ACTA CHIRURGIAE PLASTICAE

INTERNATIONAL JOURNAL
OF PLASTIC SURGERY

10·2

1968

Acta chir. plast. 10: 2 : 1968

CZECHOSLOVAKIA · PRAGUE · SZDN

Published four times (in 1959: two times) a year by Státní zdravotnické nakladatelství, (Czechoslovak Medical Press), Malostranské nám. 28, Praha 1. Editor in Chief Prof. Dr. H. Pešková; Substitute of Editor in Chief Prof. Dr. V. Karfík. — Adress of the editorial office: Acta chirurgiae plasticae (M. Dobrkovský, M. D. — Secretary) Legerova 63, Praha 2, Czechoslovakia. — Orders through ARTIA, Smečky 30, Praha 2. — Press: Středočeské tiskárny, n. p., provoz 101, Hálkova 2, Praha 2

TABLE OF CONTENTS

STÁTNÍ ZDRAVOTNICKÉ NAKLADATELSTVÍ
CZECHOSLOVAK MEDICAL PRESS
Praha 1 - Malá Strana, Malostranské nám. 28

24

publishes in 1968 already

INTERNATIONAL MEDICAL JOURNALS

REVIEW OF CZECHOSLOVAK MEDICINE Vol. 14

Published in English, four times a year, every copy comprising 80 pages and 4 enclocures in the size of 170×240 mm.
Annual subscription $ 4,— £ 1/8/9

JOURNAL OF HYGIENE EPIDEMIOLOGY, MICROBIOLOGY AND IMMUNOLOGY Vol. 12

Published in a combined English-French-German version, four times a year, every copy comprising 128 pages and 8 enclosures in the size of 170×240 mm.
Annual subscription $ 6.— £ 2/3—

ACTA CHIRURGIAE PLASTICAE Vol. 10

Published in a combined English-French-German version, four times a year, every copy comprising 80 pages and 4 enclosures in the size of 170×240 mm.
Annual subscription $ 4,— £ 1/8/9

COR ET VASA Vol. 10

Published in a combined English-French-German version, four times a year, every copy comprising 80 pages and 4 enclosures in the size of 170×240 mm.
Annual subscription $ 4,— £ 1/8/9

All these Journals publish informations on the latest knowledge and research of Czechoslovak doctors in the given specialties as well as contributions by scientific workers from the socialist countries represented in the respective international board.

informations and orders are received and given attention by

ARTIA

EXPORT CORPORATION,
PRAHA 1, SMEČKY 30
CZECHOSLOVAKIA

ACTA CHIRURGIAE PLASTICAE — *10*, 2, 1968

Clinic of Plastic Surgery, J. Ev. Purkyně University Faculty of Medicine, Brno,
Director Prof. V. Kubáček, M. D., CSc.

PROBLEMS OF RECONSTRUCTION OF THE THUMB

V. KUBÁČEK

Loss of the thumb means a very serious anatomical and functional damage to the human hand. The grasping ability is admittedly preserved by means of flexion of the remaining fingers but the ability to grasp an object between the first and the second finger, to form the pinch, is lost, and there is a complete loss of the so called opposition of the first finger, these components of the functional fitness of the human hand being the most essential ones. The functional importance of the thumb logically follows from the anatomical arrangement of the human hand. The second to fifth fingers have metacarpals firmly connected by means of ligaments and the small muscles of the hand while the metacarpal of the thumb has a free articular connection with the os multangulum maius, its motility is very good, and it possesses its own group of muscles which constitutes the thenar portion of the palm.

This arrangement enables the thumb to perform an isolated, more complicated and multifarious movement, and especially provides the specific grasping ability of the human hand with the possibility of thumb opposition. Thumb opposition is of great importance for in a large number of performances the function of the thumb is limited to its passive opposition to the other fingers with the stabilized metacarpophalangeal and interphalangeal joints.

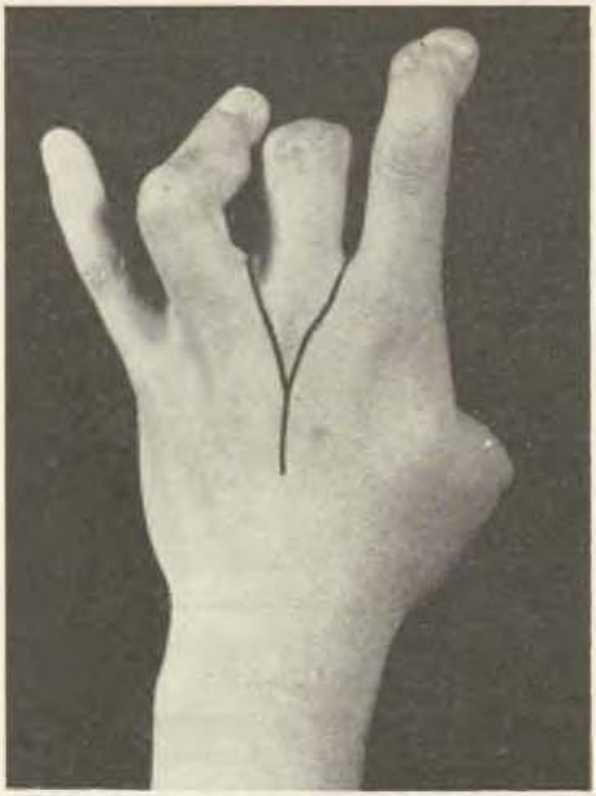
From the above mentioned follows that there is a sort of functional exclusiveness of the thumb and a considerable functional equivalence of the second to fifth fingers. In the loss of some of them they can easily replace each other without reconstructive surgery which, however, is absolutely indispensable in the case of loss of the thumb. For this reason, reconstruction of the thumb is a relatively frequent intervention and belongs to the most complicated and most interesting problems of reconstructive surgery of the hand in general.

METHODS OF RECONSTRUCTION OF THE THUMB

In principle, there are three kinds of methods which make possible anatomical and functional reconstruction of a lost thumb, namely:

1. The correction consists in a simple local intervention;

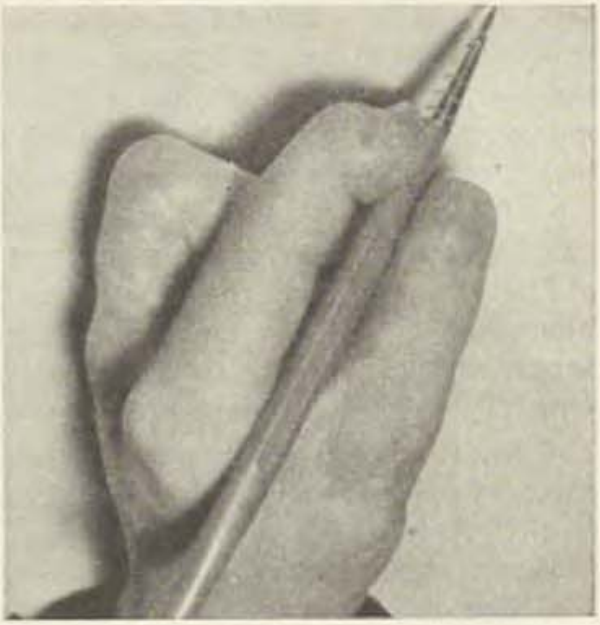
2. One of the fingers of the same hand must be used for the reconstruction, and the so called transposition (shift) of the finger is performed;



1

2

3



4

3. Parts taken from other organs must be used for the restoration of the thumb, and the so called transplantation is performed.

The first method is used, if only the distal phalanx of the thumb is missing. In such cases, the anatomical reconstruction is limited to a relative prolongation of the remaining part of the thumb by deepening the first interdigital space using Z-plasty. Of course, this method of correction is indicated only in those cases, where the function of the remaining stump of the thumb is normal. In this way we only adjust the grasping ability of the thumb.

The other two methods are used in the case of a more extensive loss of the thumb, i. e. if at least both phalanges of the thumb are lost.

The transposition is such a method of reconstruction of the thumb during which either the stump of some finger along with the metacarpophalangeal joint and a portion of the pertaining metacarpal, or a whole healthy finger, exarticulated in the metacarpophalangeal joint of the respective finger, is shifted. It is an important feature of this method that the shift be performed with

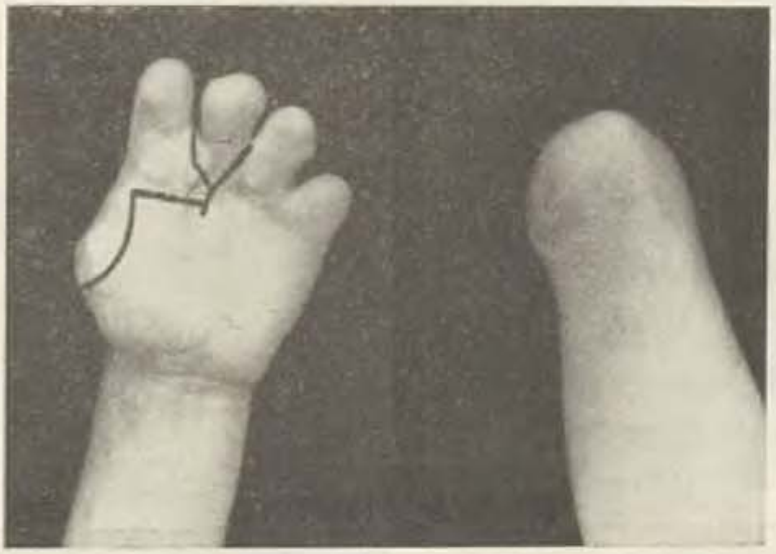


Fig. 5

the neurovascular bundle with preserved and unimpaired flexor tendons which remain in permanent connection with the maternal localization, only their course being changed.

For the transposition, any finger of the same hand, or its stump can be used. This method is the best of the up-to-date methods of reconstruction, involving the least risks and yielding a relatively perfect functional result. It can be used practically in all extensive losses of the thumb, both partial and complete. Of course, it unconditionally requires a proper surgical skill and great experience.

The third method of reconstruction of a lost thumb consists in transplantation. It is not characterized by a shift but by transplantation of a finger from the other hand, or of a toe, to replace the lost thumb. This means that the connection of the transplanted part with the maternal localization is gradually interrupted in stages, and completely interrupted in the end.

In this methods of reconstruction we also include reconstruction of the thumb by means of flap skin grafts from the hypogastrium, reinforced secondarily by means of a bone or cartilage autotransplant (Karfík).

Of course, transplantation of a finger from the other, healthy hand, or of a toe from one of the feet is a rare and rather theoretical indication, apart from the fact, that its results are not good, for the thumb newly reconstructed in this way is not sufficiently sensitive and its motility is considerably limited. It is also a complicated, exacting and risky method.

6

7

8

9

On the other hand, reconstruction of the thumb by means of flap skin grafts from the hypogastrium is used much more frequently, is not so hazardous and exacting. Of course, at present, its indication is relatively narrow, mainly in such cases, where transposition is impossible or where the thumb has been only scalped during the injury while the skeleton is completely preserved.

THE AUTHOR'S OWN MATERIAL

In the Department of Plastic Surgery in Brno a total of 45 reconstructions of the thumb were performed, both in partial and complete losses. Most of them,

Fig. 10

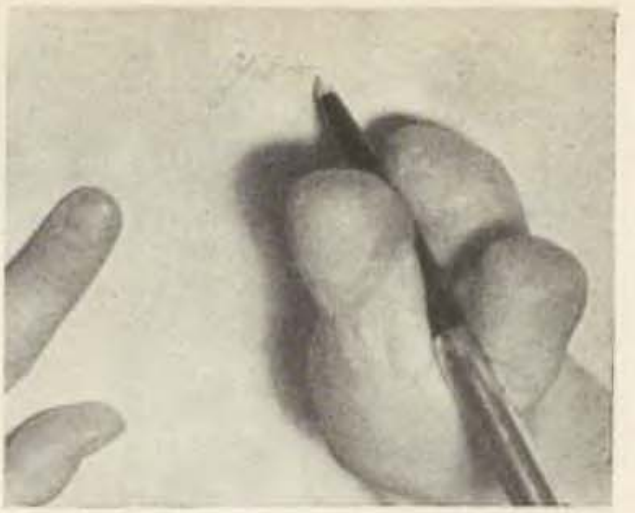


Fig. 11

i.e. 33 cases, were solved, either by local correction, or by means of flap skin grafts from the hypogastrium. In 12 patients restoration of the lost thumb was performed by transposition of the stump of some of the fingers or of a whole healthy finger.

