic contracture from the point of view of reconstructive surgery. He suggests a method of lengthening the tendons of the shortened muscles by shifting their origin from the muscle bellies. Good results were demonstrated after operation in three patients. The importance of rehabilitation to prevent many severe changes developing some-time after the subsidence of the acute stage, is emphasised.

ВЫВОДЫ

Ишемическая контрактура Фолькмана, замечания и проект операции

J. Vejvalka

Обсуждена проблематика ишемической контрактуры Фолькмана с точки зрения восстановительной хирургии. Предложен новый способ удлинения сухожилий укороченных мышц выдвижением их конца из мышечного брюшка. На трех больных продемонстрированы хорошие результаты произведенных операций. В работе подчеркнуто значение восстановительной терапии, производимой с целью предупреждения многих тяжелых повреждений, возникающих после окончания острой стадии болезни.

RÉSUMÉ

Quelques observations au sujet de la contracture ischémique de Volkman et proposition d'un mode opératoire

J. Vejvalka

Discussion de la problématique de la contracture ischémique de Volkman du point de vue de l'aide chirurgicale réparatrice. On propose une façon d'allongement des tendons des muscles retracts en faisant sortir leurs bouts en dehors de la portion charnue du muscle. Présentation de trois malades, où cette opération a donné de bons résultats. On souligne l'importance de cette réhabilitation dans le but de prévenir des endommagements graves qui ne se font sentir que plus tard, après que la première phase dramatique se soit terminée.

ZUSAMMENFASSUNG

Die Volkmannsche ischaemische Kontraktur, Bemerkungen und Operationsvorschlag

J. Vejvalka

Die Problematik der Volkmannschen ischaemischen Kontraktur wird vom Standpunkt einer reparativen chirurgischen Hilfe eingehend dargelegt. Es wird eine Art der Sehnenverlängerung der verkürzten Muskeln durch Verschiebung deren Anfänge aus der Muskelkuppe vorgeschlagen. Gute Ergebnisse nach durchgeführter Operation werden an 3 Patienten demonstriert. Im Text wird die Rehabilitation als Prävention zahlreicher schwerer Schädigungen betont, die später, nach Beendigung der ersten stürmischen Phase, entstehen.

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HEMIATROPHIA FACIEI PROGRESSIVA Romberg's Disease

H. PEŠKOVÁ, B. STOCKAR

In 1825 Parry first drew attention to a disease of the face the clinical picture of which was described more exactly by Romberg in 1846. He called the disease trophoneurosis of the face, and it is referred to under this name in the later papers. More often, however, the name hemiatrophia faciei progressiva, which was given to it by Eulenberg in 1871, is used. Since the first observations this disease has been reported with increasing frequency, predominantly in the neurological, dermatological and, later, in the stomatological literature. Only in recent decades have reports also appeared in the surgical literature. These deal with the only possibility of treatment known hitherto, i. e. with the implantation of substitute tissue to the sites affected by the atrophic process.

The most complete report on progressive hemiatrophy of the face was published by Moebius in 1895 and Marburg and Cassirer in 1912. These authors were supplemented by Wartenberg in 1924 who published a second report on the disease in 1945. Papers on the disease were published by Marinesco, Kreindler and Facon in 1931, by La Salle Archambault and Nelson V. Fromm in 1932, by Mollaret in the same year and later by Weil, Hurez, Morice Levy Burtin, Kazanjian, Dechaume, Cauhépe, Dubruille, Neumann. In 1937 the report of Zatloukal and in 1945 that of Karfík from the Institute of Plastic Surgery in Prague appeared in the Czechoslovak literature. The incidence of the disease is not very frequent. These authors refer to varying numbers of observations ranging from a single case to ten and more. The disease mostly affects children and young people and only occasionally could its onset be observed in adults. The older authors stressed a prevalence in women, recent authors have denied this.

Opinion as to the more frequent affection of the right or left half of the face is not unanimous. Heredity has never been observed.

The actual morphological changes are sometimes preceded by neuralgic pains in the trigeminal area and by spasm of the facial muscle. Atrophy progresses very slowly and reaches its maximum after 2.5 to 10 years, after which period progression ceases.

Prior to the onset and spread of atrophy some patients show bluish, white or brownish pigmented atrophic markings, at first quite delimited, from which, later, atrophy of all tissues of the face progresses.



Fig. 1.



Fig. 2.

Fig. 1. Exactly unilateral affection by an atrophic process. — Fig. 2. Affection of tongue by right-sided progressive hemiatrophy.



Fig. 3.



Fig. 4.

Fig. 3. Atrophy with maximum changes in the forehead, the orbit and the left side and ala of the nose. — Fig. 4. Atrophic process mainly affecting the lower lip and chin, to a lesser extent the upper lip and the region of the nose and cheek.

Apart from slow progression the disease is characterized by its exact unilateral localization (Fig. 1 and 2). The atrophic changes always affect first the subcutaneous tissue which slowly diminishes, until it finally disappears completely. In addition to the changes in the subcutaneous tissue, changes take place in the skin, the mucosa, muscle and bone.

Histologically, intensive chronic inflammatory changes in the subcutaneous tissue with signs of necrobiosis leading to scar formation, can be observed. The epidermis is markedly thin and shows slight keratosis on the surface. The stratum granulosum is almost indiscernible and its thin layer is frequently interrupted. The interpapillary columns are completely missing in some places, the stratum Malpighii is markedly thinned. Both vessels and skin appendages are atrophic at the affected site. The atrophic clusters of sweat glands are usually lined with poorly stained cells, the cytoplasm of which shows a sharp contour, but otherwise appears optically almost empty. The differential diagnosis of these changes from those in localized scleroderma is very difficult. According to Škorpil the difference lies mainly in the preservation of elastic tissue.

Clinically, the skin becomes thin, dry and taut and firmly adherent to muscle and bone. After a time it acquires the character of an atrophic scar and is characterized by its atypical greyish brown discolouration, particularly where it lies close to bone. Sometimes the skin gets slightly creased at the affected site. Muscles atrophy and become thin. Their power is preserved, but the range of movements is limited by the rigidity of the skin. Electric tests do not show any signs of degeneration. Histology shows slight degeneration of muscle fibres, a decrease in the number of nuclei and diminishing or disappearance of striation.

The bone changes depend on the age at which the disease started. The younger the individual the more is the facial skeleton or even that of the skull affected. Since growth of the skull is completed to the extent of 90% in length, and 96% in width, in relation to that of the adult, already at the age of three, bone changes in the skull are usually less marked. The facial skeleton, however, has but 70% of its ultimate dimensions at the age of three and does not reach 90% before the age of twelve to thirteen. Therefore, in cases, where the disease has started at an early age, the bone deficit in the face is often very conspicuous. Where the disease starts later, this deficit will be only slight or is absent altogether, though the atrophic process of the soft parts leads to considerable clinical hemiatrophy and thus to a conspicuous asymmetry of the face. According to most authors, the teeth do not participate in the atrophic process, nor does their condition deteriorate with further development of the atrophy.

The salivary glands, too, undergo atrophy as can be shown by sialography.

The atrophic process sometimes comes to a stop and remains localized to a smaller area. This mostly happens in the field of distribution of one of the branches of the trigeminal nerve (Fig. 3 to 7). Often, however, a large section of the face is affected (Fig. 8) or the process envelops the entire half of the face, sometimes also affecting the adjacent parts of the skull and the neck. Parts of the body other than the face are affected but rarely; some authors, have observed changes in the upper extremity.



Fig. 5.



Fig. 6.

Fig. 5. The maximum changes in the cheek. On smiling the creasing of the thinned and brownish discoloured skin is quite conspicuous. — Fig. 6. Extensive hemiatrophy of the lower lateral part of the face.



Fig. 7.



Fig. 8.

Fig. 7. Affection of lower and middle part of face with partial facial nerve palsy. — Fig. 8. Extensive hemiatrophy developed at the age of four has led to considerable damage to the skeletal framework of the face.

Progressive hemiatrophy of the face is sometimes accompanied by alopecia, trigeminal neuralgia or anesthesia and sympathetic disorders (Claude-Bernard-Horner syndrome, unilateral mydriasis, heterochromia of the iris, disorders of perspiration, exophthalmos, local temperature differences, changes in the pilo-motor reflex, etc.). Even facial nerve palsy, epilepsy, vascular disorders in the supply bed of the carotid and temporal arteries, arteriosclerosis of cerebral vessels with mental disorders (psychosis and neurosis) have been described.

Etiologically, various generalized infections, such as diphtheria, scarlet fever, typhoid fever, erysipelas, rubeola, tuberculosis, syphilis, neurotropic ectodermosis, syringomyelia, tumours of the posterior cranial fossa, etc. are usually mentioned. Some authors consider various local infections, most frequently of dental origin, to be the cause of this disease. In the majority of patients, however, the premorbid history does not show any generalized or local affection. The patients rather relate the appearance of the first signs to minor injuries, often banal, frequently happening in normal life, i. e. a bruise from a fall or knock, etc.

THE AUTHORS' OBSERVATIONS

Since 1934, 23 cases have been treated at the Clinic of Plastic Surgery in Prague for the sequelae of progressive facial hemiatrophy. In this series there was a preponderance of women (16), and the right side of the face was much more frequently affected (15). The disease started between the age of 2 and 13, most frequently around the 5th, 8th and 10th year. Only in two patients did it start later, i. e. at the age of 16 and 19. In these two cases a fairly severe accident preceded the onset. The atrophic process spread from the original site to areas which had not been affected by the injury. In the patients' history toothache was reported five times (twice with purulent periostitis, once incised). Five patients gave a history of a blunt blow resulting from a fall, one of which caused a skin laceration. In one of these cases the process of atrophy started to spread approximately half a year after the extirpation of a small tumour in the face. One girl had diphtheria two years prior to the onset of the atrophic process. In the remaining patients no generalized or local disease could be found in the history, nor did they remember any injury prior to the onset of the disease.

In nine patients, operated on at the Clinic, the atrophic process involved the whole side of the face, in three patients it also spread to the upper part of the neck, in two patients partly to the scalp. One girl to this series showed slight atrophy in the upper extremity of the same side but without any typical skin changes. The middle and lower section of the face was affected by the process in seven cases, the upper section only in two cases, the upper and middle section also in two cases, and the middle section only in three cases. In these patients the atrophic process had been active for two to eight years. The patients came to the Clinic for treatment at an age ranging from 7 to 47 years. Prior to this they had undergone medical treatment with local massage, application of ointments, cataplasms, ultrasound, in one patient an unsuccessful operation had been performed on the cervical sympathetic, in another paraffin

had been injected under the atrophic skin which led to extensive necrosis with loss of tissue around the corner of the mouth and in the cheek (Fig. 9).

Heredity could never be established. One patient had a congenital heart defect, another a bilateral supernumerary rib, yet another a congenital deformity of the hand with cutaneous syndactyly of three fingers, and, finally, one patient showed ptosis of the upper eyelid on the affected side of the face. Three patients showed positive Horner's syndrome, two unilateral mydriasis, one a partial facial nerve palsy.

The diagnosis of progressive hemiatrophy of the face is not at all difficult when it has reached an advanced stage, particularly when a large area, up to the entire half of the face, has been affected. The picture of the changes in the skin and subcutis are very typical and occur in no other type of facial atrophy or asymmetry. A careful history confirms the diagnosis. More difficult is it to decide in cases where the atrophy has remained limited to a circumscribed area. In these cases, differentiation between a limited progressive hemiatrophy and a circumscribed form of scleroderma is often difficult for an experienced histologist, the more so for a clinician. The typical signs in the initial stage of scleroderma, i. e. oedema and induration, which never occur in Romberg's disease, frequently remain unnoticed, and after skin atrophy has set in differentiation becomes very difficult.

The unknown etiology and the unclear pathogenesis of Romberg's disease has led to numerous hypotheses as to its origin; Pollak, in the same way as Romberg, Brissaud and Moebius regards hemiatrophy as a vasomotor tropho-neurosis, Wartenberg, based on the degenerative character of inherited affections, regards hemiatrophy as a heredodegenerative change. Rothmann coins the theory of endocrine origin because hemiatrophy is often coincident with endocrine disorders which, however, other authors have observed but rarely.

Kiskadden and McGregor, who have found peripheral trigeminal neuritis in some cases, defend the theory of trigeminal origin.