Reconstruction of the thumb using local correction by means of skin graft plasty is sufficiently known and has already been published (Karfík, Vejvalka, Šlesinger). We shall therefore deal in more detail only with reconstruction of the thumb by transposition of the stump of some other digit or of a whole finger.

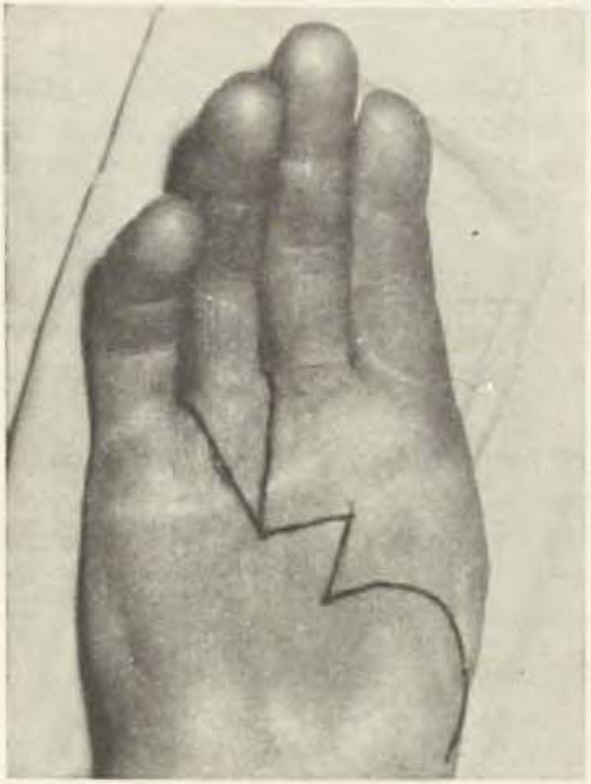
In 12 of our patients the stump of the third finger was transposed in six cases, the stump of the second finger in two cases, the stump of the fourth finger in two cases, and in two cases the whole fourth finger was transposed (Figs. 1—4, 5—7, 8—11, 12—13, 14—15).

In 10 of the injured both phalanges of the thumb and a part of the metacarpal were always lost; the thenar muscles and their function were well preserved and, at the same time, the second to fourth fingers were damaged in such a way that a well functioning stump, formed by the proximal phalanx of the finger, was preserved in each of them. In the remaining two patients there was a complete loss of both the thumb and the thenar, while only the base, about 1.5 cm long, and the articulation with the os multangulum maius (Fig. 16) remained from the first metacarpal, in one of the patients.

In the second patient the whole skeleton of the thumb with a well functioning thenar was preserved, but both phalanges of the thumb, i. e. the metacarpophalangeal and interphalangeal joint, were completely ankylotic, absolutely immobile, and covered only with atrophic scarred skin, so that practically the condition corresponded to complete loss of both phalanges of the thumb. In this case perhaps replacement of the skin by flap graft plasty from the hypogastrium would be indicated but we believe that this solution would not be correct and would not bring the patient such an advantage and restitution of function as the transposition of the fourth finger of the same hand did.

12

13



14

15

In both these patients the second to fifth fingers were both anatomically and functionally absolutely normal. The operative technique and tactics of the transposition were as follows:

As a rule, transposition of the stump of a finger or of a whole finger is performed under 0,25% novocain anaesthesia after Vishnevski in such a way that — as already mentioned — the neurovascular bundle and the flexor tendons must remain preserved and absolutely intact. If the stump of one of the

Fig. 16

Fig. 17

fingers is transposed, the respective metacarpal is resected at about one half of its length and adjusted to form a bony spine which is then inserted into the medullary cavity of the remaining metacarpal of the thumb. The stump of the finger is thus transposed in toto along with the skin and the metacarpophalangeal joint.

If a whole finger is transposed, interruption with the maternal location is usually performed at the site of the metacarpophalangeal joint. It is thus not always necessary to shitf a part of the pertaining metacarpal along with meta-

Fig. 18

Fig. 19

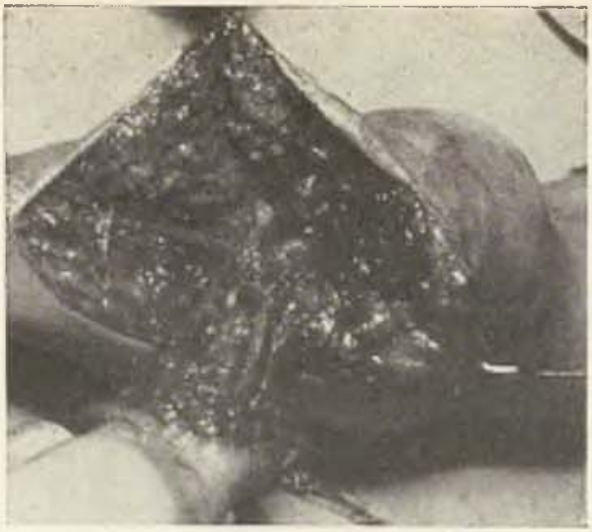


Fig. 20

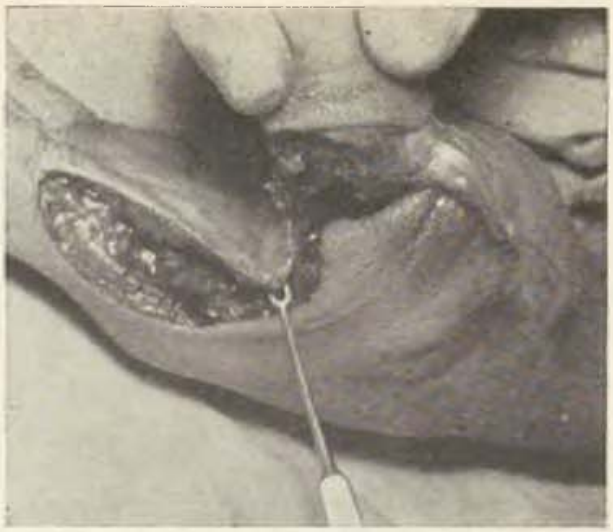


Fig. 21

carpophalangeal joint. The extent of the loss of the thumb is the decisive factor. In principle, the stump of any finger or any finger of the same hand is suitable for transposition (Figs. 18—21).

The transposition in itself is a relatively simple performance. An unexperienced surgeon, however, may meet with considerable difficulties in the reconstruction of the skin at the site from which the stump is shifted, and especially in the reconstruction of the skin of the newly formed thumb. For this reason it is necessary to master the methods of local transposition as well as that of free skin transplants.

*

The problem of local adjustment is simple, on the whole, and its technique not very exacting. If the surgeon has the posibility to carry out this correction during the primary treatment, we can only recommend it. Of course, care must be taken that in the case of a relatively great loss of the soft tissues the surgeon should not shorten the bone of the basal phalanx and should always replace the soft tissues by means of skin transplantation or flap skin grafts.

It has already been mentioned that transplantation of a finger from the other hand or of a toe is a more or less theoretical problem and comes very rarely into consideration. The transplanted finger loses its sensitivity and, for the most part, also its mobility since considerable rigidity develops in the transplanted joints. For these reasons as well as for reasons of aesthetics we reject this method of reconstruction of the thumb. It would certainly be wrong to mutilate the healthy other hand by removal of a finger if there exists the possibility of replacement of the thumb by another method. The result of transplantation of a toe is also very unsatisfactory from the aesthetic point of view — besides other drawbacks.

Reconstruction of the thumb by means of flap skin grafts from the hypogastrium was very often performed by plastic surgeons in earlier times. A great disadvantage of this method is, however, that it creates a surrogate with very

limited motility, capable only of the opposition and possessing very little sensitivity, and thus easily vulnerable. In our opinion, this plastic operation is indicated only in such cases, where the skin of the thumb has been scalped, and in the very rare cases in which transposition of the stump of a finger or of a whole finger is impossible. This situation often arises in extensive injuries after which only two fingers remain in the hand while the thumb as well as the index and the third finger are lost.

It follows from what has been mentioned that we consider reconstruction of the thumb by transposition to be the most convenient method available in cases of loss of the thumb. It has alredy been said that transposition of the stump of any finger is always suitable. It should be noted, however, that insertions of a portion of the thenar muscles are disturbed during transposition of the stump of the index and thus the motility of the newly reconstructed thumb is impaired; therefore we perform transposition of the stump of the index only in cases of utmost urgency.

In transposition of a whole healthy finger, which is indicated in such cases where only the thumb is lost while the other fingers are intact, we consider only the transposition of the fourth finger to be the most correct and most suitable method. From the functional point of view, the index finger — if well preserved and with normal function — is the most important digit after the thumb. It would be wrong to lose it. Besides, the so called pollicization of the index causes a considerable narrowing of the transverse diameter of the palm, which is a disadvantage. In addition, the thumb created from the index finger is too long, consisting of three phalanges. The third finger, from the functional point of view, is of the same value as the index, possesses considerable strength as compared with the fourth finger, completes the function of the index and helps in forming the pinch with the thumb. We believe therefore that neither this finger is suitable for transposition in the case of loss of the thumb. On the other hand, the fourth finger is the least important from the functional point of view and does not possess such strength as the third finger. Thus it is more dispensable. Besides, the loss of the fourth finger is acceptable from the aesthetic point of view since it is less conspicuous than the loss of any other finger. We have repeatedly made sure of it in our patients.

Even in complete loss of the thumb it is of advantage to use the fourth finger for the reconstruction of the thumb because the newly formed thumb consists of two phalanges — the basal phalanx is namely used as the metacarpal of the new thumb — its length is almost normal, which is a great benefit as compared with the reconstruction of the thumb using the index (Fig. 17).

The most essential advantage of the transposition consists in the fact that the sensitivity of the newly reconstructed thumb as well as the motility of the transposed interphalangeal joints remain fully preserved.

It should be emphasized that transposition will suffice in cases of all extensive losses of the thumb, irrespective of whether the loss is partial or complete. The recent refinement of the operative technique and the physiological trends in the reconstructive surgery of the hand, aiming in the first place at the resto-

ration of the ability to grasp the object between the thumb and the index, to form the pinch, and, at the same time to secure firmness of the new thumb as well as its motility and sensitivity account for the fact that transposition of the stump of a finger or of a whole finger is preferred to other methods.

CONCLUSION

Loss of the thumb represents a serious anatomical and functional damage to the human hand. For this reason reconstruction of the lost thumb should be always attempted. From the up-to-date methods used for anatomical and functional restoration of the thumb the author recommends transposition of the stump of a finger or of a whole healthy finger as the main method. This method can be used in any case irrespective of the extent of the loss of the thumb and the newly formed thumb possesses not only perfect sensitivity but also very good motility.

Reconstruction of the thumb using skin flap plasty which is secondarily reinforced by means of a bone or cartilage autograft is recommended only in cases where transposition is impossible for some reason.

Transplantation of a digit from the other hand, or of a toe, is not recommended owing to its being exacting and hazardous, but also for its results being not so good as those of the transposition. In the author's opinion, it is indicated only in some exceptional and rare cases which should always be decided individually.