On the basis of the vasomotor changes Cassier adheres to the theory of scleroderma being the cause of the disease. The theory of sympathetic origin has the greatest number of followers. These (Dejerine, La Salle Archambault, Marinesco, Mollaret, Leri and others) support their hypothesis by numerous proofs obtained both by experiment and clinical observations. Several times it was possible to provoke the onset of hemiatrophy experimentally by lowering of the sympathetic tonus, e. g. by means of severing the upper cervical plexus. Archard and Thiers observed the onset of facial hemiatrophy after irritation of the cervical sympathetic by thyroidectomy, other authors in cases of cervical rib, a vertebral tumour, etc. The well known fact that severing of the cervical sympathetic does not, in the majority of cases, lead to the onset of hemiatrophy, is explained by La Salle Archambault and Fromm on the basis of the mixed character of the sympathetic, i. e. by its paralysing as well as irritating character. When severed, signs of sympathetic deficiency are combined with paradoxical signs of irritation.

The sympathetic theory is clinically supported by the presence of additional disorders indicative of hyperexcitability of the sympathetic nervous system, such as iritis, neuropathic keratitis with unilateral mydriasis and exophthalmos, homolateral migraine, changes in the pilomotor reflex, vasomotor disorders, disorders of perspiration, etc., and the relatively frequent incidence of the Claude-Bernard-Horner syndrome.

The experiment of Haxahusen and Comel proving an evident influence of the vegetative nervous system on the simultaneous incidence of vitiligo in progressive facial hemiatrophy is significant. These authors transplanted the depigmented skin from the atrophic area into normal surroundings and normal skin to a site where the skin had been affected and vice-versa. The depigmented transplant gradually became pigmented, whereas the transplant of normal skin showed depigmentation and atrophy within a few months.

The fact, however, that operations performed on the sympathetic ganglia, even if carried out in childhood, do not lead to hemiatrophy gave rise to the present, most frequently expressed view that in progressive facial hemiatrophy the sympathetic tracts are affected more centrally, perhaps directly in their centres in the diencephalon. This would also indicate the frequent coinciding of hemiatrophy with disorders in the cerebral nerves.

TREATMENT

In the literature, progressive facial hemiatrophy is considered to be a disease which cannot be treated causally. Success in the treatment with the use of various medical methods reported by some authors is refuted by others who maintain that the process of atrophy could also have stopped progressing spontaneously and not as the result of therapy. Nobody has as yet reported on the disappearance of already developed atrophic changes as a result of treatment.

The only treatment which gives good results is surgical treatment. This, of course, does not act on the cause of the disease, which is hitherto unclear, but only substitutes for the loss of the tissue in the quiescent stage of the fully developed disease by transplantation of the tissue from a healthy part of the body.

For transplantation to the site of the atrophy, skin, corium, fat, cartilage and bone have been used, the latter two not only as auto-, but also as homo- and hetero-transplants. Since, however, the implanted tissue undergoes partial or total absorption, some authors tried other methods. They believed they had found them in unabsorbable foreign materials, such as paraffin, ivory, and recently also acrylates and plexiglass. Some authors, e. g. Esser already in 1917, enlarged the buccal space by an intraoral skin graft and filled the tissue deficit with an acrylic mould fixed to a dental prosthesis. Recently, Figi and Masson adopted this method but consider it to be only a supplement to other surgical measures. In some papers reports of good results after the use of homotransplants and acrylic inlays have been published; other reports, however, refute this and recommend the use of autotransplants only.

Since 1934 Academician Burian has been using free grafts of fat and corium for the correction of loss in volume. Transplantation of this kind of tissue appears

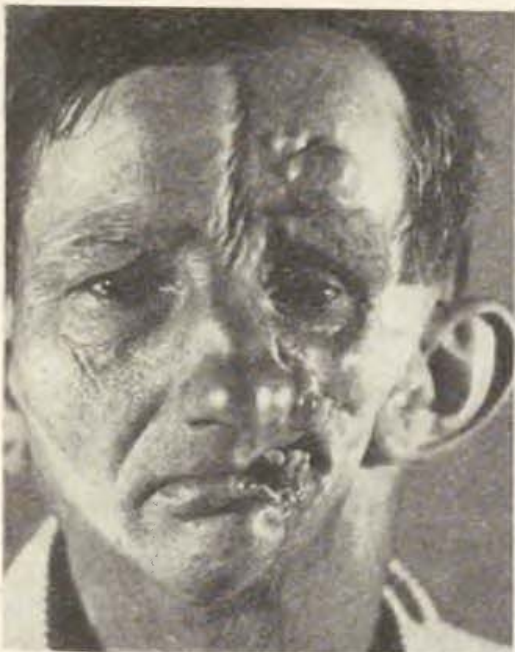


Fig. 9.



Fig. 10.

Fig. 9. Patient, aged 47, had paraffin injected under the atrophic tissues elsewhere some years previously. Nodules of paraffin clearly stand out against the forehead under the skin. On the cheek and lip the paraffin has caused necrosis with loss of tissue. — Fig. 10. Patient, aged 20, with extensive right-sided hemiatrophy together with ptosis of the eye lid.



Fig. 11.



Fig. 12.

Fig. 11. Condition after four transplantations of free corium-fat grafts and suspension of lid which will have to be repeated in order to widen the palpebral fissure. — Fig. 12. Severe hemiatrophy developed since the age of four. Condition at nine.

quite logical and has, hitherto, proved best. The technique of the operation is quite simple. The thinned skin is mobilized through incisions made in the physiological creases or at inconspicuous sites, (the hair margin, below the mandible, etc.). After careful control of the bleeding, the cavity is filled with a corium-fat graft which is flattened out into the atrophic site by means of marginal sutures. In order to avoid affecting the viability of the skin, already lowered by the disease itself, it is necessary to mobilize the skin only to a limited extent and finish grafting in stages, each time lifting only a small area of soft tissue. The early results are very satisfactory. Providing careful operation technique, the graft takes easily and makes up for the loss in contour.

After a time, however, the transplant starts to shrink, atrophies and sometimes even disappears completely. This process of shrinkage is much more marked than that which we know from grafting corium-fat tissue to sites where the skin and subcutaneous tissue have not been affected by an atrophic process. From this it may be judged that the transplant, though viable, if placed into the site of pathological change, is not always capable of overcoming the bad condition of the milieu and, consequently, starts to atrophy itself. This is certainly not only due to the pressure of taut skin lying over it, but mainly to the insufficient neurovascular supply. The transplant, however, by its very presence, has a favourable influence on the tissue affected by the atrophic changes, although it itself may undergo shrinkage and atrophy after a time. It increases the biological value of the tissue. If, therefore, transplantation is repeated once or perhaps several times, each subsequent transplant undergoes atrophy to a lesser extent and results improve (Fig. 10 and 11).

In less extensive atrophy, mainly with less marked changes in the skin and subcutaneous tissue, a single transplantation often suffices. In these cases the transplanted tissue does not succumb to the unfavourable local conditions and preserves a great deal of its original volume. Maybe the circumstance that the transplant can be supplied from the surrounding tissue which has not been affected by the atrophic process, contributes to this by a better supply of the necessary nutritive substances.

In severe forms of the disease it is often necessary to repeat transplantation a number of times. The severest forms of hemiatrophy treated by this method had to be re-grafted 10 to 15 times (Fig. 12 and 13). Clinical experience coincides here with the results of the experiments carried out by Haxahusen and Comel.

In 1953 Neumann recommended transplantation of tissue with a well developed blood supply to the site of atrophy by means of a tubed flap which prior to implantation under the skin had been stripped of its epithelium and then flattened out. He prepared the flap on the abdomen, transferred it via the forearm and fixed it by its pedicle to a site which itself had not been affected by atrophy so as to obtain the best possible conditions for nutrition. It could be shown that the tissue transplanted by this method did not undergo atrophy in the same way as a free graft and that later it was necessary to remove the surplus of tissue which the author had left in reserve, when flattening out the graft, in the anticipation of partial atrophy. The author has published three cases



Fig. 13.



Fig. 14.

Fig. 13. Patient with sixteen times repeated transplantation of corium-fat tissue taken from the gluteal regions. — Fig. 14. Right-sided hemiatrophy. Seven times repeated transplantation of free corium-fat grafts improved the biological value of the skin but, however, did not remove the defect in contour. Every time the grafts were absorbed after a few months.



Fig. 15. In this patient tissue transplanted by means of a tubed flap from the abdomen via the forearm was used to make up the loss in contour.

operated upon with good results. This method was used at the Clinic in one patient with a severe hemiatrophy where transplantation of the corium-fat grafts had been performed eight times but the result remained unsatisfactory because the implanted tissue was always absorbed within a few months. The biological value of the skin had been improved by free grafting, but correction of the loss in contour could not be achieved. This was successfully attained by transplantation of the tissue of a tubed pedicle graft from the abdomen (Fig. 14 and 15).

By this report the authors wish to draw attention to a disease of the face which, due to its localization, is very distressing to the patient, making him markedly conspicuous. It can make his life very difficult, although the prognosis as to life is good. The authors are well aware of the fact that what they have done so far is only an emergency measure and that they must not be satisfied by the good results of operations; it is necessary to pay increased attention to this disease and, by meticulous analysis of the case history as well as by improved clinical examination, to strive to reveal its etiology and based on this to develop treatment capable of arresting or curing it.

SUMMARY

Romberg's disease occurs very rarely and is characterized by its chronic course and by the fact that it leads to various degrees of facial deformities which can be corrected surgically with a lasting satisfactory result.

After a brief historical review, the authors discuss the clinical picture of the disease, the typical feature of which is the slow progress which becomes stabilized within 2—10 years and is characterized by unilateral atrophy of a part of the face or one side. The subcutaneous tissue is the most affected, followed by skin and muscle. If the disease starts before the completion of growth of the facial bones it has a marked effect in deforming the face as a whole. In discussing the causes of the disease the authors give an account of their own experience in the treatment of 23 cases at the University Clinic for Plastic Surgery in Prague. Women are more frequently affected than men, and it is most commonly met with on the right side. In most cases the onset was before the age of 13, in only two cases did it start after 19.

The diagnosis of the fully developed disease is easy, but it is more difficult in the initial stages and where the disease is confined to smaller parts of the face. Among many hypotheses on the aetiology of the disease, the sympathetic theory is the most reasonable from the clinical point of view and on the basis of both experimental and surgical results.

The authors give a brief account of the surgical treatment used at the Clinic. In the quiescent stage of the disease the volume of tissue only is supplemented and that always by autotransplants. The implantation of corium dermis and fat flaps has proved to be the most satisfactory method, either in the form of free transplants or tubed pedicle flaps with their own blood supply. This improves the shape of the affected part of the face as well as the quality of the skin cover.

ВЫВОДЫ

Прогрессивная гемиатрофия лица (болезнь Ромберга)

Н. Pešková, B. Stockar

Авторы посвящают свою работу изучению болезни Ромберга, которая встречается сравнительно редко, характеризуется хроническим течением и влечет за собой возникновение различных деформаций лица, поддающихся хирургическому исправлению со стойким, хорошим результатом.

После краткого исторического обзора авторы обсуждают клиническую картину болезни, типичным признаком которой является медленное прогрессирование процесса, который прекращается через 2—10 лет и характеризуется односторонней атрофией части или же всей половины лица. При этом заболевании больше всего бывает поражена подкожная клетчатка, затем также кожа и мышцы. При поражении болезнью ребенка до завершения роста костей лица, последние принимают явное участие в его деформации, возникающей вследствие замедления роста костей. После обсуждения причин возникновения болезни авторы описывают собственные наблюдения над 23 больными, лечеными в Клинике пластической хирургии в Праге. Заболевание встречалось чаще у женщин, причем также чаще была поражена правая сторона лица. У большинства больных заболевание началось до достижения 13 лет и лишь у двух до 19 лет.

Постановка диагноза при полной картине заболевания не вызывает затруднений, более трудной является постановка диагноза в начале заболевания и при ограниченной на небольшой участок форме заболевания. Из многих гипотез об этиологии болезни наиболее приемлемой в клиническом отношении является симпатическая теория, которую можно легче всего обосновать результатами различных испытаний и хирургического лечения.

Коротко описана методика хирургического лечения, применяемого в клинике. В стадии покоя пополняется только утрата объема, причем исключительно при помощи аутоотрансплантатов. Наилучшие результаты были получены при имплантации кожно-жирового лоскута, либо путем свободной пересадки ткани, либо при помощи стебельчатого лоскута на ножке с собственным сосудоснабжением. При помощи такого метода можно улучшить как вид пораженной части лица, так и качество кожного покрова.

RÉSUMÉ

Hemiatrophia faciei progressiva (La maladie de Romberg)

Н. Pešková, B. Stockar

Dans le travail présenté, les auteurs s'occupent de la maladie de Romberg que l'on n'observe qu'assez rarement et qui est caractérisée par sa chronicité; elle détermine des déformations faciales plus ou moins graves, pouvant être corrigées par des interventions chirurgicales, ce qui donne des résultats satisfaisants et permanents.

Après une introduction historique rapide, les auteurs donnent les détails du développement clinique de la maladie où la progression lente d'un processus qui ne va se stabiliser qu'au bout de 2—10 ans constitue un des signes les plus typiques et qui, en outre, est caractérisée par une atrophie unilatérale ou bien partielle, ou bien affectant toute la moitié de la figure. C'est la couche sous-cutanée qui est la plus touchée, mais aussi l'épiderme et la musculature. Si l'individu se trouve atteint de cette maladie avant d'avoir terminé le développement de ses os faciaux, ceux-ci participent nettement à la déformation faciale par un ralentissement de leur développement. Après avoir discuté les causes de l'origine de cette maladie, les auteurs présentent leurs propres observations,

faites sur 23 malades hospitalisés à la clinique de chirurgie plastique de Prague. Parmi ces malades, on compte plus de femmes et c'est surtout le côté droit de la figure qui est touché; chez la plupart, la maladie s'est déclarée avant l'âge de 13 ans et deux fois seulement avant l'âge de 19 ans.

On reconnaît facilement les stades évolués, mais le début de la maladie et les cas où elle n'intéresse que des régions relativement petites sont plus difficilement à diagnostiquer. Du grand nombre des hypothèses possibles quant à l'éthiologie de cette maladie, c'est la théorie sympathique qui semble la mieux acceptable du point de vue clinique et expérimental aussi bien que par rapport aux résultats opératoires.

On décrit sommairement la méthode du traitement chirurgical utilisé à cette clinique. A l'état de repos, on ne remplace que les pertes en volume, et ceci uniquement par greffe autoplastique. C'est l'implantation d'un lambeau dermo-adipeux qui s'est montrée la plus appropriée, et ceci aussi bien sous forme de greffe libre que sous forme d'un lambeau cylindrique pédiculé avec son propre approvisionnement vasculaire. De cette manière, c'est aussi bien l'hémiatrophie faciale de la partie atteinte de la figure que la qualité de la couverture épidermique qui se trouvent sensiblement améliorées.

ZUSAMMENFASSUNG

Hemiatrofia faciei progressiva (Rombergsche Erkrankung)

H. Pešková, B. Stockar

Die Autoren beschäftigen sich in ihrer Arbeit mit der relativ selten vorkommenden Rombergschen Erkrankung, die sich durch Chronizität auszeichnet und eine Gesichtsdeformation verschiedenen Grades zur Folge hat, die chirurgisch mit einem guten Dauererfolg korrigiert werden kann.

Nach einem kurzen historischen Überblick behandeln die Autoren das klinische Bild der Erkrankung, deren typisches Anzeichen eine langsame Progression des Prozesses ist, die sich im Verlaufe von 2—10 Jahren stabilisiert und durch einseitige Atrophie eines Teiles oder der ganzen Gesichtshälfte charakterisiert wird. Am meisten befallen ist das Subcutaneum, hernach auch die Haut und der Muskel. Wird das Individuum von dieser Erkrankung vor der Wachstumsvollendung der Gesichtsknochen befallen, so beteiligen sich diese klar durch ein verlangsamtes Wachstum an der Gesichtsdeformation. Nach einer Diskussion über die Entstehungsursachen der Erkrankung, werden eigene Beobachtungen von 23 Fällen angeführt, die an der Klinik für plastische Chirurgie in Prag behandelt wurden. Mit einer Praevalenz von Frauen, bei häufigerer Schädigung der rechten Seite, begann bei der Mehrheit die Erkrankung vor dem 13. Lebensjahr, nur 2 Fälle im 19. Lebensjahr.

Die Diagnose der entwickelten Erkrankung ist leicht, schwieriger gestaltet sich diese zu Beginn der Erkrankung und bei Formen, die auf einen kleinen Abschnitt begrenzt bleiben. Von den zahlreichen Hypothesen über die Ätiologie der Erkrankung ist die sympathische Theorie durch Versuche und operative Ergebnisse am leichtesten durch Versuche und Operationserfolge klinisch verwertbar.

Es wird ein kurzer Vorgang der an der Klinik verwendeten chirurgischen Behandlung geschildert. Im Ruhestadium werden lediglich die Volumenverluste ergänzt und dies ausschliesslich durch Autotransplantate. Am meisten hat sich die Implantation eines Corio-Fettgewebslappens, entweder als frei transplantiertes Gewebe oder mittels Rundstiel-lappens mit eigener Gefässversorgung bewährt. Durch diesen Vorgang wird sowohl ein Formverlust des geschädigten Gesichtsteiles, sowie die Qualität der Hautdeckung verbessert.

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BLOOD SUPPLY OF A FILATOV'S SKIN FLAP

J. BARDACH, A. KURNATOWSKI

In the reconstruction of total or partial defects of the nose by the method of Khitrov, as well as by the authors' modification, the fatty tissue of the flattened flap must be radically removed. The stripped flap is, however, also bent at an angle of 90° to 180° thus greatly obstructing the blood supply of the rotated part.

Khitrov was the first to suggest radical removal of the fatty tissue from a Filatov's flap. He based the method on his own clinical observations regarding the position of vessels at the periphery of the flap.

Similar observations, concerning the branching of the large vascular network at the border between the skin and the subcutaneous fat, were described by Kartashev and Vechtomov. They did not, however, use these findings which were based on only a few histological examinations, to draw concrete conclusions.

In a histological study Pešková showed that four to five weeks after transfer of a Filatov's flap the number of blood vessels in the subcutaneous and fatty tissue increases. She also points out that both the number and calibre of blood vessels increases manyfold in flaps which have been transferred repeatedly, as compared with the number and calibre of blood vessels in a flap just formed.

In the central portions of a Filatov's flap, Okulova could find no blood vessels which were larger than a normal vessel. Zhak found larger vessels only in three out of 37 histological slides, whereas in all others he found vessels of varying calibre in the skin as well as on the border of the skin and subcutaneous tissue.

A number of papers of different authors were concerned with research of the blood supply of Filatov's flaps, aimed at ascertaining the most favourable conditions for transfer, with regard to the formation of new arteries and veins. In this research a number of different methods was used: contrast substances, fluorescence, thermoelectric measurements, radioactive isotopes. These methods of research were carried out by Braithwaite, Conway, Kasparova, Douglas and Meneely, Taubenfliegel and others.

In spite of this, however, no clear answer was found to the question as to which vessels are of essential significance for the blood supply of a Filatov flap and what course they take. The above cited survey of references permits

the conclusion to be reached that up to date no histological research has been carried out substantiating the possibility of radical removal of the fat layer from a flattened Filatov's flap. Many authors fear that radical removal of the fatty tissue may have an adverse effect on the blood supply of the flap which may be followed by total or partial necrosis.

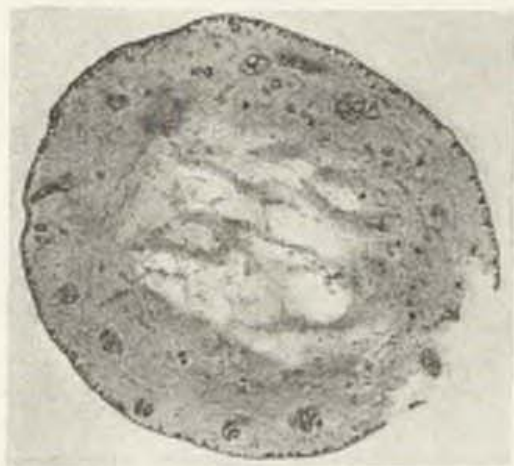


Fig. 1. Cross section of a Filatov's flap. Stained with haematoxylin-eosin. Magnified 5X.—
1. epidermis, 2. corium, 3. layer of fat.

The authors' clinical observations are in conformity with those of Khitrov who maintains that in the periphery of the flap there is an abundant network of blood vessels which is well visible.

The authors' experimental in the reconstruction of the nose with a Filatov's flap completely stripped of its fat layer has convinced them that the main role in the blood supply of the flap is played by the vessels of the corium and those situated at the border between the skin and subcutaneous fat. They also ascertained that the viability of skin flaps of a surface area of 60 to 120 cm.² undergoes no changes even if the flaps have a very narrow nutritive pedicle.

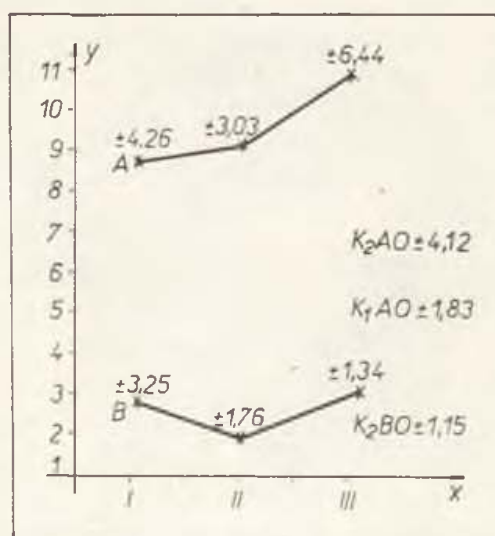
These clinical observations, therefore, had to be complemented by histological research with the aim to investigate of the blood supply of the corium and the part of the fat lying next to the skin.

Microscopic examinations were carried out in 34 specimens of skin excised from 16 Filatov flaps. Excision was carried out at different stages between 5 weeks and 22 months after the formation of the flap, up to its implantation into the forearm or the margin of the facial defect and also during the reconstructive plastic operation.

As control, in five cases skin was obtained from the abdomen in the region where Filatov's flaps were taken, and in six cases skin was taken from the same site in a cadaver.

A total of 45 excised specimens of skin were investigated after fixing them in formalin, embedding in paraffin and staining sections with haematoxylin-eosin.

The blood supply of the skin was evaluated by counting the number of blood vessels in three fields of each slide at the same power 10 X 8 and measuring the diameter of the vessels with a special eyepiece fitted with a measuring scale. The fields were chosen so that the border between the epithelium and the corium was always visible.



Tab. 1. Curves illustrating the average amount of blood vessels in dependence on the "age" of tubed flaps. Average values. The age of tubed flaps.

The blood vessels of the skin were divided into two groups according to their diameter. Group A comprised vessels up to 20μ in diameter, group B those above 20μ . Special attention was paid to the blood vessels of the subcutaneous fat.

The material was divided into three groups according to the age of the flap. Group I consisted of specimens in which the skin was excised 12 weeks after formation of the flap, group II those after 10—24 weeks and group III — after more than 24 weeks.

The control group "K₂" consisted of specimens excised from the abdominal skin at a site where Filatov's flaps are usually formed. Control group "K₁" comprised skin taken from cadavers.

In all specimens, both control and taken from Filatov flaps, most arteries and veins of the superficial layer were small and thin-walled.

(See Fig. 1, 2, 3, 4.)

Both the number and the diameter of these vessels, were different in the different slides, in the control group and in the specimens from Filatov flaps. In most slides vessels of large diameter were observed at the border of the skin and the subcutaneous tissue.

(See Fig. 5.)

The numerical values obtained by counting the vessels found in the corium in the histological preparations were submitted to statistical analysis (Kurnatowska).



Fig. 2.



Fig. 3.



Fig. 4.

Fig. 2. Abdominal skin. Stained with haematoxylin-eosin. Magnified 100X. — I. Vessels of diameter up to 20 μ . — II. Vessels of diameter over 20 μ . — Fig. 3. Filatov flap (group I). Stained with haematoxylin-eosin. Magnified 100X. — I. Vessels of diameter up to 20 μ . — II. Vessels of diameter over 20 μ . — Fig. 4. Filatov flap (group III). Stained with haematoxylin-eosin. Magnified 100X. — I. Vessels of diameter up to 20 μ . — II. Vessels of diameter over 20 μ .