SUMMARY

In the paper the importance of replacement of the loss of the thumb, methods of replacement, surgical technique, and the tactics used in the individual methods are discussed. Each of the methods is critically evaluated and the transposition of either the stump of one of the fingers or of a whole intact finger of the same hand is recommended as the principal method of reconstruction of the lost thumb. The technique using flap skin grafts reinforced with autoplastic bone or cartilage grafts is only recommended in those cases where transposition cannot be carried out.

The main advantage of transposition in comparison to both the flap reconstruction and transplantation of one of the fingers from the other hand or one of the toes lies in the possibility of creating a thumb that has a very good function, undisturbed sensitivity and motility in all joints, and that is completely acceptable also from the aesthetic point of view.

Reasons are given for the suggestion that the whole healthy fourth finger is best suitable for the reconstruction of the thumb, since it is of the least importance for the human hand from the functional point of view so that its loss is bearable. If a finger stump is used for the transposition it may be taken from any finger of the same hand.

Transplantation of a finger from the other hand or of a toe is regarded as a rare intervention and individually indicated in only very few cases. The results are not so good as those of the transposition.

RÉSUMÉ

Problèmes de la reconstruction du pouce

V. Kubáček

L'article traite l'importance du replacement du pouce manquant de la main humaine. L'auteur passe en revue les méthodes employées pour le remplacement du pouce manquant et examine en traits principaux la technique opératoire et la tactique des méthodes individuelles. Les méthodes étaient soumise a une évaluation critique et la transposition soit d'un moignon d'un doigt ou d'un doigt intact entier de la même main est recommandée comme la méthode principale pour la reconstruction d'un pouce perdu à la suite d'un accident. La reconstruction du pouce au moyen d'une plastie lobulaire réinforcée par une autogreffe osseuse ou cartilagineuse n'est recommandée qu'en cas où la transposition ne peut pas être effectuée.

L'avantage principal de la transposition tant sur la plastie lobulaire que sur la transplantation d'un doigt de l'autre main ou de l'orteil consiste en ce qu'elle permet de construire un pouce doué d'une haute habileté fonctionelle et sensitivité maintenue, mobilité dans toutes les articulations, qui est parfaitement acceptable même du point de vue esthétique.

Les raisons sont présentées, démontrant que le quatrième doigt convient le mieux pour la reconstruction du pouce au moyen d'un doigt intact entier; du point de vue fonctionnel, le quatrième doigt est peu important pour la main humaine, de sorte que sa perte est possible. Pour la transposition du moignon convient le doigt quelconque de la même main.

La transplantation d'un doigt de l'autre main ou d'un orteil est considérée comme une très rare opération qui est indiquée dans un très petit nombre de cas. Les résultats de cette transplantation ne sont pas aussi satisfaisants que ceux obtenus à partir de la transposition.

ZUSAMMENFASSUNG

Die Problematik der Rekonstruktion des Daumens

V. Kubáček

In der Arbeit wird die Wichtigkeit des Ersatzes des fehlenden Daumens der menschlichen Hand besprochen. Es werden Methoden behandelt, mit welchen der fehlende Daumen ersetzt werden kann und in Hauptumrissen wird auch die Operationstechnik und Taktik der einzelnen Methoden erörtert. Einzelne Methoden werden kritisch beurteilt und als Hauptmethode zur Rekonstruktion des durch Unfall verlorenen Daumens wird die Transposition entweder eines Stumpfes von einem Finger oder eines ganzen intakten Fingers von derselben Hand empfohlen. Die Rekonstruktion des Daumens mittels einer mit einem Knochen- oder Knorpeltransplantat verstärkten Lappenplastik wird in denjenigen Fällen empfohlen, in welchen die Transposition undurchführbar ist.

Der Hauptvorteil der Transposition gegenüber der Lappenplastik und der Transplantation eines Fingers von der anderen Hand oder einer Zehe besteht darin, dass mit ihr ein Daumen gebildet wird, der sehr funktionstüchtig ist, ungeschädigte Empfindlichkeit hat, in allen Gelenken beweglich ist und auch vom ästhetischen Standpunkt vollständig akzeptirbar ist.

Es wird begründet, dass für die Rekonstruktion des Daumens mit einem ganzen gesunden Finger am geeignesten der vierte Finger ist, da er von dem funktionnellen Gesichtspunkt für die menschliche Hand von geringster Bedeutung ist, so dass sein

Verlust möglich ist. Als Fingerstumpf zur Transposition eignet sich jeder Stumpf von derselben Hand.

Die Transplantation eines Fingers von der anderen Hand oder einer Zehe hält man für eine sehr seltene Leistung, die nur in sehr wenigen Fällen individuell indiziert wird. Ihre Ergebnisse sind auch nicht so gut, wie die Ergebnisse der Transposition.

RESUMEN

El problema de la reconstrucción del pulgar de la mano

V. Kubáček

En este trabajo se discute la importancia de la sustitución del pulgar ausente de la mano humana. El autor se ocupa de los métodos por los cuales el pulgar ausente se puede sustituir y pues discute la técnica operatoria y la táctica de los métodos individuales en general. Los métodos individuales están evaluados y como el método principal para la reconstrucción del pulgar ausente el autor recomienda la transposición sea de un muñón de algún dedo sea de todo el dedo sano de la mano misma. La reconstrucción del pulgar con ayuda de la plastia de lóbulo reforzada por un autotransplante óseo o por un de cartílago se recomienda solamente en aquellos casos cuando la transposición no puede ser realizada.

La ventaja principal de la transposición en comparación con la plastia de lóbulo tanto como con la transplantación de algún dedo tomado de otra mano o desde el pie se apoya en el hecho de que por medio de ella se forma un pulgar con un gran capacidad desde el punto de vista de su function, que matiene su sensibilidad y capacidad de movimiento en todos sus nudos y está bien aceptable también desde el punto de vista de estética.

El autor presenta motivos por este procedimiento, es decir que para la reconstrucción del pulgar por un dedo sano es el más ventajoso el cuarto dedo que no posee tan importancia para la mano humana desde el punto de vista de su función de modo que su ausencia no es tan grave. El muñón del dedo está conveniente para la transposición de cualquier dedo de la mano misma.

La transplantación del dedo de otra mano o de un pie está considerada como un procedimiento raro y está indicada sólo en pocos casos. Sus resultados no son tan buenos como los resultados adquiridos a base de la transposición.

REFERENCES

Bunnell, S.: Surgery of the hand. Fourth Edition 1964, s. 535—560.

Gosset, J.: J. Chir. (Paris), 65, 1949 : 403—411.

Iselin, M.: Chirurgie de la main. Paris, Masson et Comp. 1955.

Karfík, V.: Čas. Lék. čes., 87, 1948.

Karfík, V.: Rozhl. Chir., 32, 1953 : 68.

Karfík, V.: Voj. zdravotn. Listy, 1—2, 1949.

Karfík, V., Šlesinger, M.: Plast. chir. ruky, s. 192—198. Praha, 1956.

Murray, A. R.: Brit. J. Surg., 34, 1946 : 131—140.

Nicoladoni, C.: Langenbecks Arch. klin. Chir., 65, 1900 : 606.

Pešková, H.: Plast. chir. ruky, s. 69. Praha, 1956.

Pešková, H.: Rozhl. Chir., 31, 1952 : 6—8.

Vejvalka, J.: Acta Chir. orthop. Traum. cech., 31, 1964 : 6.

Prof. dr. V. Kubáček, Tábor 42 A, Brno, Czechoslovakia

Department of Faculty Surgery (head of dept.: Prof. I. I. Khozhainov),
Stavropol Medical Institute, Stavropol, USSR

AUTOGENOUS URETEROPLASTY

I. M. DEREVYANKO

Reconstruction of the ureter with tubes of synthetic material is, up to the present, impracticable. The ureter is an organ with active peristalsis. A prosthetic tube substituting for part of the ureter has, of course, no peristaltic movement. It presents a non-functioning section of the ureter; above it the ureter reacts with increased peristalsis which, at the beginning, leads to hypertrophy and later to atony and dilation. It all ends in hydronephrosis and the kidney on the side of the ureteroprosthesis gradually perishes. Alloplasty of the ureter, in fact, creates a condition which may serve as a model of the congenital disease called megaureter. This disorder is based on congenitally inadequate innervation of the lower part of the ureter.

From an anatomical and physiological point of view it is most expedient and fully practicable to reconstruct the lower half of the ureter with a urinary bladder flap. In clinical practice, two such methods, that of Boir and the other of Demel are used. Boir's operation is based on the formation of a flap from the anterior wall of the bladder which is then turned upwards and sutured into a tube replacing the defective pelvic section of the ureter. A flap formed from the anterior wall of the bladder usually suffices but for the reconstruction of approximately the distal third of a ureter. For reconstruction of the lower half of the ureter, Boir's method is inadequate even if the kidney has been exposed, mobilized and brought down together with the upper half of the ureter. The kidney can be lowered no more than 4—5 cm., because the renal vessels are too short.

Ureteroplasty according to Demel is based on mobilization of the bladder by stripping it of its peritoneum and on an transverse incision on the side of the bladder contralateral to that of the ureteral defect and dividing it almost into two halves. The upper half is then turned upwards thus bridging the defect of the affected ureter (fig. 1). Demel elaborated his method in experiments on animals. He maintained that it was possible by it to reconstruct the lower two thirds of the ureter. D. V. Kan studied this method in operations on dogs in whom it is indeed possible to replace almost the entire ureter by a bladder flap. This is due to the canine urinary bladder lying intraperitoneally (unlike the human which lies mesoperitoneally) and being extremely mobile. In man, due to the anatomical features of the urinary bladder, only the lower half of

the ureter can be reconstructed by Demel's operation. A longer section of the ureter can be replaced by this method only if the kidney is brought down (or if the patient suffers from nephroptosis).

At present most surgeons give preference to Boir's operation, because they fear a sand-glass deformation of the bladder to develop after Demel's operation.

In the available literature, we only found two cases in which Demel's operation was carried out it man: In 1926 it was performed by Baidin and in 1960 by Michalowski et Modelski; the latter operated on a patient with only one kidney.

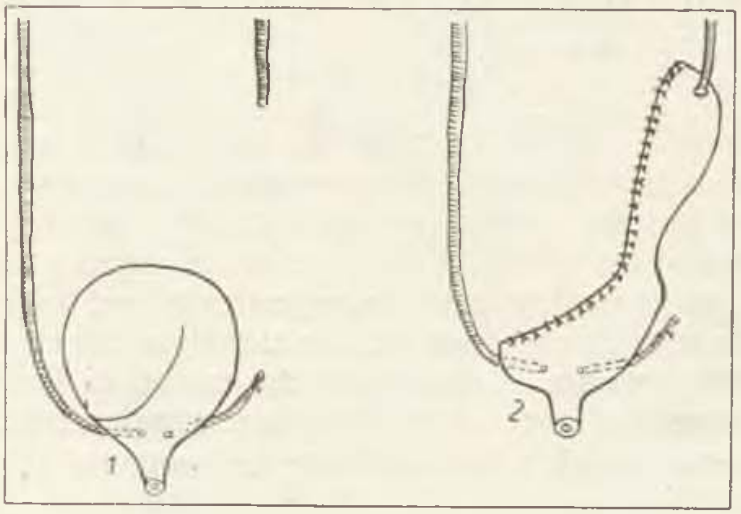


Fig. 1. Diagram of Demel's operation: 1, 2 = stages of operation

We perfermed Demel's autoplastic reconstruction of the ureter 18 times in 18 patients. In order to prevent sand-glass deformation of the bladder, we have somewhat modified the technique of the operation. In Demel's original operation the upper half of the bladder is turned upwards and to the side of the affected ureter, then the wound of the bladder is sutured completely and the ureter stump inserted in the top-most vault of the transposed part of the bladder (fig. 1). We, however, suture the ureter into the upper corner of the wound (fig. 2). In this way the transposed upper part of the bladder grows longer and thinner after operation thus forming more of a tube which is better fitted to bridging a defect in the ureter. With this modification Demel's operation rather resembles Boir's method, but the transposed upper half of the bladder permits formation of a thicker and longer tube with a broader basis which ensures good blood supply to the flap.