The mean value (\bar{X}) of the number of blood vessels of different diameter was calculated for all groups. The condition of the blood vessel network in the corium of Filatov's flaps is depicted in the diagram, where the age of the flaps is marked on the ordinate and the mean value of the blood vessel diameters (\bar{X}) on the abscissa.

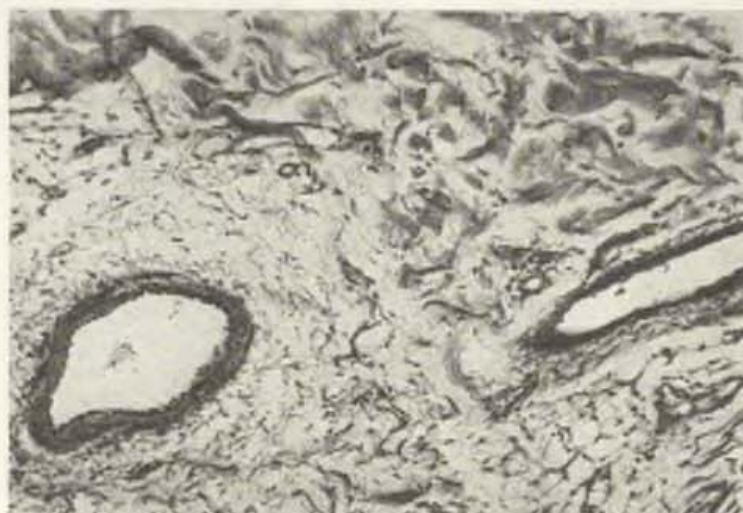


Fig. 5. Filatov flap. Vessels on the border between corium and subcutaneous tissue. Stained with haematoxylin-eosin. Magnified 100 \times . — I. Vessels of diameter up to 20 μ . — II. Vessels of diameter over 20 μ .

The standard deviation was calculated for each point. In Tab. 1 the arithmetic mean and the standard deviation of the control groups are shown, in addition to the curves.

From the diagram it becomes evident that the mean value of the number of vessels is substantially higher in Filatov's flaps than in the control groups; e. g. in the control group "K₁" the mean value of vessels with a diameter up to 20 μ is 5, whereas in group I (slides of the skin from flaps 12 weeks after formation) this indicator is 8.8 and in group III even 11. The difference in the number of vessels was found to be smaller in the groups with diameters over 20 μ . Thus in the control group "K₂" \bar{X} amounts to 2.3, in group I to 2.6 and in group III to 3.0.

For comparison of results obtained in the various groups and the control material the indicator of the significant difference t (Student's test) and the value P (probability of favourable cases according to Fisher's table) were used. The values thus obtained are shown in Tab. 2.

From this table it becomes evident that the differences in the blood supply of the skin between control group "K₁" and "K₂", group III and II, and also group II and III are statistically significant. The difference concerns to vessels of small diameter (up to 20 μ). Comparing the number of vessels with diameters over 20 μ it can be shown that the difference between group II and III is statistically significant.

Tab. 2. Comparison of values of the indicators of significant difference "t" as obtained from the various groups

Groups		III	III	II	II	I	I
		A	B	A	B	A	B
K ₁	t	5.7143	—	—	—	—	—
	d	d<0.01	—	—	—	—	—
K ₂	t	3.0704	1.1006	1.9528	0.4615	1.557	0.3356
	d	d<0.01	0.3>d>0.2	0.1>d>0.05	0.7>d>0.6	0.2>d>0.1	0.8>d>0.7
I	t	1.6373	0.5479	0.0943	0.8108	—	—
	d	0.2>d>0.1	0.7>d>0.6	d>0.9	0.5>d>0.4	—	—
II	t	1.9351	2.5253	—	—	0.0943	0.8108
	d	0.1>d>0.05	d<0.01	—	—	d>0.9	0.5>d>0.4
III	t	—	—	1.9351	2.5253	1.6373	0.5479
	d	—	—	0.1>d>0.05	d<0.01	0.2>d>0.1	0.7>d>0.6

— = Statistically significant differences.

On the basis of the clinical and histological observations the authors came to the conclusion that the network of blood vessels, lying in the corium at the border between the corium and the subcutaneous tissue, is of decisive significance for the blood supply of a Filatov's flap. The microscopic examinations and the statistical analysis show that the blood supply of the skin of a Filatov flap is better than that of the abdominal skin taken from a site where these flaps are usually formed, as well as of the skin taken from the abdomen of a cadaver (control slides). The authors also found an increase in the number of vessels in the skin of a Filatov's flap after "training" and stepwise transfer.

These phenomena must be evaluated in close connection with the conditions under which the skin is placed after formation of a Filatov's flap. It is well known that conditions for the blood supply get worse in the first period. But already three to four weeks later a balance of the blood circulation in the flap is reached which makes transplantation possible. It should, however, be added that from the tenth to fourteenth day after the formation of a Filatov's flap the conditions of its blood supply are impeded artificially by the so-called "training". Some days later one pedicle is cut off from its matrix and transferred to a new site what constitutes considerable worsening of the blood supply in the flap.

The authors assume that the increase in the number of blood vessels present in the pedicle is the result of vessels sprouting or of the widening of capillaries which under normal conditions are indiscernible because of their narrow diameter.

The authors also assume that the changes in the number and the calibre of blood vessels found in the skin of a Filatov flap are morphological manifestation of compensatory properties of the skin under changed conditions.

SUMMARY

In plastic reconstructions of partial or total defects of the nose with a Filatov flap by the method of Khitrov or the authors' modification, it is necessary to remove the fatty tissue of the flattened flap almost completely. Hitherto no histopathological research justifying the complete removal of fatty tissue from a Filatov's flap, has been carried out.

In their histological studies the authors tried to determine the character of blood supply the skin of the flap and the adjacent connective tissue. Microscopic examination of 34 specimens of Filatov's flaps from 16 patients was carried out. The material was taken at different periods after the formation of the flap (from 5 weeks to 22 months). For control skin was taken in five cases from the abdomen in the vicinity of the site where the flap was formed originally, and in six cases abdominal skin from cadavers. The number of blood vessels was counted in three fields in each slide, and, at the same time, the diameter of these vessels was measured.

The results obtained by the histological evaluation of the number and diameter of vessels in the corium, were treated statistically.

Microscopic and statistical evaluation showed that the main part in the blood supply of a Filatov's flap is played by the network of blood vessels in the corium and by that situated at the border between the corium and the subcutaneous tissue. The skin of a Filatov's flap has a better blood supply than that taken from the abdomen of the same patient or of cadavers. It was also found that the number of blood vessels in the corium of a Filatov's flap increases by "training" and successive re-implantation. The authors explain these phenomena as a morphological manifestation of the compensatory properties of the skin under changed conditions.

ВЫВОДЫ

Кровоснабжение кожи филатовского стебля

J. Bardach, A. Kurnatowski

При пластике частичных и полных дефектов носа филатовским стеблем по методу Хитрова или по нашей модификации этого метода, необходимо удалить почти всю жировую ткань из распластанного стебля. До настоящего времени не проводились гистопатологические исследования с целью обоснования возможности полного удаления жировой ткани из филатовского стебля.

В процессе наших гистопатологических исследований мы стремились определить характер кровоснабжения собственно кожи стебля и соединительной ткани, непосредственно к ней прилегающей. Микроскопические исследования были произведены на 34 препаратах филатовских стеблей, взятых у 16 больных. Материал для исследований мы брали в различные сроки от момента образования стебля (от 5 недель до 22 месяцев). Для контроля в 5 случаях была исследована кожа живота, взятая по соседству со сформированным филатовским стеблем, а в 6 случаях кожа живота трупа. Количество кровеносных сосудов

в каждом срезе высчитывалось в трех полях зрения. Проводились также измерения диаметра этих сосудов. Полученные в процессе гистологических исследований данные, касающиеся количества и диаметра сосудов собственно кожи, были подвергнуты статистическому анализу.

Микроскопические исследования и статистические вычисления указывают, что решающая роль в питании филатовского стебля принадлежит сети кровеносных сосудов, находящихся в собственно коже и на границе собственно кожи и подкожной клетчатки. Кожа филатовского стебля имеет лучшее кровоснабжение по сравнению с кожей живота того же больного, а также с кожей живота, взятой от трупа. Установлено также, что количество сосудов собственно кожи филатовского стебля увеличивается после тренировки и после последующих пересадок. Авторы объясняют эти явления, как морфологическое выражение компенсаторных способностей кожи, находящейся в измененных условиях.

RÉSUMÉ

Perfusion sanguine du lambeau d'après Filatov

J. Bardach, A. Kurnatowski

Lors des greffes d'après Filatov des déficiences partielles ou totales de la nez par la méthode de Chitrov ou bien à l'aide de notre modification de cette méthode, il est indispensable d'enlever à peu près entièrement le tissu adipeux du lambeau mis en place. Jusqu'à maintenant, l'examen histologique et pathologique devant motiver la possibilité de l'écartement complet du tissu adipeux du lambeau de Filatov n'a pas encore été fait.

A l'occasion des études histologique, les auteurs ont essayé de mettre en évidence la perfusion sanguine du lambeau et du tissu conjonctif adhérent. Cet examen microscopique a été fait sur 34 préparations de lambeaux de Filatov de provenance de 16 malades. Le matériel examiné a été prélevé à des stades différents du développement du lambeau (à partir de la cinquième semaine jusqu'au 22ème mois). Des morceaux de la peau abdominale, prélevés d'un côté sur 5 malades au voisinage de l'endroit où on avait fait prendre naissance le lambeau de Filatov, d'autre côté sur 6 sujets décédés, ont été examinés pour servir de contrôle. Le nombre des vaisseaux sanguins a été déterminé dans trois champs visuels de chaque coupe. En même temps, le diamètre de ces vaisseaux a été évalué.

Les résultats des examens histologiques, en ce qui concerne le nombre et le diamètre des vaisseaux du derme, ont été précisés par des calculs statistiques.

La comparaison des résultats microscopiques et statistiques prouve que le réseau vasculaire du derme et celui de la couche intermédiaire entre le derme et le tissu conjonctif sous-cutané jouent le rôle le plus important pour la perfusion sanguine du lambeau de Filatov. La peau du lambeau de Filatov est mieux approvisionnée en sang que la peau et que la peau abdominale des sujets décédés. On a pu constater que le nombre des vaisseaux du derme du lambeau de Filatov augmente au cours du training et des greffes successives. Les auteurs expliquent ces phénomènes qu'ils considèrent représenter des manifestations morphologiques des facultés compensatrices de la peau dans les conditions qu'ils viennent de décrire.

ZUSAMMENFASSUNG

Die Blutversorgung des Hautlappens nach Filatov

J. Bardach, A. Kurnatowski

Bei der plastischen Korrektur teilweiser oder vollständiger Nasendefekte mit dem Filatovschen Lappen nach der Methode von Chitrov oder mittels unserer Modifikation dieser Methode es ist unerlässlich, das Fettgewebe des Lappens fast vollständig zu ent-

fernen. Bisher wurde eine histologisch-pathologische Untersuchung, die die Möglichkeit, das Fettgewebe des Filatovschen Lappens vollständig entfernen zu können, bestätigt hätte, noch nicht durchgeführt.

Bei unseren histologischen Untersuchungen suchten wir die Art der Blutversorgung des Lappens und des ihm unmittelbar anliegenden Bindegewebes festzustellen. Es wurden mikroskopische Untersuchungen an 34 Präparaten von Filatovschen Lappen bei 16 Patienten durchgeführt. Das Material für die Untersuchung wurde in verschiedenen Zeitabständen nach der Bildung des Lappens (5 Wochen bis 22 Monate) entnommen. Zu Kontrolluntersuchungen wurde in 5 Fällen eine Untersuchung der Bauchhaut durchgeführt, wobei letztere an diesen Stellen entnommen wurde, die dem Bildungsort des Filatovschen Hautlappens benachbart waren; ferner wurde in 6 Fällen auch die Bauchhaut von Leichen untersucht. Die Anzahl der Blutgefäße wurde in jedem Schnitt in 3 Gesichtsfeldern gezählt, gleichzeitig wurde der Durchmesser dieser Gefäße gemessen.

Die durch die histologische Untersuchung gewonnenen Ergebnisse hinsichtlich der Anzahl und des Durchmessers der Koriumgefäße wurden statistisch ausgewertet.

Die mikroskopische und die statistische Bewertung weisen darauf hin, dass die Hauptrolle bei der Ernährung des Filatovschen Lappens dem Blutgefäßnetz des Koriums und dem vaskulären System an der Grenze zwischen Korium und Unterhautbindegewebe zukommt. Die Haut des Filatovschen Lappens weist eine bessere Blutversorgung auf als gewöhnliche Haut, aber auch als die bei Leichen untersuchte Bauchhaut. Es konnte festgestellt werden, dass die Anzahl der Blutgefäße im Korium des Filatovschen Lappens durch Training und sukzessive Transplantation ansteigt. Die Verfasser betrachten diese Erscheinung als morphologischen Ausdruck der Kompensationsfähigkeit der Haut, welche sich unter veränderten Bedingungen befindet.

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ANAESTHESIA IN THE SURGICAL TREATMENT OF BURNS

R. I. MURAZYAN

In recent years, surgical treatment of deep burns consisting in excision of necrosis and autotransplantation of skin (Postnikov, Kolesnikov, Vilyavin, Aryev, Vilain, Franc, MacMillan and others) is gaining increasingly wide usage.

In view of the surgical trauma in these operations, not infrequently accompanied by shock (a serious condition in these patients), and also by complications originating from disorders of the internal organs, the question of differentiated approach to and choice of the anaesthetic arises.

Protopopov, Postnikov and Gektin suggest local anaesthesia with novocain in the surgical treatment of burns, whereas Kolesnikov, Vikhriev, Matushevich use ether-oxygen intratracheal anaesthesia in most operations.

During the period from 1954 to May, 1960, 182 autotransplantations of skin in 116 patients were performed at the Burns Department of the Surgical Clinic of the Central Institute for Haematology and Blood Transfusion, holder of the Lenin Order. In 21 patients early excision of necrotic tissue together with autotransplantation was carried out (see Tab. 1).

In most cases the skin grafts were taken by means of a pneumo- or electro-dermatome.

It should be mentioned that in most patients who underwent surgical treatment, the condition was of medium severity. This was caused by the extent of the burns, by septic manifestations and by low haemoglobin, erythrocyte and blood protein readings. In 102 patients with burns of second and third degree more than 20% of body surface was affected: 96 showed definite signs of sepsis with a raised temperature; in 69 the blood proteins were decreased, in 28 of them the protein concentration was less than 5.5%.

In 32 patients disorders of the cardiovascular system and the respiratory tract were ascertained. The large number of patients and the various degrees of surgical trauma required great care in the choice of anaesthetic. In the surgical treatment of burns the author used local anaesthesia, intramedullary anaesthesia with novocain, intravenous general anaesthesia with thiopental sodium administered in divided doses, ether-oxygen anaesthesia with a mask and intratracheally, potentiated by curare substances.

Local anaesthesia by injection was used in the taking of autotransplants of a size up to 600 cm². When using a pneumo- or electrodermatome the thickness

Tab. 1. Types of anaesthesia used and complications observed in surgical treatment of patients with burns

Type of anaesthesia	Size of autografts				Number of operations	Complications	
	up to 200 cm ²	from 200 to 600 cm ²	from 200 to 1000 cm ²	over 1000 cm ²		Shock	Pneumonia
Local anaesthesia	86	34	—	—	120	—	—
Intramedullary novocain anaesthesia	—	2	—	—	2	—	—
Thiopental-sodium intravenous anaesthesia in divided doses	1	7	—	—	8	1	—
Ether-oxygen anaesthesia with mask	2	10	7	2	21	1	1
Intratracheal anaesthesia potentiated with curare substances	—	4	16	11	31	2	1
Total	89	57	23	13	182	4	2

of the skin grafts did not exceed 0.3 to 0.5 mm. For grafts up to 400 cm², a 0.5% solution of novocain (100 to 400 ml.), for larger grafts a 0.25% solution (500 to 800 ml.) was used. Infiltration of the tissue with the novocain solution formed a firm elastic cushion raised above the surrounding tissue which facilitated the taking of a straight and even graft.

For the taking of skin grafts from the lower and middle third of the thigh and the calf, in two cases the author used novocain administered by a regional injection anaesthetizing the whole limb.

For short operations intravenous thiopental sodium anaesthesia administered in divided doses was used. Slow intravenous injection (lasting ten minutes) of a 2% solution of thiopental sodium, given in amounts of 25 to 50 ml. (0.5 to 1.0 g), resulted in anaesthesia lasting 15 to 20 minutes. It should be added, however, that sufficient depth of anaesthesia was not always attained by this method which, in traumatizing operations, may lead to shock, an event the author was able to register in one of his patients.

In 52 operations ether-oxygen general anaesthesia was given by mask or intratracheally. In the last two years intratracheal ether-oxygen anaesthesia with premedication (atropine, promidol, morphia and barbiturates) together with the administration of aqueous solutions of thiopental sodium and relaxants, were used. Only in cases where intubation was difficult or in patients with scars in the face or on the neck, was ether-oxygen given by mask. The advantage of potentiated intratracheal anaesthesia in the taking of large grafts or in traumatizing operations is as follows: possibility of a) attaining the best possible conditions of anaesthesia with the smallest possible dose of anaesthetic, b) aspirating mucus from the bronchi during operation, c) applying artificial and controlled respiration.

Vikhriev, Matushevich and Filatov registered shock in four out of 57 cases of burns operated on under intratracheal anaesthesia, whereas in 209 operations only one patient died from shock on the table and only three patients died during the first days after operation from cardiac failure.

In 52 operations under ether-oxygen anaesthesia the author observed first degree shock in three patients in whom skin was taken from an area larger than 1000 cm² (see Tab. 1). Two patients developed postoperative pneumonia in the first days following operation. No patient, however, died during the operation or in the postoperative period.

These favourable results attained despite extensive and traumatizing operations, can be explained as follows:

1. Meticulous pre-operative treatment by routine blood transfusions in amounts of 200 to 400 ml. (twice to three times a week).

2. Anti-shock measures by drip infusions introduced at the beginning of the operation and by polyglukin, a highly effective blood substitute, in doses of 200 to 400 ml. administered in a continuous flow if the arterial pressure dropped to 90 or 80 mm. Hg.

3. Intratracheal anaesthesia potentiated with curare preparations, used in most operations, decreased the danger of hypoxia and shock even in traumatizing excisions of necrotic tissue and large autoplasties.

In extensive burns, where repeated operations at intervals of six to seven days could be anticipated, particularly in cases of cardiovascular or pulmonary disorders, traumatizing excisions of necrotic tissue and extensive autoplasties were mostly performed under potentiated intratracheal anaesthesia. Less traumatizing operations were carried out under local anaesthesia.

Not in a single case did the author register shock when local novocain anaesthesia was used. This applied even to cases with cardiovascular pathology. The function of the cardiovascular system was registered in all patients with burns larger than 10% of body surface or in those who had cardiovascular disorders before the accident.

In these patients a study was carried out of the ECG and X-ray kymograph recordings during movement (Burevich). Registration of the venous and arterial pressure permitted most precise assessment of the changes in the cardiovascular system. Where clear signs of cardiovascular failure or severe changes in the parenchymatous organs are found, the author recommends using local novocain anaesthesia particularly when the need arises for repeated operations at intervals of five to seven days.

However, the actual lack of direct contraindications for potentiated intratracheal anaesthesia permitted its successful and repeated use (5—6 times) even with patients in a very serious condition.

Apart from elaborating the various indications for the use of the different methods of anaesthesia, the author also studied the problem of the take of autografts in connection with the type of anaesthesia used. Postnikov and Propopov assumed that novocain anaesthesia is followed by a better take of skin grafts.

Kolokoltsev, on the contrary, demonstrates that local anaesthesia makes conditions worse for the take of autotransplants.

Bezmenova, Vikhriyev and Matushevich are unable to prove any advantage of local over general anaesthesia.

On analyzing the material the author was unable to register any advantages of one type of anaesthesia over the other with regard to the take autotransplants.

SUMMARY

1. In the choice of the type of anaesthesia to be used it is necessary to take into account both the extent and the duration of the operation, and the condition of the patient at the beginning of the operation.

2. In excision of necrotic tissue and autotransplantations of a small area the injection of novocain gives an adequate degree of anaesthesia without causing any complications.

3. With intramedullary novocain or with intravenous thiopental sodium in divided doses, it is also possible to attain an adequate degree of anaesthesia. With novocain, however, application remains limited to the extremities, and with thiopental sodium anaesthesia which lasts about 20—30 minutes, in a number of cases (particularly in excision of necrotic tissue) it does not always reach a sufficient depth.

4. In extensive and traumatizing operations it is best to use intubation general anaesthesia potentiated with curare substances.

The take of autotransplants evidently does not depend on the type of anaesthesia used.

ВЫВОДЫ

Обезболивание при хирургическом лечении ожогов

Р. И. Мурадян

1. В зависимости от объема и продолжительности хирургического вмешательства, исходного состояния ожогового больного, необходим дифференцированный подход к выбору того или иного вида обезболивания.

2. При проведении небольших по площади некротомий и аутотрансплантаций инфильтрационная новокаиновая анестезия позволяет добиться хорошей степени обезболивания, не вызывая каких-либо осложнений.

3. Применение внутрикостной новокаиновой анестезии, внутривенного фракционного тиопентал-натриевого наркоза также позволяет получить достаточную степень анестезии, однако, при первом виде обезболивания применение его ограничивается лишь конечностями, а при втором продолжительность использования составляет лишь 20—30 мин., не позволяя в ряде случаев (особо некротомий) достигнуть глубокого обезболивания.

4. При обширных и травматичных операциях наиболее оправдано и высоко эффективно применение потенцированного интубационного наркоза с использованием курареподобных веществ.

5. Степень приживания аутотрансплантатов по-видимому не зависит от применения того или иного вида обезболивания.

RÉSUMÉ

L'anesthésie dans le traitement chirurgical des brûlures

R. I. Murazjan

1. En choisissant l'un ou l'autre mode de l'anesthésie, il faut prendre à l'égard la grandeur et la durée du traitement chirurgical de même que l'état général du malade.

2. En faisant des nécréctomies en petite étendue, suivies de l'autotransplantation, l'anesthésie infiltrative par la novocaïne donne de bons résultats, sans avoir des complications.

L'usage de l'anesthésie à la penthothale soit intraveineuse, soit intraosseuse, donne de même de bons résultats, mais il y a des limites: pour la intraosseuse, elle ne touche que des membres, pour la intraveineuse, la durée (de 20—30 minutes) ne permet d'obtenir l'anesthésie profonde.

4. Quant aux grandes opérations, et surtout celles dans la traumatologie, le mieux est de se servir de l'anesthésie endotrachéale, utilisant le curare.

5. Le grade de la prise des autotransplants — à voir les résultats obtenus — ne dépend point de l'usage de l'un ou l'autre mode de l'anesthésie.

ZUSAMMENFASSUNG

Die Anaesthesie bei der chirurgischen Behandlung von Verbrennungen

R. I. Murasjan

1. Bei der Wahl dieser oder jener Anaesthesieart ist es notwendig, je nach Umfang und Dauer des chirurgischen Eingriffes und dem Zustand des Patienten vorzugehen.

2. Bei der Ausführung nicht zu ausgedehnter Nekrotomien und Autotransplantationen gestattet die Novokain-Infiltrationsanaesthesie, einen hohen Grad von Schmerzf়reiheit zu erzielen, ohne irgendwelche Komplikationen zu verursachen.

3. Die Verwendung der intraossären Novokainanaesthesie oder der intravenösen fraktionierten Thiopentalnarkose führt ebenfalls eine hinreichend tiefe Anaesthesie herbei, jedoch ist die Anwendung der intraossären Novokainanaesthesie auf Eingriffe an den Extremitäten beschränkt, während bei der zweiten Betäubungsart die Anaesthesiedauer (insgesamt 20 bis 30 Minuten) in einer Reihe von Fällen (besonders bei Nekrotomien) nicht ausreicht, eine hinreichend tiefe Anaesthesie zu erzielen.

4. Bei ausgedehnten und traumatisierenden Operationen ist am besten die Durchführung einer potenzierten Intubationsnarkose unter Verwendung von Curare-Stoffen zu empfehlen.

5. Das Ausmass des Einheilens der Autotransplantate hängt offenbar nicht von der Verwendung der einen oder anderen Anaesthesieart ab.