All 18 operations were carried out extraperitoneally; the technique was as follows:

The incision runs along the outer edge of the rectus abdominis from the mons pubis to the costal arch. In depth it reaches to the line where the aponeuroses of the rectus abdominis sheath meet those of the obliquus internus and transversus abdominis. The peritoneum is left intact, but mobilized and pushed medially thus extraperitoneally exposing the urinary bladder and the whole ureter. Through the same incision, if necessary, the kidney can be examined, mobilized and brought down, a measure which had to be taken in

five of our cases. The anastomosis of the ureter the transposed part of the urinary bladder is effected with stitches of thin polymerized acrylate threads.

After this operation no suprapubic cystostomy had to be made. Instead we introduced a polyvinyl tube into the reconstructed ureter whose distal end was led across the bladder and out through the urethra. Another such tube but with a larger diameter was left in the bladder and also led out through the urethra. Later, if these tubes were blocked by urates, we carried out lavage with solutions containing novocain and antibiotics. Both tubes were removed simultaneously about ten to twelve days after operation, sometimes even earlier.

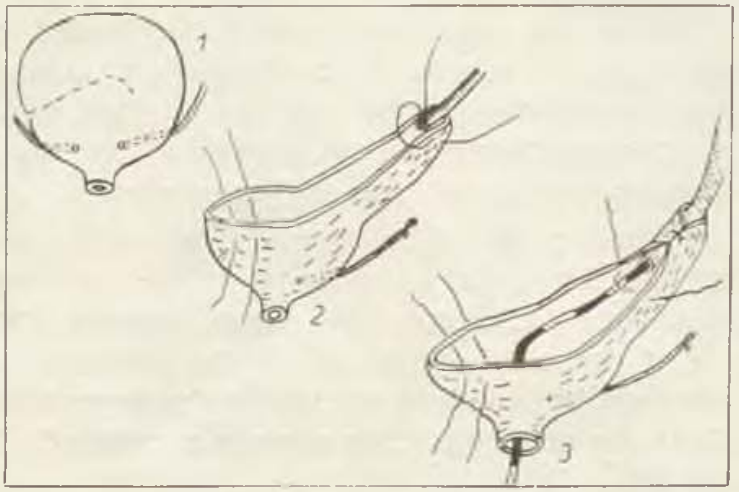


Fig. 2. The author's modification of Demel's operation (diagram): 1, 2 and 3 = stages of operation

This operation is indicated in injuries, necrosis, fistulae, strictures, tumours and congenital deformities of the ureter, if the defect of its lower half makes direct uretero-vesical anastomosis impracticable. In our opinion, this operation is better than that of Boir, because it permits reconstruction of the entire lower half of the ureter thus saving the functioning kidney on the affected side. Contraindications of uretero-vesical plasty are affections of the bladder leading to a decrease in capacity.

We have carried out autogenous reconstruction of the lower half of the ureter in 18 patients — 8 male and 10 female — aged between 10 and 46 years. In 13 patients it was done for strictures of tuberculous aetiology situated in the middle third (fig. 3) or, as in most cases, involving the entire lower half of the ureter. One patient was operated on for a scar stricture which had developed 18 months after lithotomy of the ureter. In another patient such a stricture had taken its origin from a decubitus ulcer in the ureteral wall due to a trapped renal calculus. Two patients suffered from a ureteral fistula which had developed from an injury sustained during surgical operation. One girl, aged ten, had a congenital anomaly, a megaureter.

In all patients the kidney on the side of the affected ureter was functioning normally as was ascertained by intravenous urography. The level of the ureteral disorder was found prior to operation both by excretory and retrogade urography. In some patients the exact level, at which the ureter was affected, could only be determined during operation.

None of the patients died after operation: all are still alive and under observation. After healing of the operational wound intravenous urography was again carried out in each patient (in order to test the function of the kidney on the side of the operated on ureter), as well as chromocystoscopy and sometimes even retrograde urography. These examinations were then repeated every three to four months after operation.

Both immediate and late results were good. In all patients the kidney on the side of the operated on ureter functioned properly, i.e. secretion of "sergozin" and indigo carmine was good. The patients were checked up from three months till three years after operation.

After the operational wounds had healed, cystography was carried out in each patient in order to determine the capacity of the urinary bladder and also to find out whether any deformation of the bladder had developed and whether vesico-ureteral reflux was or was not present. This cystography was then repeated every three to four months.

After operation, micturition was normal in all patients. Bladder capacity reached 200 to 300 ml. In some patients deformation of the bladder was found immediately after operation which, however, did not produce any clinical signs. Fig. 4 shows the cystogram of the patient A., a man aged 21, made 15 days after operation (reconstruction of the lower half of the left ureter with a vesical flap): the urinary bladder appears considerably lengthened upwards and toward the left.

One to two months later the upper half of the bladder has grown narrower and the lower half wider, and the whole bladder has thus acquired a different shape. Fig. 5 shows the cystogram of the patient B., a woman aged 40, made one month after operation (reconstruction of the lower half of the left ureter with a vesical flap): deformation of the urinary bladder is less pronounced if compared with that in fig. 4.

Six to seven months after operation the part of the urinary bladder, which was used for bridging the ureteral defect, has a lumen whose diameter almost equals that of a normal ureter, while the lower part of the bladder has acquired the shape and capacity of normal urinary bladder. Fig. 6 shows the cystogram of the patient T., a woman aged 38, made one year after operation (reconstruction of the lower half of the right ureter with a vesical flap). The retrograde uretero-pyelogram of this patient prior to operation is shown in fig. 3. In fig. 6 it can be seen that the urinary bladder is of normal shape and the contrast substance only permeates into the most distal parts of the reconstructed right ureter.

In none of our patients did we observe vesico-ureteral reflux after operation. This can be explained by the circumstance that on micturition also the upper half of the bladder (used for reconstruction of the ureter) contracts thus preventing urine from flowing back into the ureter. This is why this operation is preferable to a direct uretero-vesical anastomosis after which vesico-ureteral reflux can frequently be observed.

Fig. 3. Bilateral retrograde uretero-pyelography in patient T., woman aged 38, prior to operation: Stricture of middle part of right ureter, above stricture dilatation of ureter, pelvis and calyces of kidney. On the left ureter appears normal. — Fig. 4. Cystography in patient A., man aged 21, after autogenous reconstruction of lower half of left ureter. X-ray 15 days after operation

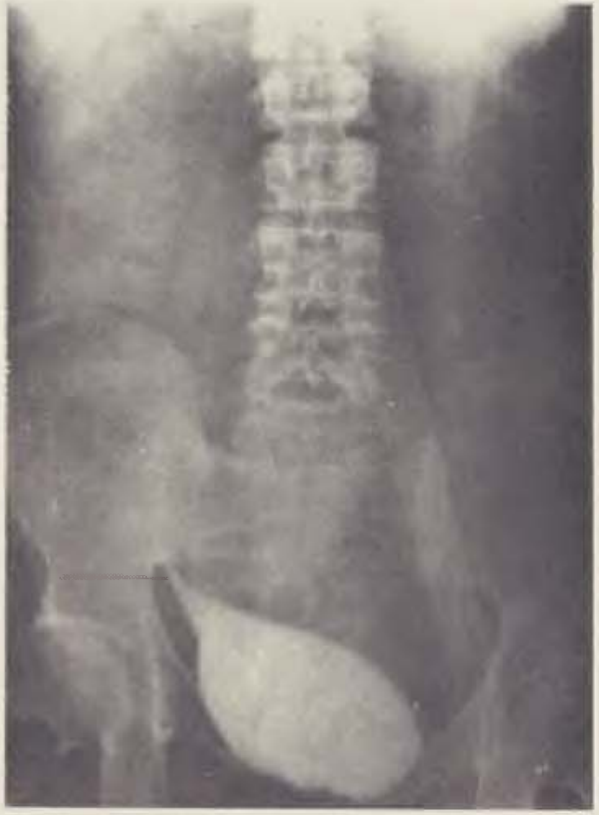


Fig. 5. Cystography in patient B., woman aged 40, after autogenous reconstruction of lower half of left ureter. X-ray one month after operation. — Fig. 6. Cystography in patient T., woman aged 38, one year after autogenous reconstruction of lower half of right ureter

The above described method of autogenous reconstruction of the ureter can, therefore, be recommended for the surgical treatment of the various disorders and diseases of the ureter, because it not only saves the kidney on the affected side, but also prevents reflux of urine into the reconstructed ureter.

SUMMARY

Reconstruction of the lower half of a ureter with a flap from the urinary bladder is used in the surgical treatment of the various disorders and diseases of the ureter. Usually the method of Boir is employed. However, with this method only the lower third of the ureter can be reconstructed. The operation of Demel, on the other hand, permits reconstruction of the entire lower half of a ureter. The author describes his modification of Demel's operation which, to a certain extent, prevents postoperative deformation of the bladder. Reconstruction of the lower half of the ureter was carried out by this modification in a total of 18 patients and the results achieved may be evaluated as good. The illustrations in the article show diagrams of Demel's operation and the author's modification of it as well as urograms and cystograms of patients prior and after operation.

RÉSUMÉ

L'urétéroplastie autogène

I. M. Derevyanko

La reconstruction de la moitié inférieure de l'uretère au moyen d'un lobe fait de la vessie urinaire est employée dans le traitement chirurgical de divers désordres et maladies de l'uretère. Habituellement on s'emploie de la méthode de Boir. Cette méthode permet cependant de reconstruire seulement le tiers inférieur de l'uretère. D'autre part l'opération suivant Demel permet de reconstruire la moitié inférieure entière de l'uretère. L'auteur décrit une modification de l'opération de Demel développée par lui-même qui prévient dans une certaine mesure la déformation postopératoire de la vessie. La reconstruction de la moitié inférieure de l'uretère en cette modification était effectuée chez un total de 18 malades et les résultats obtenus peuvent être évalués d'être satisfaisants. Les illustrations présentées dans l'article montrent les diagrammes de l'opération de Demel en modification développée par l'auteur, et les urogrammes et cystogrammes des malades avant et après l'opération.

ZUSAMMENFASSUNG

Autogene Ureteroplastik

I. M. Derevyanko

Bei der chirurgischen Behandlung verschiedener Störungen und Krankheiten des Harnleiters benützt man die Wiederherstellung der unteren Hälfte des Harnleiters mit einem Lappen aus der Harnblase. Üblicherweise wird die Methode nach Boir benützt. Mittels dieser Methode kann jedoch nur das untere Drittel der Harnleiters wiederhergestellt werden. Demgegenüber ermöglicht die Operation nach Demel das Wiederherstellen der ganzen unteren Hälfte des Harnleiters. Der Autor beschreibt seine eigene Modifikation der Operation nach Demel, welche im gewissen Umfang die postoperative Deformation der Harnblase verhütet. Die Wiederherstellung der unteren

Hälfte der Harnblase wurde insgesamt bei 18 Kranken durchgeführt und die gewonnenen Ergebnisse wurden als gut gewertet. Die Abbildungen in der Abhandlung zeigen die Diagramme der Demelschen Operation und ihrer Modifikation nach dem Autor sowie auch die Urogramme und Zystogramme der Kranken vor und nach der Operation.