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THE TREATMENT OF SEQUELAE OF FACIAL BURNS

M. V. MUKHIN

In the face deep burns are followed by considerable scar deformities. Sometimes the physiognomy of the face is changed to such an extent after burns that, when comparing photographs of the same person taken before and after the injury, it is difficult to find any resemblance. It is quite understandable that these patients find facial disfigurement hard to endure and that they are often irritable or, sometimes, depressed.



Fig. 1. Face of a man aged 21 prior to burns.

Scars around the mouth cause deformation of the oral fissure and thus impede the intake of food and speech. Frequently a scar ectropion of the lips develops after burns. The lower lip is sometimes pulled right down to the chin. Ectropion of the lips causes baring of teeth, uncontrollable dribbling of saliva and escape of fluid or semi-fluid food from the mouth. Inability to bring the lips together impedes the pronunciation of lip consonants (M, P, B, V, F etc.) and thus speech becomes difficult to understand.

In other cases scars formed around the mouth contract the oral fissure to such an extent that the patient cannot even use a teaspoon.



Fig. 2.



Fig. 3.



Fig. 4.

Fig. 2. Face of the same man 6 months after deep burns of the face and scalp. On the granulating surface in the face and scalp skin grafts have been implanted which have taken completely but ectropion of the lips and eye lids and defects of the tip of the nose, both eye brows and auricles persist. — Fig. 3. Hair-bearing skin was left only at the back of the neck. — Fig. 4. On the left side of the neck a Filatov flap was formed with which the eye brows were later reconstructed from the hair-bearing skin of the back and the neck. The tissue of the flap proper was used for the reconstruction of the tip of the nose.

In some cases burns of the lips, chin and cheeks show alternating areas of different depth, i. e. 2nd and 3rd degree. After healing uneven scar formation develops. The small areas of preserved skin are drawn out by the pull of the scars into little funnels which accumulate sebum. These depression easily retain dirt and are thus prone to infection. In some cases sycosis develops in the skin of these formations. In contradistinction to the changes described above, some patients develop keloid scars. In men this kind of unevenness of the skin surface makes shaving very difficult. These and similar changes in the skin of the face induce patients to consult plastic surgeons for the repair of deformities.

Deep burns in the eye lids are followed by ectropion. The lower lid is affected more frequently. After burns in the neighbourhood of the medial or lateral canthus, scar epicanthus develops.

In burns the eye lashes are affected most frequently. In these cases, when the wounds have healed, a smooth, hairless scar band remains replacing the lashes, thus increasing the disfigurement of the face.

A deep burn in the region of the neck causes severe contractures which sometimes pull the chin right down to the sternum thus making the oral fissure gape still more and increasing the functional disorder.

The auricles are often very badly damaged.

After severe burns all deformities described above can be observed simultaneously. Their repair can only be effected by intricate plastic operations



Fig. 5.



Fig. 6.



Fig. 7.

Fig. 5. The lower pedicle of the Filatov flap was transferred to the upper lip from the left side after prior excision of the scar in that region. — Fig. 6. The other pedicle containing hair-bearing skin from the back of the neck was transferred to the right eye brow. — Fig. 7. Later, the remaining hair-bearing skin from the back of the neck was used for the left eye brow.



Fig. 8.



Fig. 9.

Fig. 8. After the hair-bearing skin had taken at the left eye brow, the pedicle was transferred to the edge of the defect in the nose. — Fig. 9. After shaping the lower part of the nose the remainder of the Filatov flap was flattened out and implanted partly to the upper lip (from the right side) and partly to the lower lip.



Fig. 10.



Fig. 11.



Fig. 12.

Fig. 10, 11, 12. The same patient after completion of the many-stage plasty. The ectropion of the eye lids was repaired by section of the scars followed by free skin grafting. Although the transplants have all taken well, the cosmetic result cannot yet be considered satisfactory.

carried out in stages which requires considerable time. Thus the clinical picture of the sequelae of facial burns can be variform the main part being played by the functional disorders caused by scar deformities.

In the treatment of defects and deformities of the face following burns, various methods of skin plasty are used in a single patient even in a one-stage operation.

Relatively small scars of a band-like shape may be repaired by local plasty using exchange of opposing triangular flaps according to Limberg. In cases, where it is impossible to repair the scar deformity by the exchange of opposing flaps, reconstruction by means of a pedicle graft from the neighbourhood (nasolabial groove, temporal region, forehead, etc.) is indicated.

In severe scar deformities of the lips a flap from the submandibular region on a single or double pedicle (of a visor-like shape) according to Lepchinsky, or a pedicle flap from the neck, may be used. In the latter, i. e. the flap from the neck, it is possible to form a flap of 14—15 cm. in length.

In cases, where the scar deformity of the face cannot be repaired by local tissue or pedicle flap plasty free skin grafts may be used. When using free skin grafts in the face it is advisable not to perforate them, since perforation gives rise to the formation of scars which impair the cosmetic result.

Free skin grafts are frequently used in the repair of scar ectropion of the lips and after the excision of large scars in the cheeks. The grafts are preferably taken from the inner aspect of the arm.

Defects of the eye brows are reconstructed by using hair-bearing skin from the temporal or parietal regions transplanted on a subcutaneous vascular pedicle [Esser, Blokhin, Kazanjian and others].

Depending on the extent and size of the scars in scar contractures of the neck, the following methods of reconstruction are used. Scar bands are treated by local plasties. In extensive scars free skin grafts, Filatov tubed pedicle flaps or epaulet flaps from the shoulder (Kazanyan and Converse) are employed.

In defects of the lower parts of the nose the author uses a Filatov flap.

In combined defects and deformities of the face plastic operations are performed using Filatov flaps supplemented by other methods of skin plasty.

The repair of defects and deformities of the face following deep burns is a chapter of plastic surgery that is still unfinished. With regard to the cosmetic effect, the results of these operations are still unsatisfactory. The surgical methods of the plastic repair of defects and deformities as described above require further elaboration and perfection.

S u m m a r y

Following deep facial burns, extensive scar deformities usually develop, such as keloid scars, ectropion of lips and eye lids, microstoma, contracture of the neck, defects in the lower parts of the nose, defects of the eye brows and the auricles, etc.

The repair of these deformities and defects entails great difficulties and requires that the surgeon has a mastery of all methods of skin plasty. Repair of multiple defects and deformities in the face requires a great many plastic operations with time-consuming postoperative care. The author wishes to point out that it is necessary to interrupt the treatment and discharge the patient from hospital. The report is supplemented by a demonstration of the author's own patients.

В Ы В О Д Ы

Лечение последствий ожогов лица

М. В. М у х и н

После глубоких ожогов лица в большинстве случаев остаются большие рубцовые деформации, келлоидные рубцы, вывороты век и губ, микростома, контрактуры шеи, дефекты нижних частей носа, бровей и ушных раковин.

Устранение таких деформаций и дефектов связано с большими затруднениями и требует, чтобы хирург владел всеми методами кожной пластики. Устранение многочисленных дефектов и деформаций лица требует проведения большого количества пластических операций, связанных с длительным временем лечения. Автор обращает внимание на то, что лечение необходимо прерывать и выписывать больного из коечного отделения. Статья дополнена демонстрацией больных, леченных автором.

R É S U M É

Le traitement des séquelles des brûlures de la face

M. V. M u c h i n

Les séquelles des profondes brûlures de la face font dans la plus part des cas les cicatrices peu esthétiques, telles que: les chéloïdes, les ectropies des palpèbres et des lèvres, microstoma, les déformations du cou, des parties inférieures du nez, les défauts des sourcils et du pavillon de l'oreille.

La réparation de telles déformations et défauts présente des difficultés appréhensibles et presse le chirurgien de maîtriser toutes les méthodes de la plastie de la peau.

La réparation de multiples déformations et défauts de la face n'est point réalisable sans de nombreuses opérations plastique à la durée du traitement longue.

L'auteur souligne qu'il faut souvent couper le traitement et permettre au malade de quitter le lit hospitalier.

L'article est suivi des démonstrations des malades traités à la manière citée ci-dessus.

ZUSAMMENFASSUNG

Die Behandlung von Folgeerscheinungen bei Gesichtsverbrennungen

M. V. Muchin

Nach tiefgradigen Gesichtsverbrennungen verbleiben grösstenteils umfangreiche Narbendeformationen, keloide Narben, Lid- und Lippenektropia, Mikrostoma, Halskontraktionen, Defekte des unteren Nasenteils, Augenbrauen- und Ohrmuscheldefekte.

Die Beseitigung von derartigen Deformationen und Defekten bietet grosse Schwierigkeiten und erfordert vom Chirurgen die Beherrschung sämtlicher Methoden der Hautplastik. Die Beseitigung von zahlreichen Gesichtsdefekten- und Deformationen erfordert eine grosse Anzahl von plastischen Operationen und lange Behandlungsdauer. Der Autor macht darauf aufmerksam, dass die Behandlung mit Unterbrechungen zu erfolgen hat und der Patient aus der Krankenstation zu entlassen ist. Seine Behauptung belegt der Autor mit Demonstrationen eigener Patienten.

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CHEMICAL BURNS AND THEIR TREATMENT

M. I. SINILO

Among the various types of work accident, chemical burns caused by acids and alkalis play a foremost part and are followed by long unfitness for work.

In contradistinction to thermic injuries, chemical burns caused by an alkaline electrolyte (dilute sodium hydroxide) are one of the specific accidents in miners requiring special methods both of first aid and treatment.

These burns are mostly characterized by their particular clinical picture and course. In the first hours or even days, the degree, size and depth of the burn cannot, as a rule, be distinguished with certainty, because the chemical agent continues to act. The symptoms, therefore, do not become apparent immediately, but after hours, sometimes even days and are accompanied by deep coagulation necrosis followed by typical, torpid wounds which take the shape of craters, forming ulcers resembling trophic ulcers. Spontaneous healing of a chemical burn without suppuration is exceptional. The slow regeneration and tedious and prolonged course of healing of chemical burns depends not only on the local trophic changes but also on the general condition of the organism which has been affected by the chemical agent, as well as by the products of tissue decomposition.

Analysis of the clinical material comprising a period of five years and observations in patients with chemical burns numbering more than 3,000 have shown that the various methods of conservative treatment do not give the expected results and require a period many times exceeding that of the treatment of thermic burns of the same size. It takes on an average one and a half to two months, but in a number of cases conservative treatment drags out for three to five months. These methods of treatment are mainly aimed at the gradual removal of sloughs and the slow healing of the wound.

Despite the significant improvement of the treatment of burns, which has taken place in recent years, the treatment of chemical burns has not yet been sufficiently elaborated. Therefore, the endeavour to find a new and more efficient method is quite in order and fully justified. From the few sources in the literature concerning the treatment of burns, it becomes evident that the various surgeons have tried to remove the damaged tissue and close the wound by suturing or covering it with a skin graft. Most reports about such operations, however, were more case histories and only in most recent years have papers

based on a larger number of observations, been published. These principles have mainly been applied in the treatment of third degree thermic burns and only rarely in injuries from electricity or chemical agents.

The inadequacy and tediousness of conservative treatment in chemical burns and the overall and detailed study of a number of other problems related to this injury, induced the author to carry out an experimental investigation of the use of more active surgical methods in the treatment of these burns. He endeavoured by early operation to remove the damaged tissue and to close the defect produced thereby completely, in one stage. For this purpose he chose two methods which proved to be most adequate under the given circumstances: the method of primary excision of the burned tissue followed by a tight suture of the wound edges, and covering the defect, left after the radical excision of the necrotic tissue, by free skin grafting with a so-called "net flap".

Preliminary check-up of the experiments and observations in 130 patients showed that the most favourable results were obtained if the operation was performed the second or third day after injury, i. e. when the demarcation line between the necrotic and viable tissue had become quite clear. If performed earlier, i. e. at a time when the alkali was still having a damaging effect, complications in the nature of sutures cutting through and flaps dissolving arose quite frequently, as could be shown in 63 patients both from clinical observations and the histological analysis of the burned tissue.

The quite promising and convincing experimental results and their critical evaluation permitted the application of the surgical method in the treatment of burns from electrolytes with great success even under clinical conditions. Up to date, a clinical material of more than 200 observation has been collected. In 80% of cases the method of primary excision of the burned tissue with subsequent tight suture of the wound edges performed after partial mobilization of the skin, was used. In nearly all cases primary healing was achieved within eight to nine days. Patient P., aged 28 (case paper 26099/108944), was admitted to the Clinic with chemical burns on both buttocks, on the right side of an area of 6 X 5 cm., on the left 5 X 5.5 cm. The next day, under local novocain anaesthesia total excision of the burned tissue into the healthy tissue was performed first on the left, then on the right side. The skin defect was closed by complete suture of the wound edges after partial excision. On the ninth day the sutures were removed. The wound had healed by first intention. On the twelfth day the patient returned to work.

With regard to this, primary excision followed by complete closure of the defect deserves the widest application as the method of treatment in chemical burns. It is particularly suitable in deep burns on limited areas of the body where the skin is sufficiently mobile and where, therefore, no danger of large defects arises.

In larger areas, where after excision of the necrotic tissue it is impossible to approximate the wound edges, a free skin autotransplant, the so-called "net flap", is used for the one-stage and complete closure of the skin defect. This method was used in 20% of cases. Only in two of these did the graft slough

off as a result of being lifted off the wound floor, due to an error of treatment in the post-operative period. In two other cases partial marginal necrosis occurred as a result of the cutting-through of some sutures, but this did not show in the ultimate result. In all other cases complete take of the transplanted "net flaps" was attained within 12 to 14 days.

As proof of what was said above, reference is made here of the following case: Patient P., aged 28 (case paper No. 29933/126581), was admitted to the Clinic with chemical burns of the right calf. The burned area was 110 cm². Under local novocain anaesthesia complete and deep excision of the burned area into healthy tissue was performed. A "net flap" was taken from the skin of the left side of the abdomen and with it the defect was covered completely. The sutures were removed on the eleventh day; the graft had taken completely. The patient was discharged on the thirteenth day. Thus the method of free skin grafting in the treatment of chemical burns by means of a "net flap" has proved its value and it seems that it is the best of the plastic methods. Its advantage lies without doubt in that the operation can be performed in one stage, that even large defects can be covered completely, that it is simple from the technical point of view and that it gives a large percentage of good results. It is also the most physiological method known, since the graft is capable of adapting itself to the functional requirements, of retaining the best possible shape, of permitting good movements, of leaving the greatest possible freedom in the choice of material and of showing considerable resistance towards mechanical stress — qualities which are only excelled by a flap with all skin layers.

The clinical and experimental analysis of the surgical method of treatment in chemical burns permits the author to recommend and widely propagate it among medical practitioners. Recently, as can be shown by the analysis of the methods of treatment of these burns carried out in many coalfield districts, the surgical method has found successful application in many mining medical centres.

Thus the above report as well as reports from a number of other mining medical centres bear witness to the fact that the surgical method of treatment of chemical burns has many advantages over the conservative methods. It shortens the period of treatment to one half or even one third and, therefore, deserves special attention and the widest application in surgical practice.

SUMMARY

1. Chemical burns from electrolytes of storage batteries are specific injuries in miners. They require a special method both of first aid and treatment and are followed by a long period of unfitness for work.

2. The clinical picture of burns from electrolytes is on the whole characteristic and distinctive. It differs in its clinical manifestation and course not only from thermic but also from a series of other chemical injuries. Instead of colliquative necrosis, as caused by an alkaline electrolyte, it leads to coagulative necrosis of tissue.

3. Until recently the treatment of these burns was mainly conservative and aimed at gradual removal of the necrotic tissue and slow spontaneous healing of the wound. The time required for this method of treatment was usually three to four times longer than that of thermic injuries of the same size.

4. The preliminary experimental analysis of the surgical method and the follow-up of 130 experimental cases permitted its successful use even under clinical conditions. The most suitable period for early operation proved to be the second or third day after injury when the demarcation line had formed around the damaged tissue.

5. In deep burns of limited area the method of local skin plasty performed after radical excision of the burned tissue, gave quite satisfactory results. In large burns where it was impossible to close the defect resulting from the excision of the damaged tissue by skin from the surroundings, it proved expedient to use the one-stage, under any circumstances applicable and most physiological method, of free skin transplantation by means of the so-called "net flap".

6. The results of the surgical methods of treatment as performed in 214 patients with chemical burns were much better than those of the conservative methods. The duration of treatment could thus be shortened by more than half, a feature which deserves special attention and the widest usage in surgical practice.

ВЫВОДЫ

Химические ожоги и их лечение

М. И. Синило

1. Химические ожоги от электролита аккумуляторной батареи являются специфической ожоговой травмой среди горняков, требуют специальных методов оказания первой помощи и их лечения и влекут за собой длительную утрату трудоспособности.

2. Клиническая картина электролитных ожогов весьма характерна и своеобразна. Они, по своему клиническому проявлению и дальнейшему течению отличаются не только от термических, но и от ряда химических. Вместо колликвационного некроза, ожоги от воздействия щелочного электролита вызывают типичный коагуляционный некроз тканей.

3. Лечение этих ожогов до последнего времени осуществлялось, главным образом, консервативным путем и было направлено на постепенное отторжение некротических тканей и такое же медленное заживление ожоговой раны. Длительность такого лечения химических ожогов обычно в 3—4 раза превышала сроки лечения термических ожогов одинакового по площади поражения.

4. Предварительная экспериментальная проверка оперативного метода и наблюдения над 130 подопытными животными, позволила успешно осуществить его и в условиях клиники. Наиболее благоприятным сроком для раннего оперативного вмешательства является второй-третий день, когда вокруг поражения устанавливается четкая демаркационная линия.

5. При глубоких и ограниченных по площади поражениях, после радикального иссечения обожженных тканей, вполне удовлетворительные результаты дал метод кожной пластики местными тканями; при более обширных поражениях, когда после иссечения пора-

женных тканей полученный дефект местными тканями закрыть не представляется возможным, целесообразно использовать одномоментный, доступный в любых условиях и наиболее физиологичный метод — свободной кожной пластики «лоскутом-сито».

6. Оперативные вмешательства, предпринятые у 214 больных с химическими ожогами, выявили значительные преимущества хирургического метода их лечения по сравнению с консервативным. Сроки лечения при этом удалось сократить более чем в два раза, что заслуживает особого внимания и широкого применения в хирургической практике.

RÉSUMÉ

Les brûlures chimiques et leur thérapie

M. I. Sinilo

1. Les brûlures chimiques provoquées par les électrolytes des batteries d'un accumulateur représentent les brûlures traumatiques spécifiques des mineurs qui demandent des méthodes spéciales pour le traitement de la première urgence ainsi que pour la thérapie ultérieure; en plus, elles entraînent la perte de l'aptitude professionnelle pendant une période très longue.

2. Les symptômes cliniques des brûlures par les électrolytes sont caractéristiques et très particuliers. Par leur développement cliniques et leurs séquelles, ces brûlures diffèrent non seulement des brûlures thermiques, mais aussi de beaucoup des brûlures chimiques. Au lieu d'une nécrose colliquative, les brûlures causées par des électrolytes alcalins provoquent une nécrose de coagulation typique des tissus.

3. Encore tout récemment, la thérapie de ces brûlures consistait dans l'application des méthodes conservatrices et se bornait à l'écartement progressif des tissus nécrotiques et la cicatrisation lente des plaies qui résultaient des brûlures. Le temps nécessaire à une telle thérapie des brûlures chimique dépassait de 3 à 4 fois celui qui était nécessaire pour la thérapie des brûlures thermiques d'une importance correspondante.

4. Après une vérification expérimentale préalable de la méthode opérative et l'observation de 130 animaux d'expérience, il a été possible de l'appliquer avec succès dans des conditions cliniques. Le moment le plus favorable pour l'intervention, c'est le deuxième ou le troisième jour, quand une ligne de démarcation nette se développe aux environs de la blessure.

5. Dans le cas des blessures profondes dont la surface est limitée, on a obtenu des résultats satisfaisants par la méthode des greffes cutanées à l'aide des tissus avoisinants, après excision radicale des tissus brûlés. S'il s'agit de blessures d'une plus grande étendue où il n'est pas possible de couvrir, après avoir enlevé les tissus endommagés, la défectuosité produite à l'aide des tissus de la région touchée, il est utile de se servir de la méthode en une seule étape, utilisable dans les conditions données et en même temps la plus physiologique — celle de la greffe cutanée libre à l'aide du „lambeau perforé“.

6. Les interventions faites sur 214 malades avec des brûlures chimiques montrent les avantages considérables qu'offre la thérapie par la méthode chirurgicale, en comparaison avec la méthode conservatrice. Le temps nécessaire pour le traitement a pu être abrégé à moins qu'à la moitié, ce qui mérite un intérêt spécial et l'application générale en chirurgie de routine.

ZUSAMMENFASSUNG

Chemische Verätzungen und ihre Behandlung

M. I. Sinilo

1. Chemische Verätzungen durch Akkumulatoren-Elektrolytlösung stellen einen spezifischen Unfall der Bergarbeiter dar, erfordern eine spezielle Methode sowohl bei der Leistung der ersten Hilfe, als auch bei der Behandlung und haben eine langdauernde Arbeitsunfähigkeit des Betroffenen zur Folge.

2. Das klinische Bild der Verätzung durch Elektrolytlösung ist ziemlich charakteristisch und eindeutig. Durch seine klinischen Erscheinungen und den weiteren Verlauf unterscheidet es sich nicht nur von thermischen Verbrennungen, sondern auch von einer Reihe anderer chemischer Verätzungen. An Stelle einer Kolliquationsnekrose rufen die durch die alkalische Elektrolytlösung verursachten Verätzungen eine typische Koagulationsnekrose des Gewebes hervor.

3. Die Behandlung dieser Verätzungen war bis in die jüngste Zeit konservativ und auf eine allmähliche Entfernung der Gewebsnekrosen und eine langsame Heilung der Verätzung abgerichtet. Die Zeitspanne, die bei diesem Vorgehen für die Heilung der chemischen Verätzung erforderlich war, betrug gewöhnlich das Drei- bis Vierfache der Behandlungsdauer thermischer Verbrennungen von gleichem Wundausmass.

4. Die vorausgehende experimentelle Kontrolle der operativen Methode sowie Beobachtungen an 130 Versuchsfällen gestatteten die erfolgreiche Verwendung dieser Methode auch unter klinischen Bedingungen. Den geeignetsten Zeitpunkt für einen frühzeitigen operativen Eingriff stellt der 2. bis 3. Tag dar, zu welcher Zeit sich um die Verätzung eine deutliche Demarkationslinie ausgebildet hat.

5. Bei tiefen und in ihrem Flächenausmass begrenzten Verätzungen erzielte nach der radikalen Exzision der verätzten Gewebe die Hautplastik mit Hilfe lokalen Gewebes vollkommen zufriedenstellende Ergebnisse; bei ausgedehnten Verätzungen, bei denen nach Exzision der geschädigten Gewebe der Defekt nicht durch lokales Gewebe gedeckt werden kann, ist es zweckmässig, eine einzeitige, unter allen Bedingungen durchführbare und äusserst physiologische Methode anzuwenden — die freie Hautplastik mit dem „Sieblappen“.

6. Die bei 214 Patienten mit chemischen Verätzungen vorgenommenen operativen Eingriffe erwiesen, dass die chirurgische Behandlungsmethode den konservativen Methoden bei weitem überlegen ist; die Behandlungsdauer konnte auf diese Weise auf weniger als die Hälfte verkürzt werden, was besondere Beachtung verdient und die Eignung dieser Methode zur Verwendung in der chirurgischen Praxis unterstreicht.

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SIGNIFICANCE OF SKELETAL CHANGES IN BURNS

V. ŠTĚPÁNEK

A number of papers [Colsen, Dubs, Kolář, Owens, Rochlin, Rouiller and others] have dealt with the changes in the skeleton due to burns. The author has studied this problem in detail during recent years and his findings are summed up as follows:

The author most frequently found osteoporosis which is almost a regular feature in extensive third degree burns of the extremities. In small burns of first or second degree without suppuration it occurs but rarely (Dubs, 1921). In the skeleton of the trunk the author found bone atrophy only in 2% of patients with burns of second and third degree involving 20 to 60% of the body surface. The osteoporosis is either diffuse or, often more marked in the metaphyses and epiphyses of long bones, and in the short bones it acquires a mottled appearance (Fig. 1). This picture corresponds to that of Sudeck's atrophy. As a rule, osteoporosis appears one to three months after injury and persists for several months, in severe cases even for several years. In the late stage it acquires the appearance of hypertrophic bone atrophy (Fig. 2). The patient, whose radiogram of the legs can be seen in Fig. 2, showed severe osteoporosis of the skeleton in all burned parts of the body, i. e. in both lower extremities, the right upper extremity, the pelvis and the lumbosacral spine (he had suffered second and third degree burns to almost one half of body surface). Osteoporosis persisted for several months, during which time nephrolithiasis developed (Fig. 3). Neurotrophic disorders with neurovascular changes participate particularly in the development of osteoporosis (as was stressed by Colson, Rochlin and others): immobilization, hypoproteinaemia, hypovitaminosis and exaggerated alert reaction (Lichtwitz) are also involved.