RESUMEN

Ureteroplastia autógena

I. M. Derevyanko

La reconstrucción de la mitad inferior del uréter por un ala tomada de la vejiga urinaria se emplea en el tratamiento quirúrgico de los disórdenes y malestares diferentes del uréter. De costumbre se usa el método de Boir. Pero con este método solamente la tercera parte inferior del uréter puede ser reconstruída. La operación de Demel, por otro lado, permite la reconstrucción de toda la mitad inferior del uréter. El autor describe su modificación de la operación de Demel que hasta cierto punto previene la deformación post-operatoria de la vejiga. La reconstrucción de la mitad inferior del uréter fué realizada con esta modificación en 18 pacientes en total y los resultados adquiridos pueden ser considerados como buenos. Las ilustraciones que acompañan este artículo demuestran los diagramas de la operación de Demel y su modificación del autor tanto como los urogramas y cistogramas de los pacientes antes y después de la operación.

REFERENCES

1. **Derevyanko, I. M.:** Urologiya, 1960, 5 : 37.
2. **Derevyanko, I. M.:** Record of Scientific Meeting of the Scientific Research Institute of Clinical and Experimental Surgery of the Ministry of Health of the RSFSR and the Stavropol Medical Institute of Stavropol in the Caucasus, 1964, p. 171.
3. **Derevyanko, I. M.:** Khirurgiya (Mosk.), 1964, 9 : 123.
4. **Derevyanko, I. M.:** In the book: Some Topical Problems in Surgery and Urology. Rostov on Don, 1965, 290 p.
5. **Derevyanko, I. M.:** Vestn. Khir., 1965, 2 : 114.
6. **Derevyanko, I. M.:** Akush. i Ginek., 1965, 6 : 132.
7. **Derevyanko, I. M.:** Klin. Khir., 1966, 5 : 82.
8. **Kan, D. V.:** B.M.E.M., 1958, 8 : 1024.
9. **Baidin, A.:** Zbl. Gynak., 1930, 54 : 3237.
10. **Demel, R.:** Langenbecks Arch. klin. Chir., 135, 1925 : 203.
11. **Demel, R.:** Zbl. Chir., 1924, 51 : 2008.
12. **Michalowski, E., Modelski, W.:** Z. Urol., 53, 1960 : 9.

I. M. Derevyanko, Prosp. Oct. Revolutsii 37/16, Stavropol in the Caucasus, USSR

Clinic of Plastic Surgery, Director Prof. V. Kubáček, M. D., CSc.
Second Pediatric Department, Director Prof. M. Toman, M. D., CSc., Medical Faculty,
J. E. Purkyně University, Brno, Czechoslovakia

PLASTIC ADJUSTMENT OF FEMALE GENITALS IN ADRENOGENITAL SYNDROME

L. BAŘINKA, M. STAVRATJEV, M. TOMAN

Virilism of genitals in female external pseudohermaphroditism is — as is well known — caused by either 1) congenital hyperplasia of the suprarenal glands, also called adrenogenital syndrome (AGS), or 2) a virilizing disorder of the mother during pregnancy, or 3) administration of some steroid hormones to the mother during pregnancy.

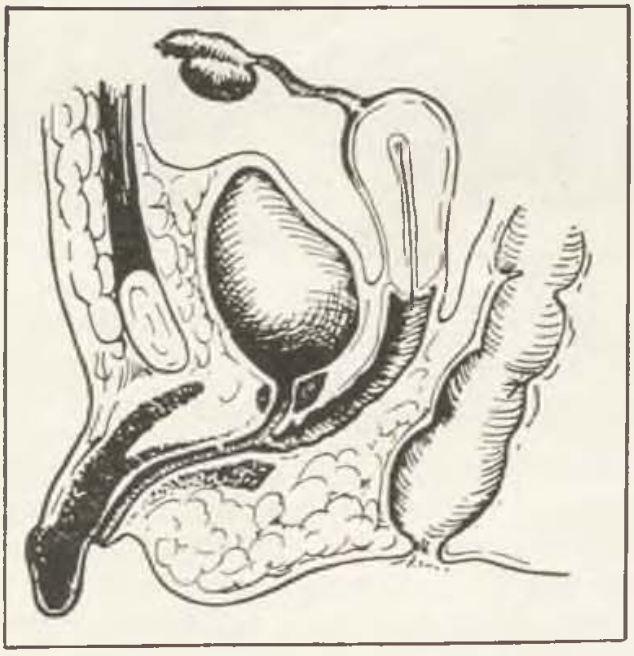


Fig. 1

Apart from other common signs, all three types of female pseudohermaphroditism show various degress of clitoris hyperplasia. From the point of differential diagnosis it is important to know that in AGS, if not blocked by proper treatment, virilization progresses and the clitoris hypertrophies to a degree resembling a penis in the extreme case (fig. 1). In the second and third group, on the other hand, the virilizing effect of androgens, transferred from the mother to the foetus via the placenta, ceases immediately after birth. Hyper-

trophy of the clitoris, therefore, does not progress in the further development of the child.

For this reason, the interest of plastic surgery is mainly concerned with the adjustment of genitals in virilism due to AGS. However, up to the present, the question of the most suitable age for operation has not yet been clarified.

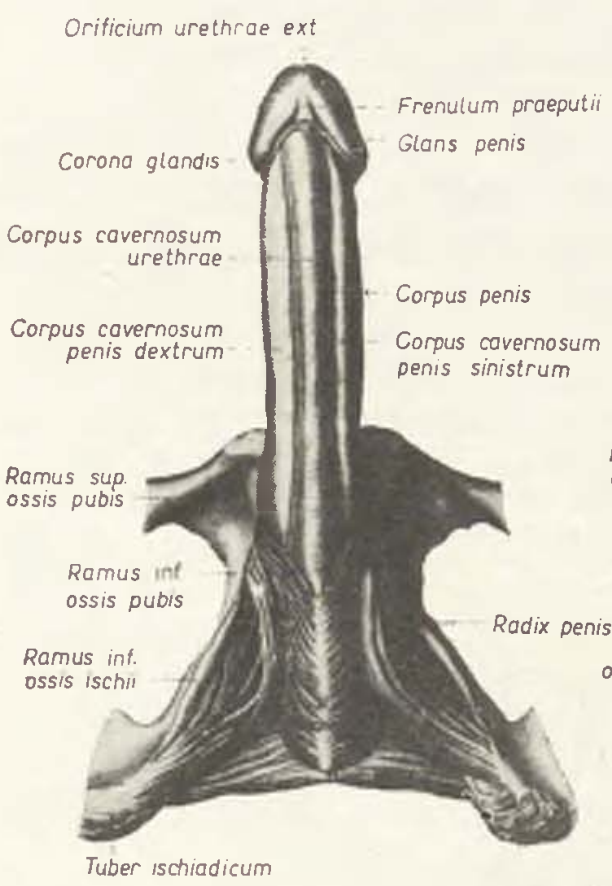


Fig. 2

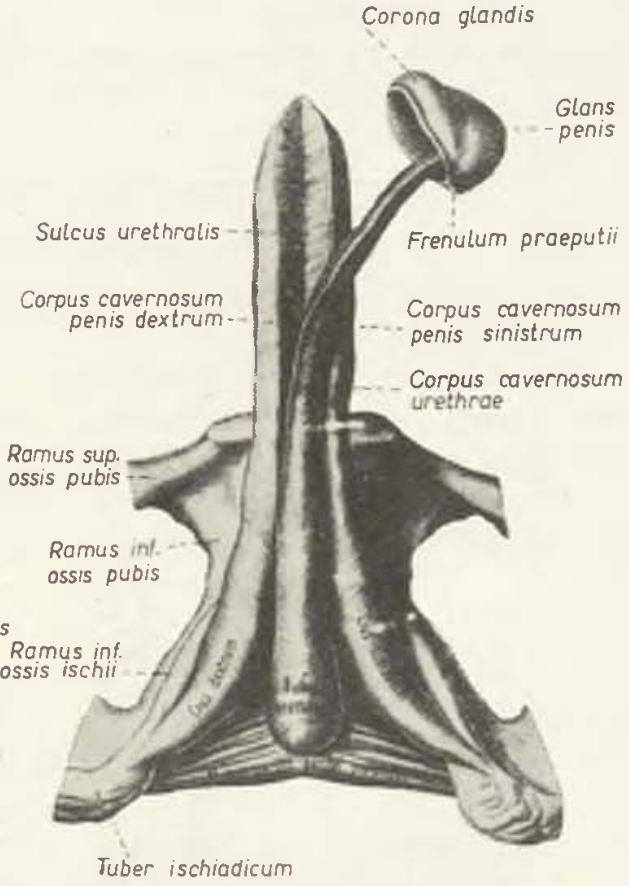


Fig. 3

AGE LIMITS FOR OPERATION

Psychosexual examination of patients with AGS has confirmed that the child starts to become conscious of its sex around the third year of age. In our series of cases, we were able to verify that the children became conscious of an aberration in the development of their genitals about this period and were fully aware of it at the age of five. This age limit for the plastic adjustment of genitals should, therefore, never be surpassed, if psychical traumatization of the child be prevented. Otherwise this may lead to various degrees of depression during puberty and of homosexuality in the adult.

METHOD OF PLASTIC ADJUSTMENT

A number of methods and modifications has been recommended, the simplest and most currently used is that of clitoridectomy. This, however, does not present a physiological solution of the problem and always constitutes a gross interference with the sensitive erogenous zone of the female genitals.

Other methods — be it implantation of the hypertrophic clitoris under the skin of the genitals or its incorporation into one of the labia — have various disadvantages. They do not take into account the fact that the clitoris is capable of errection which is provoked by the constant mechanical irritation leading to congestion in the corpora cavernosa.

We have tried to solve the problem not only from a cosmetic, but mainly from an anatomico-physiological point of view and have elaborated a surgical method whose merrits are demonstrated below:

Under general anaesthesia, the hypertrophic corpora cavernosa are removed down to the insertion of the ischiocavernosus and bulbocavernosus on either

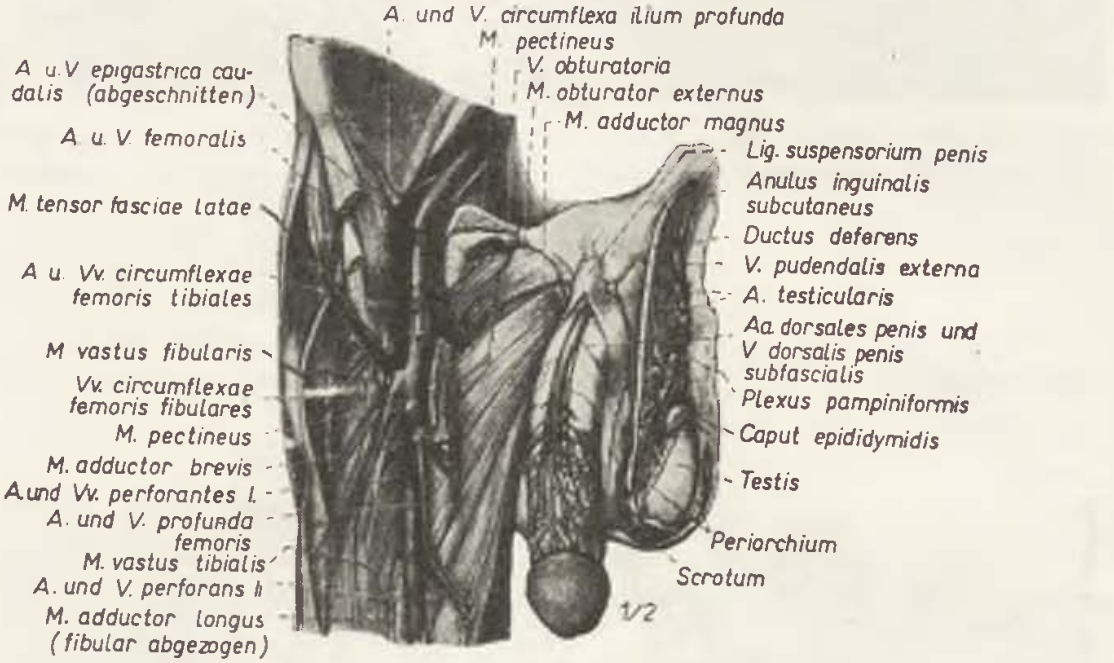


Fig. 4

side. Distally, the corpora cavernosa are dissected free of the glans clitoridis which then remains suspended on the very important neurovascular bundle of the dorsal artery and vein of the clitoris and the sensitive nervous network spread in the subcutaneous tissue which is called the nervus dorsalis clitoridis (fig. 2, 3, 4).

By the resection of the corpora cavernosa, a sufficiently large space under the symphysis is created to hold the glans clitoridis which is then sutured to the stump of the bulbus corporis cavernosi. In this way the glans clitoridis is placed above the entrance, into the vagina, i.e. to a site which is extremely important for eliciting orgasm.

The surplus of skin, which has remained after resection of the corpora cavernosa, is a very suitable material for the construction of the labia minora, but also for the adjustment of the entrance into the vagina in a persistent urogenital sinus.

The described surgical procedure and its results are shown in fig. 5 to 14.

Fig. 5. Condition after operation — hypertrophic clitoris in errection. — Fig. 6. Ventral aspect with skin incisions marked. Entrance into urogenital sinus below clitoris

DISCUSSION

Unlike other methods, our surgical procedure in plastic adjustment of the female genitals in AGS mainly deals with the creation of normal, anatomico-physiological conditions.

Fig. 7. Dissection of corpora cavernosa free of glans clitoridis and skin — ventral aspect. — Fig. 8. Separation of skin from corpora cavernosa — dorsal aspect

Fig. 9. Stump of corpora cavernosa at level of ischiocavernosus and bulbocavernosus insertions. Skin with preserved neurovascular bundles turned over to the left. — Fig. 10. Excised corpora cavernosa

Considering which of the methods of plastic adjustment would be the most suitable for this purpose, we took into account that it would be necessary: 1) to spare the sensitive nervous endings of and the blood supply to the glans clitoridis, 2) to find the correct place for the glans clitoridis just above the entrance into the vagina (which is done by suturing the glans to the stump of the bulbus corporis cavernosi) and 3) to construct the labia minora (which are missing in a persistent urogenital sinus).

We wish to emphasize the importance of close cooperation with the paediatric endocrinologist in the preoperative period, during operation and in the

Fig. 11. Swinging-in and suture of glans clitoridis to stump left after resection of corpora cavernosa. — Fig. 12. Condition after operation. Glans clitoridis covered by skin fold (condition two months after operation)

Fig. 13. Condition two months after operation — detailed view. — Fig. 14. Condition two months after operation — good take of glans, covering skin fold resemble labia minora. Below the glans clitoridis, entrance into urogenital sinus can be seen

postoperative treatment. The competence of deciding the time for operation, perfecting the diagnosis and directing the preoperative endocrinological treatment, is entirely his own. Only such team work can ensure success in the treatment of a condition as complicated as AGS.

The recommended method of surgical adjustment of the female genitals in AGS was carried out at our Department in four patients at an age between four and fourteen years. With regard to the results of psychosexual examination in girls with AGS, we shall endeavour to treat these conditions surgically, if possible, up to the third year of age.

SUMMARY

The article deals with a new method of plastic adjustment of female genitals in the virilization effect of an adrenogenital syndrome. Some of the surgical methods used hitherto are also referred to and their disadvantages discussed.

The here recommended method has done away with these disadvantages. Its merrits, which lie in the anatomico-physiological approach and the good cosmetic results, are elucidated.

The suitable age for the plastic adjustment of genitals has been decided upon and this decision justified. It has been limited to the third year according to the results of psychosexual examination.

Up to the present, a total of four patients at an age between four and fourteen years, have been operated on by this method. The importance of the team work between the surgeon and the paediatric endocrinologist has been emphasized both for the pre- and postoperative periods.

RÉSUMÉ

Une plastie réconstructive de l'organ génital externe chez le syndrôme adrénogénital

L. Bařinka, M. Stavratjev, M. Toman

Une nouvelle méthode de la plastie réconstructive du défaut de l'organ génital externe en suite du syndrôme adrénogénital faute de la virilisation vient d'être décrit. Les méthodes employées jusqu'ici sont citées et leurs mésavantages exposés.

La nouvelle méthode des auteurs supprime ces mésavantages et les auteurs exposent ses avantages se basant sur le respect des relations anatomo-physiologiques de même que de l'effet esthétique. L'indication de l'âge juste de l'intervention est discutée et fondée, le limite de l'âge juste étant celui de la troisième année de la vie, suivant les examens psychosexuels. Jusqu'ici, on a réalisé une intervention pareille chez quatre des malades à l'âge de 4—14 ans. La necessité de la collaboration en team du chirurgien plastique, du pédiatre-endocrinologue dans les périodes pré- et postopératoires a été soulignée.

ZUSAMMENFASSUNG

Plastische Korrektur des äusseren Genitales beim adrenogenitalen Syndrom

L. Bařinka, M. Stavratjev, M. Toman

In der vorliegenden Arbeit schlagen die Verfasser eine neue Operation vor, mittels der die Virilisation des äusseren Genitales beim adrenogenitalen Syndrom plastisch des äusseren Genitale zu korrigieren ist. Es werden einige der bisherigen Operationsmethoden angeführt und ihre Nachteile aufgezeigt.

Die vorgeschlagene neue Methode beseitigt diese Nachteile; ihre Vorteile beruhen in der Respektierung der anatomisch-physiologischen Verhältnisse sowie im erzielten kosmetischen Effekt und werden eingehend beschrieben.

Die Altersindikation zur plastischen Korrektion wird erörtert und begründet; als unterste Altersgrenze wird das 3. Lebensjahr festgesetzt, was auch mit den Ergebnissen der psychosexuellen Untersuchung im Einklang steht. Bisher wurden 4 Patientinnen im Alter von 4 bis 14 Jahren auf die beschriebene Art operiert. Es wird die Notwendigkeit der Team-Arbeit des plastischen Chirurgen mit dem pädiatrischen Endokrinologen hervorgehoben und darauf hingewiesen, dass dies sowohl für das präoperative wie für das postoperative Stadium gilt.

RESUMEN

La reconstrucción plástica del genital externo en el síndrome adrenogenital

L. Bařinka, M. Stavratjev, M. Toman

Se describe un nuevo modo operativo de reconstrucción de las modificaciones virilizantes del genital externo en el síndrome adrenogenital. Se mencionan algunos métodos operativos existentes señalándose sus desventajas. El nuevo método propuesto

elimina estas deficiencias y se describen sus preferencias fundamentadas en el respeto de las condiciones anatomo-fisiológicas y también su afecto cosmético.

Se resuelve el motivo de la indicación de la reconstrucción plástica según la edad, cuyo límite se determina el tercer año de vida, como demonstraron los exámenes psicosexuales. Hasta ahora las operaciones realizadas fueron hechas en cuatro pacientes con edades entre 4—14 años. Se reafirma la necesaria colaboración del team cirujano y pediatría-endocrinólogo tanto antes de la operación y después de la operación.

REFERENCES

1. **Bedrna, J.**: Dětská urologie (Paediatric Urology), Praha, ZdN 1951, p. 329—344.
2. **Fortunoff, S., Lattimer, J. K., Edson, M.**: Vaginoplasty, technique for female pseudohermaphrodites. Surg. Gynec. Obstet., 118, 1964 : 545—548.
3. **Jones, W. H. jr., Wilkins, L.**: The genital anomaly associated with prenatal exposure to progestogens. Fertil. and Steril., 11, 1960 : 148—156.
4. **Lattimer, J. K.**: Relocation and recession of the glans: an alternative to amputation. J. Urol. (Baltimore), 86, 1961 : 113—116.
5. **Schmid, M. A.**: Plastische Korrektur des äusseren Genitales bei einem männlichen Scheinzwitter. Langebecks' Arch. klin. Chir., 298, 1961 : 977—981.
6. **Stefan, H.**: Chirurgische Behandlung des äusseren Genitales bei weiblichen Pseudohermafroditen. Z. Kinderchir., 3, 1966, 2 : 249—252.
7. **Wilkins, Lawson:** The Diagnosis and Treatment of Endocrine Disorders in Childhood and Adolescence. Third Edition. 1965, p. 342—443.

Dr. L. Barinka, Berkova 34, Brno, Czechoslovakia

Department of Traumatology and Orthopaedics (Director: Prof. L. I. Shulutko), Kazansk Postgraduate Medical School and Department of Hospital Surgery (Director: Prof. G. Y. Iosset), Blagoveshchensk Medical Institute, USSR

MORPHOLOGICAL STUDY OF AUTO-, HOMO- AND BREPHO-BONE PLASTY

L. I. KOSTANDYAN

Observations both of experimental workers and clinicians have proved that employment of homogenous bone tissue in reconstructive surgery is not only possible but expedient. However, side by side with the good results after bone homoplasty, cases of failure are known which most authors explain by the biological incompatibility between the tissues of the donor and recipient, the time it takes for the transplanted tissue to be transformed, the imperfect osteogenesis in and around the transplant, etc. These circumstances induced further search for means against the manifestations of immunological incompatibility, for new methods of tissue conservation, for new grafted material, etc.

In this respect, the question as to whether it was expedient to use bone tissue of foetus or newborn, draws great interest, because many authors maintain that these tissues show less antigenic activity, and more plasticity and regenerative capacity than those of adult donors (Studitsky, Lapchinsky et Malinowsky, Gintsburg, Polezhayev, Brudastov, Teodorovich, Okulova, Klebanovskaya, Murry et Huxley, Willis, Hancox, etc.). However, even the successful experiments of Studitsky, Ravitskaya, Murry et Huxley, Willis, Hancox, Ray et collab., Felts, Heikel, Chalmers, etc. with the transplantation of "fresh", i. e. not conserved foetal bone tissue under the skin, into the anterior chamber of the eye, the brain, the muscle, the allantois, etc. did not yet solve all the numerous theoretical and practical problems of bone brephoplasty. We, therefore, decided to carry out morphological investigations of conserved foetal bone transplanted into a bony bed and compare the results with those of transplantation of autoplasty or homogenous conserved bone tissue from adult donors.

We completed three series of experiments in a total of 72 rabbits.

In the first series a periosteum-free resectional defect (9—12 mm. long) in the diaphysis of the fibula was convered with the diaphysis of the femur or tibia of a 27—28-day-old foetus. In the second series this defect was bridged by a section of the fibula taken from the contralateral leg of the same subject and in the third series by the diaphysis of a metatarsal from an adolescent rabbit. In all instances the grafts were transplanted together with their pe-

riosteum. The homogenous grafts both from the foetal and adolescent donors were subjected to conservation by cooling in air at 0 to +4 ^{0}C for 7 to 15 days.

In each case, the specimen for histological investigation was a section of diaphysis of the fibula together with the surrounding soft tissue about 1.0—1.5 cm. in length, taken at the level of transplantation and containing both the graft and the recipient bone stumps. This retrieved material was then fixed in 10% formalin and decalcified with 5% nitric acid. Finally the decalcified specimen was immersed into celloidin and cut parallel to the longitudinal axis of the bone. The slides were stained either with haematoxylin-eosin or by the van Gieson method.

First series: Five days after transplantation the periosteum of the graft looks thicker; in its innermost layers cambium cells have been formed. The graft itself consists of cancellous bone and the trabeculae are of varying shape and thickness; the nearer the surface the thicker and more compact they become. Everywhere there are large osteocytes with vividly stained nuclei; only rarely does one find cell-free areas. The spaces between the trabeculae are filled with myelogenic bone marrow (fig. 1). Some distance away from the site transplatation the periosteum of the fibula has normal histological structure. The nearer to the site of transplantation the thicker its outer tissue layer becomes, and it is pushed away from the bone by periosteal proliferation consisting of osteoid tissue. The cortical layer of the fibula has also normal histological structure and its marrow cavity is filled with fatty bone marrow.