A less frequent finding in patients suffering from burns is calcification in the soft parts of the burned areas, which the author found in 4% of the patients lying in hospital. These are dystrophic calcifications (developing at sites of suppuration, protracted elimination of necrotic tissue and sometimes of deeper burns). Disorders of calcium metabolism and neurotrophic disorders are also not without significance (Fig. 4).

Osteomyelitis, which sometimes takes a concealed course and always has a deleterious effect upon the patient's general condition, may be considered a very

serious complication. Frequently bone deformities remain as its sequelae, e. g. exostotic unevenness of the growing skeleton, the proximal margin of which is marked by a minute defect in the adjacent part of the metaphysis (Fig. 4). These changes are not specific for burns; they occur in all types of osteomyelitis in childhood (Feller, Štěpánek). According to Hladík, they are parostotic pseudochondromas.

According to the experience of the author periosteal thickening of bone (Fig. 5) and joint ankylosis with destruction are also caused by the penetration of infection into the skeleton. The same view is held by Artz and Reis, whereas Burke Evans considers these changes to be the outcome of a degenerative process.

All changes mentioned and particularly the analysis of their pathogenesis, indicate the complexity of pathophysiological processes in patients suffering from burns. The majority of these changes are also of clinical importance. Sudeck's dystrophy is a feared complication both in burns and mechanical injuries. Extensive osteoporosis may lead to disorders of calcium metabolism and to nephrolithiasis. In order to prevent these changes it is necessary to act against the factors which are causing them, and about which mention was made above.

X-ray examination plays an important part in the detection of osteomyelitis, periostitis and arthritis which, if not recognized and treated in time may have an adverse effect on the course of toxic cachexia in patients suffering from burns.

SUMMARY

In accordance with references in the literature, the author reports on the following bone changes in burns: Osteoporosis, calcification in the soft parts, osteomyelitis, periostitis and arthritis with subsequent deformities.

He points to the cause of these changes and to the possibility of their prevention.

ВЫВОДЫ

Значение изменений скелета у пострадавших от ожога

V. Štěpánek

Автор описывает, в соответствии с литературными данными, следующие изменения скелета пострадавших от ожога: остеопороз, кальцификации мягких частей, остеомиелит, периостит и артрит с последующими деформациями.

Приведены причины возникновения этих изменений и возможности, как им воспрепятствовать.

RÉSUMÉ

L'importance des altérations osseuses chez les brûlés

V. Štěpánek

En accord avec les indications littéraires, l'auteur décrit les altérations squelettiques que voici chez les brûlés: de l'ostéoporose, des calcifications des parties molles, de l'ostéomyélite, de la périostite et de l'arthrite avec les déformations qui s'ensuivent.

Il indique les causes de l'origine de ces altérations ainsi que les possibilités pour les éviter.

Die Bedeutung von Knochenveränderungen bei Verbrannten

V. Štěpánek

In Übereinstimmung mit den Literaturangaben führt der Autor folgende Skelettveränderungen bei Verbrannten an: Osteoporose, Kalzifikation in den Weichteilen, Osteomyelitiden, Periostitiden und Arthritiden mit nachfolgenden Deformationen.

Es werden die Entstehungsursachen dieser Veränderungen und die Möglichkeit deren Vorbeugung angeführt.

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(Dr. V. Štěpánek): Paskov 61, Ostrava, Czechoslovakia

SIGNIFICANCE OF SKELETAL CHANGES IN BURNS



Fig. 1.



Fig. 2.

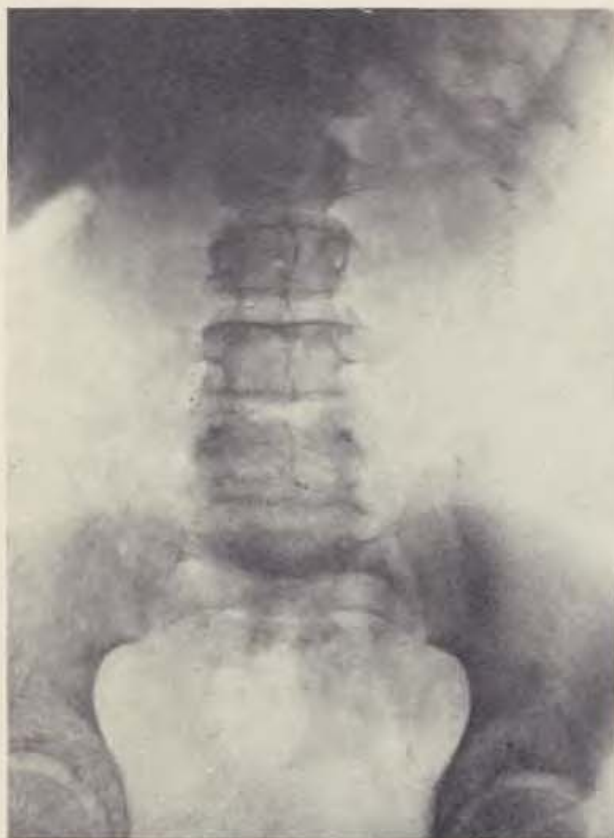


Fig. 3.



Fig. 4.



Fig. 5.

**PROFESSOR NIKOLAY NIKOLAYEVICH PRIOROV, ORDINARY
MEMBER OF THE ACADEMY OF MEDICAL SCIENCES
OF THE U.S.S.R. (1885-1961)**

Professor Nikolay Nikolayevich Priorov, one of the founders of Russian and Soviet traumatology and orthopaedics died on April 15th, 1961. He was the founder and director of the Central Institute of Traumatology and Orthopaedics of the Ministry of Health of the U.S.S.R., ordinary member of the Academy of Medical Sciences of the U.S.S.R., merited scientist of the R.S.F.S.R.



N. N. Priorov was born in 1885 in Shenkursk in the gubernia of Archangelsk. He was the son of an official. In 1912 he graduated from the Medical Faculty of Tomsk University.

Already as a student he worked during the cholera epidemic and took part in the northern expeditions to the Kara Sea, the island of Vaygach and the estuary of the Ob River.

In 1916 Priorov's future scientific and practical work began to take shape. He organized reconstructive treatment for the invalids of the First Imperialist War and the Civil War.

In 1921 he founded the Medical Institute of Prosthetics which was reorganized in 1940 and became the central and leading institution for the scientific-methodical orthopaedic and traumatological service of the U.S.S.R.

Priorov did a great deal of teaching. In 1931 he founded the Chair of Orthopaedics and Traumatology at the Central Postgraduate Medical School on the basis of the Institute, and became its director to the end of his life; at the same time, from 1933 till 1938, he

was director of the Chair of orthopaedics and traumatology of the First Moscow Medical Institute. Priorov gave guidance to a great number of aspirants and directors of clinical departments.

In the years of the Great Patriotic War, Priorov became the surgeon-in-chief of the Evacuation Hospital of the People's Commissariat for Health of the R.S.F.S.R. and also surgeon-in-chief of the Evacuation Hospital of the People's Commissariat for Health of the U.S.S.R.

From 1945 till 1947 Priorov was a deputy Minister of Health and at the same time remained director of the Institute. On his initiative 11 new institutes were founded in the main cities of the Soviet Union on the lines of the Central Institute.

Priorov is the author of more than 230 scientific papers. His monograph "Amputation of Extremities and Prostheses" played a great part in the development of the work on stumps, defects and prostheses. Many of his papers dealt with the treatment of the sequelae of gunshot wounds and his recent papers with the treatment of pseudoarthrosis, plastic operations on the hand and the forearm and with problems of the organization of comprehensive treatment of invalids from the Great Patriotic War. He also paid attention to problems of accident prevention, prevention of deformities in children, the organization of an orthopaedic service for children, treatment of the sequelae of poliomyelitis, spastic paralysis, deformities of the feet and scoliosis. Priorov and his pupils were engaged in work on the physiology and pathology of bones, the treatment of fractures, bone plasty, burns, injuries caused by electric current and sports accidents. He worked in research for introducing plastic substances into surgery and also on questions of transplantation and conservation of organs and tissues for which a tissue bank was set up in the Central Institute of Traumatology and Orthopaedics. The Institute was entrusted with the function of state methodological centre for tissue transplantation, and with Priorov's cooperation a network of analogous laboratories was founded in subsidiary institutes.

Professor Priorov, an outstanding organiser, talented surgeon and teacher founded an outstanding school of orthopaedic surgeons and traumatologists. He took an active part in All-Union Congresses of surgeons and in conferences, was editor of the journal "Gospitalnoe delo", deputy editor-in-chief of the journals "Chirurgiya", "Ortopediya, Travmatologiya i Protezirovaniye" and of the journal "Acta Chirurgiae Plasticae"; he was also a member of the editorial board of "Opyt Sovetskoy Mediciny v Velikoy Otechestvennoy Voiny", and others.

Priorov also edited a number of collections of papers of the Institute.

In 1950 Priorov became corresponding member of the Academy of Medical Sciences of the U.S.S.R. and in 1957 an ordinary member.

His entire activity was very wide and many-sided; for a number of years he had been member of the Scientific Medical Council of the Ministry of Health of the R.S.F.S.R. and U.S.S.R. In 1946 he became chairman of the Scientific Council of the Ministry of Health of the U.S.S.R., member of the presidium of the Technical Council, etc. From 1947 Priorov was deputy chairman of the All-Union Surgical Society.

In 1922 he founded the Medical Scientific Society of Traumatologists and Orthopaedic Surgeons of the city of Moscow and the Moscow region, and in 1946 the All-Union Society of Traumatologists and Orthopaedic Surgeons and became its permanent chairman.

As director of the Central Institute and chairman of the commission of the Academy of Medical Sciences of the U.S.S.R. for questions of accidents, the organisation of traumatological services, treatment of accidents and orthopaedic disorders, Priorov accomplished extremely important work in coordinating the research work with the existing problems in the country.

During all his activities Priorov devoted great efforts and attention to helping the health organisations practically and to popularizing medical knowledge.

He was appointed honorary member of the All-Union Surgical Society, The Moscow and Leningrad Society of Traumatologists and Orthopaedic Surgeons, etc. He was member of the presidium of the International Association of Surgeons, honorary member of the Society of Orthopaedic Surgeons of Great Britain and a number of other societies.

Priorov visited clinics in Austria, Germany, U.S.A., Britain, Canada and other countries.

The life of Priorov is an example of great love for work, love for his people and country. He was greatly esteemed and beloved by his collaborators, pupils and patients to whom he devoted meticulous attention. As a surgeon he was an outstanding expert. He was clever and successful in finding simple and rational solutions for complicated operations.

The Soviet Union has lost a foremost scientist and teacher and active builder of the Soviet health service, a loyal son of the Communist Party, an outstanding doctor, an attentive, modest and charming person.

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TABLE OF CONTENTS

V. Kavrakirov: On the Problem of Total Rhinoplasty with a Filatov's Flap Stripped of Fat	241
M. I. Yarchuk: Free Skin Grafting in the Face with Standardized Pressure .	250
J. Ladányi, R. Kós: Eine neue Methode zur Sensibilitätsprüfung replantierter Fingerglieder	256
J. Vejvalka: Volkmann's Ischaemic Contracture — Notes and Suggested Operation	263
H. Pešková, B. Stockar: Hemiatrophia Faciei Progressiva — Romberg's Disease	276
J. Bardach, A. Kurnatowski: Blood Supply of a Filatov Skin Flap . . .	290
R. I. Murazyan: Anaesthesia in the Surgical Treatment of Burns	299
M. V. Mukhin: The Treatment of Sequelae of Facial Burns	305
M. I. Sinilo: Chemical Burns and their Treatment	311
V. Štěpánek: Significance of Skeletal Changes in Burns	318
V. N. Blochin: Professor Nikolay Nikolayevich Priorov, Ordinary Member of the Academy of Medical Sciences of the U.S.S.R. (1885—1961) .	321
Announcements	324