Fifteen days after operation, the periosteum of the transplant can no more be distinguished, because the fibres of its outermost layer have merged with those of the connective tissue surrounding the graft. In som marginal sections of the transplant, the trabeculae look eroded and here and there chains of osteoblasts or single osteoclasts lie on their surface. The nuclei of the osteocytes can hardly be distinguished. Further away from the site of transplantation the periosteum and cortical layer of bone of the resected fibula show normal histological structure. The nearer to the site of transplantation the less is it possible to distinguish between the periosteum of the recipient and that of the transplant, because the fibres of the latter's outermost layer interlace with those of the surrounding connective tissue. In the stump ends, the haversian canals and the systems of bone lamellae are indistinctly visible and the lacunae are empty. Periosteo-endosteal proliferation in the recipient bone consists of osteoid and bone tissue which interlacing with each other form a structure similar to that of cancellous bone whose trabeculae fill up the marrow cavity of the fibula. The spaces between the recipient bone stumps and the transplant are filled with connective tissue of thick fibres containing clusters of chondroid cells and chondrocytes.

Fourty to fifty days after operation the site of transplantation is surrounded by a layer of connective tissue. The stumps of the recipient bone can, in some sections, no more be distinguished from the graft. The former bone defect has been bridged by homogenous cancellous bone with thick trabeculae consisting of original and newly formed tissue. The lacunae of the newly formed bone are occupied by osteocytes with brightly stained nuclei. In some places there are trabeculae with blurred and eroded edges and on their surfaces one finds chains of osteoblasts and single osteoclasts. The space between the trabeculae is filled with myeloid bone marrow and between its cells, fine collagenous fibres and blood vessels can be seen.

Seventy days after operation the histological structure of the site of transplantation is that of a homogenous tubular bone with well developed cortical layer and marrow cavity. Its surface is covered with periosteum in which two layers can be discerned; in the innermost cambium cells are present. Basically, the bone tissue has a lamellar structure, but in its central section the slide shows the cortical layer less

compact than in other parts. Here the haversian canals are wider and the new lamellae incompletely formed. The lacunae are occupied by osteocytes in all parts of the slide. The marrow cavity contains fatty bone marrow (fig. 2).

Second series: Five days after operation, the periosteum of the transplant shows normal histological structure. On its inner layer cambium cells have developed. The cortical layer of bone is marked distinctly. The lacunae are occupied by osteocytes with brightly stained nuclei. In the haversian canals blood vessels run whose lumina contain blood elements. The marrow cavity is filled with fatty bone marrow. Some distance away from the site of transplantation the periosteum of the fibular bone stumps show normal histological structure, nearer to their ends, however, the outer layer of periosteum is pushed away from the bone by periosteal proliferations consisting of osteoid tissue. The bone tissue of the cortical layer shows normal histological structure and the marrow cavity is filled with fatty bone marrow.

Fifteen days after operation the periosteum of the transplant looks somewhat thickened and pushed away from the bone trabeculae by periosteal poliferation consisting of osteoid tissue. Between these trabeculae and on the outer surface of bone a multitude of small blood vessels has developed. In the marginal zone of the transplant the lacunae and haversian canals are empty. The elments of bone marrow can hardly be distinguished. The thickened outer layer of periosteum of the recipient bone has been lifted off the bone over the entire length of the slide by proliferation whose trabeculae now consist of osteoid and bone tissue. The nearer they get to the site of transplantation, the trabeculae become more numerous and the space between them has been filled with myeloid bone marrow. In the stump ends of the recipient bone, the lacunae and haversian canals are empty. Nearer to the site of transplantation the stumps show endosteal proliferations consisting of osteoid tissue. The trabeculae of periosteal and endosteal proliferation on the bone stumps interlace with each other and unite with the periosteal proliferations of the transplant. In these parts islets of chondroid cartilage tissue can be found. The bone marrow of the fibula looks somewhat sclerotized.

Fourty to fifty days after operation the transplant and stumps of the recipient bone can no longer be distinguished from each other; here the slide shows homogenous bone of cancellous structure surrounded by a thick layer of connective tissue. The trabeculae consist of osteoid and bone tissue and on their surface lie chains of osteoblasts and single osteoclasts. The space between the trabeculae is filled with myeloid bone marrow (fig. 3).

Seventy days after transplantation the slides show a homogenous tubular bone with well developed cortical layer and marrow cavity. The surface of the bone is covered with periosteum in which two layers can be distinguished. The cortical layer of bone has lamellar structure. However, sometimes one sees areas with incomplete systems of concentric or intermediate lamellae, widened haversian canals and empty lacunae. The medullar cavity is filled with fatty bone marrow.

Third series: Five days after transplantation the periosteum of the bone graft shows two layers; an outer and inner layer. The cortical layer of bone has lamellar structure with distinctly marked concentric and intermediale lamellar systems. In some parts the lacunae look empty. The marrow cavity is filled with fatty bone marrow. Some distance away from the site of transplantation the periosteum of the recipient fibula shows normal histological structure. At the stump ends, however, the outer layer of periosteum appears thickened and pushed away from the bone by periosteal proliferation. The lacunae of the cortical layer of bone are occupied by osteocytes

and in the haversian canals run blood vessels. The marrow cavity is filled with fatty bone marrow.

Fifteen days after operation the periosteum of the bone graft still shows normal histological structure and the contours of the transplanted bone are very distinct, and haversian canals, however, are empty. Elements of bone marrow can hardly be discerned. The periosteum of the recipient fibula appears thickened at the site of transplantation and also pushed away from the bone by exuberant periosteal proliferations. The trabeculae of periosteal and endosteal proliferation interlace with each other surrounding the bone graft in a fan-like fashion. At the stump ends of the recipient bone the lacunae are empty and the haversian canals empty and widened. The bone marrow at the stump ends is sclerozited.

Fifty days after operation the periosteum of the transplant can no longer be distinguished. The site of transplantation is surrounded by a layer of connective tissue. The contours of the bone graft, however, are well preserved, but the concentric and intermediate lamellar systems of bone tissue are blurred and haversian canals appear empty. The elements of the fatty bone marrow can hardly be discerned. Some distance away from the site of transplantation the fibres of periosteum of the recipient bone merge with the connective tissue surrounding the operation site. The ends of the transplant are surrounded by periosteo-endosteal proliferations which cover the outer and inner surfaces of its cortical layer of bone over some distance. In the bone tissue of the recipient bone there are areas with empty lacunae. Further away from the site of transplantation the marrow cavity is filled with fatty bone marrow.

Seventy to ninty days after operation the site of transplantation is surrounded by a layer of connective tissue which makes it impossible to distinguish between the periosteum of the graft and that of the recipient bone. The outer surface of cortical layer of the transplant appears uneven with little pits filled with connective tissue fibres. The lacunae and haversian canals are empty. The lamellar structure of bone can no longer be discerned. The fatty bone marrow is sclerotized over the entire length of the marrow cavity. The outer and inner surfaces of cortical layer of the graft are covered by periosteoendosteal proliferations over a considerable area. The marrow cavity of the recipient bone stumps is filled with the trabeculae originating from endosteal proliferation.

By the 150th day after operation, the site of transplantation is surrounded by a layer of connective tissue. The cortical layer of the transplanted bone appears thinned and eroded, but layers of newly formed bone tissue lie on its outer and inner surfaces (fig. 4). These layers of tissue can also be traced into the openings of the widened haversian canals. The bone tissue of the transplant is presented by large cell-free areas; the concentric or intermediate lamellar systems cannot be discerned any more. The bone marrow is sclerotized. The spaces between the graft and the recipient bone stumps are filled with thick bone trabeculae. A considerable distance away from the site of transplantation the cortical bone layer and the bone marrow of the fibula have normal histological structure.

Comparing the results of auto-, brepho- and homoplasty from adolescent donors, it may be stated that the changes in the soft tissues surrounding the site of transplantation, the graft and the recipient bone stumps were identical in all series of the experiment in the first days after operation. Part of the soft tissues underwent necrosis, cell infiltration could be detected, granulation tissue developed, numerous blood vessels had formed, etc. In the grafts themselves, dys-

trophic changes were observed which were manifested by the empty haversian canals and bone lacunae, etc. These changes were particularly marked in homogenous grafts from adult donors.

At the same time, too, i, e. on the fifth day after operation, periosteal proliferation on the recipient bone stumps were observed in all experiments. This is proof of the fact that early proliferation in the recipient bone bed does not depend on the character of the transplanted material, but is to be regarded as the response of the organism to surgical trauma. Later, however, starting with the tenth day, the fate of the regenerative process and the restitution of integrity of the entire bone very much depend on the biological substrate, the structure, the time of absorption and other features of the bone graft. As is well known, at the site of transplantation the process of bone absorption goes parallel with that of bone tissue regeneration (Vinogradova, Zaychenko, Kartashev, Kornev, Novachenko, Rusakov, Sipovsky, etc.).

Kartashev, Novachenko and others maintain that at the site of transplantation new bone tissue is generated the sooner the earlier the transplant is being absorbed. The above described histological findings prove this assumption right. In auto- and brephoplasty, the spaces between the recipient bone stumps and the graft were bridged by canecellous bone elements already starting with the 40th to 50th day after operation due to early and fast absorption and subsequent energetic generation of new bone tissue. In bone plasty using homogenous grafts from adolescent donors, absorption on the trnasplant took a long time which greatly retarded restitution of the entire operated on bone.

As can be seen, success of brephoplasty greatly depends on the structure of the transplanted bone. In our experiment the transplant consisted of cancellous bone which is particularly well fitted for early invasion of the newly formed vessels and periosteo-endosteal proliferations developing in the recipient bone stumps. This does not apply to homogenous bone grafts from adolescent donors.

CONCLUSIONS

1. The processes taking place in the transplanted material and the reaction of the recipient bone stumps in auto- or homoplasty are basically characterized by the same natural laws. Absorption of the bone graft goes parallel with generation of new bone tissue at the site of transplantation.

2. Regeneration of young bone tissue is mainly effected on account of periosteo-endosteal proliferation taking place in the bone stumps and of metaplasia in the soft tissues surrounding the site of transplantation, but — to a certain extent — also on account of surviving elements from the transplanted bone.

3. In auto- or brephoplasty of a periosteum-free circular defect in the fibula of rabbit, restitution of the integrity of the bone with formation both of the cortical layer and of the marrow cavity is completed by the 70th day, while in a plasty using homogenous bone from adult donors this process is not even complete 150 days after operation.

SUMMARY

The author carried out experiments in which he bridged a 9—12 mm. long circular and periosteum-free defect in the fibula of adolescent rabbit with autogenous bone and bone taken from a 27—28-day-old foetus or from an adolescent donor. The homogenous grafts were conserved by cooling at 0 — +4 °C for 7—15 days. A total of 72 experiments were thus carried out.

Appraisal of the histological findings in three series of experiments showed that the changes taking place in the transplant and the reaction of the recipient bone bed basically follow the same natural laws both in auto- and homotransplantation. The processes of resorption of the transplant and those of generation of new bone tissue at the site of transplantation run parallel. Young bone tissue develops at the site of transplantation mainly on account of periosteo-endosteal proliferation in the recipient bone stumps and of metaplasia in the recipient soft tissue, but also on account of the surviving cell elements of the transplanted bone. After auto- or brephoplasty, repair of the bone defect with formation of a cortical layer and the marrow cavity is approximately completed by the 70th day, while after transplantation of homogenous tissue from adult donors restitution of the bone is not yet complete even 150 days after operation.

RÉSUMÉ

L'examen morphologique de l'auto, homo et brefoplastie osseuse

L. I. Kostandyan

Les auteurs ont entrepris un examen de remplacement d'un défaut en forme de circle privé de périoste en longueur de 9—12 mm de petit péroné d'un lapin de l'âge de sexe mûr par un os homologue d'embryon âgé de 27—28 jours, par un os autogène et par un os homologue d'un donneur en âge mûr. Les homotransplants ont été conservés sous la température de 0 — +4 degrès de Celsiusdurant la période de 7—15 jours. En somme, 72 des examens ont été réalisés.

L'analyse des données histologiques des 3 séries de examens a prouvé que les processus évolutifs du matériel en transplantation ainsi que les changements réactifs dans le lit récipient au cours des auto et homoplasties osseuses sont principiellement charactérisés par des régularités indentiques. Les processus résorbitifs du matériel en transplantation sont accompagnés par la formation nouvelle du tissu osseaux au lieu de la plastie. La régénération d'un tissu osseux jeun au lieu de la plastie comporte surtout l'accroissement périosto-endostal des restes des os, la métaplasie des tissus mous des environs du récipient et, de même, les éléments de l'os transplanté eux-mêmes. Au cours de l'auto et brefoplastie la régénération du défaut, la restitution de la couche corticale de même que du canal médullair y compris se réalise à peu prés dans les yo jours suivant l'opération, tandis que, au cours de l'homoplastie, celle par les tissus d'un donneur mur le processus régénératif n'est pas terminé parfois ni le 150ème jour suivant l'opération.

L. I. Kostandyan

MORPHOLOGICAL STUDY OF AUTO-, HOMO- AND BREPHOBONE PLASTY

Fig. 1. Transplanted foetal bone five days after operation, microphotograph with obj. No 40 and ocular No 10

Fig. 2. Brephoplasty 70 days after operation, microphotograph with obj. No 40 and ocular No 10

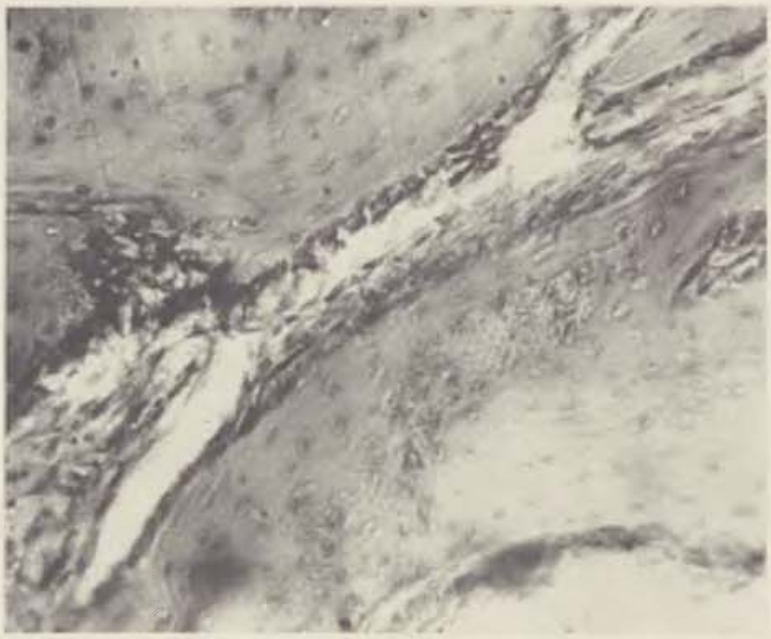


Fig. 3. Site of autoplasty 40 days after operation, microphotograph with obj. No 40 and ocular No 10

Fig. 4. Homoplasty 150 days after operation; A — regenerated bone tissue, B — transplant; microphotograph with obj. No 40 and ocular No 10

ZUSAMMENFASSUNG

Morphologische Untersuchungen von auto-, homo- und brefoplastischen Knochentransplantaten

L. I. Kostandyan

Der Verfasser ersetzte im Experiment einen kreisförmigen Defekt der Fibula (9 bis 12 mm lang) bei geschlechtsreifen Kaninchen durch homologen Knochen, von 27 bis 28 Tage alten Feten stammend, sowie durch autogenen und durch homologen Knochen eines erwachsenen Spenders. Die Homotransplantate wurden 7 bis 15 Tage bei einer Temperatur von 0 bis +4 °C konserviert. Insgesamt wurden 72 Versuche gemacht.

Analysiert man die histologischen Untersuchungen der drei Versuchsserien, ergibt sich, daß die evolutiven Vorgänge im Transplantationsmaterial und die reaktiven Veränderungen im Knochendefekt des Rezipienten bei auto- und homoplastischen Transplantationen im Grunde durch die gleichen Gesetzmäßigkeiten charakterisiert sind. Die Resorptionsprozesse im Transplantationsmaterial gehen mit Neubildung von Knochengewebe im Bereich der Plastik einher. Die Neubildung von jungem Knochengewebe im Bereich der Plastik erfolgt hauptsächlich durch periostal-endostale Wucherung der Knochenfragmente und durch Metaplasie der benachbarten weichen Gewebe des Rezipienten, aber auch unter Mitbeteiligung der Elemente des transplantierten Knochens. Bei Auto- und Brefoplastik wird der Defekt unter Bildung der Corticalis und des Knochenmarkkanals in etwa 70 Tagen nach der Operation ersetzt, während bei Homoplastik mit Transplantaten von erwachsenen Spendern die Regeneration nicht einmal 150 Tage nach der Operation zur Gänze beendet ist.

RESUMEN

El examen morfológico de las auto-, homo y brefoplásticas óseas

L. I. Kostandyan

En el experimento se sustituyó un defecto óseo circular sin periostio (9—12 mm de largo) de la fíbula de un conejo sexualmente desarrollado, por tejido óseo homólogo de un feto de 27—28 días de edad y por tejido óseo autógeno y homólogo de un donador adulto. Los homo-transplantes fueron conservados a temperaturas de 0—+4 °C por un tiempo de 7—15 días. En total fueron realizados 72 experimentos.

El análisis de los exámenes histológicas de 3 series de experimentos, demostró que los procesos evolutivos del material transplantativo y las modificaciones reactivas en la base del recibidor en las operaciones auto- y homoplásticas, se rigen fundamentalmente por los mismas principios. Los procesos de reabsorpción del material transplantativo están acompañados por la formación de nuevo tejido óseo en el lugar de la plástica. Se produce una regeneración del tejido óseo joven en el lugar de la plástica, principalmente cuando se trata de un crecimiento periostial-endostal de los fragmentos del hueso y de una metaplasia de los tejidos blandos circundantes del recibidor, y también si se trata de elementos del hueso transplantado. En las regeneraciones auto- y brefoplásticas del defecto con la formación de una capa cortical y un canal medular se produce la regeneración aproximadamente a los 70 días de la operación y en la homo-plástica total con los tejidos de un donador adulto no está terminado el proceso regenerativo, inclusive ni a los 150 días de la operación.

REFERENCES

1. **Brudastov, A. N.:** Dokl. AN SSSR, 86, 1952, 5 : 1057.
2. **Gintsburg, G. I.:** Dokl. AN SSSR, 81, 1951, 3 : 477.
3. **Zaychenko, I. L.:** Trudy vtorogo ukrainsk. syezda ortopedov-travmatologov (Papers read at Second Ukrain Congress of Orthopaedicians-traumatologists). Kiev, 1940, 86.
4. **Kartashev, Z. I.:** Vestn. Khir., 20, 1930, 58—60 : 282.
5. **Klebanovskaya, L. R.:** Ortop. Travm., 1960, 5 : 77.
6. **Kornev, P. G.:** Vestn. Khir., 12, 1927, 34 : 10.
7. **Lapchinsky, A. G., Malinovsky, A. A.:** Dokl. AN SSSR, 29, 1940, 3 : 269.
8. **Novachenko, N. P.:** Trudy vtorogo ukrainsk. syezda ortopedov-travmatologov (Papers read at Second Ukrain Congress of Orthopaedicians-traumatologists). Kiev, 1940, 92.
9. **Okulova, A. N.:** Tezisy dokl. vtorogo Vsesoyuzn. konferentsii po probleme tkanevoy nesovmenostimosti, konservatsii i transplantatsii tkaney i organov (Theses of papers read at Second All-Union Conference of Tissue Incompatibility, Conservation and Transplantation of Tissues and Organs). Odessa, 1961, 69.
10. **Polezhayev, L. V.:** Dokl. AN, SSSR, 77, 1951, 3 : 525.
11. **Ravitskaya, A. Y.:** Trudy vtorogo, ukrainsk. syezda ortopedov-travmatologov (Papers read at Second Ukrain Congress of Orthopaedicians-traumatologists). Kiev, 1940, 187.
12. **Rusakov, A. V.:** from the book: Mnogotomnoye rukovodstvo po patologicheskoy anatomii (Multivolume Handbook of Patology). Moscow, 1959, 5 : 3.
13. **Sipovsky, P. V.:** Morfolocheskaya kharakteristika prisposobitelnych/kompensatornykh/reparativnykh reaktsii kostnoy tkani (Morphological Criteria of Adaptional/Compensatory/Reparative Reactions of Bone Tissue). Leningrad, 1961.
14. **Studitsky, A. N.:** Arkh. Anat. Gistol. Embriol., 13, 1934, 1 : 27.
15. **Chalmers, J.:** J. Bone Jt Surg., 44-b, 1962, 149.
16. **Felts, W. J.:** Transplant. Bull., 4, 1957 : 131.
17. **Hancox, N. M.:** J. Physiol. (Lond.), 106, 1947 : 279.
18. **Heikel, H. V.:** Act. orthop. scand., 29, 1960 : 257.
19. **Murry, P. D., Huxley, J. S.:** J. Anat. (Lond.), 59, 1925 : 379.
20. **Ray, R. D., Degge, J., Gloyd, P. et al.:** J. Bone Jt Surg., 34-A, 1952 : 638.

L. I. Kostandyan, ul. Gorkogo 95, Blagoveshchensk na Amure, USSR

Clinic of Plastic Surgery, Charles University, Prague, Czechoslovakia
Director Prof. V. Karfík, M. D., D. Sc.

COMPLICATIONS OF HEALING AFTER PRIMARY REPAIR OF CLEFT LIP AND PALATE

(Evaluation of 1,000 cases)

J. HRIVNÁKOVÁ, M. FÁRA, V. CHLUPÁČKOVÁ

Primary suture of a cleft lip and primary repair of a cleft palate are serious surgical procedures not only because the operation itself is rather intricate, but also because it is usually carried out at an early age, i.e. in infants or babies up to three years who, in addition, may be directly or indirectly weakened by the cleft malformation.

According to clinical experience, it may be assumed that this congenital malformation affects the individual not only locally, but in a high percentage of cases and to a certain extent also either directly by impeding the function and development of various, even remote organs, or, at least, decreasing the capacities for complex defensive reactions of the organism to unusual stress and for psychical adaptation.

Apart from this, great many of the patients with cleft are simultaneously affected by another congenital malformation which may impede the child's development, make it less resistant against the adverse influences of the environments or — as in the cases with a congenital heart disease — dangerously increase the risk of operation.

The life of a child at operation as well as healing of the wound after operation used to be in great danger, until perfection of anaesthetic and resuscitation techniques and the progress in pre- and postoperative care together with the improvement in the methods of baby feeding, which have taken place in recent years, essentially reduced this risk.

It must be borne in mind that any flaw in the primary operation of cleft lip and palate retards and, to a large extent, also impairs the result of treatment with the view to function and appearance. This then will affect the patient with regard to the possibilities of his attaining an adequate social standard. Corrective surgery at a site altered by scarring resulting from complicated healing will never yield as good results as a successful primary operation.

The knowledge of these facts induced many surgeons engaged in the surgery of cleft to carry out a critical evaluation of operative results in their patients. Since the publications of Rayner (19) and, particularly, Veau (21),

a number of other papers (1—18, 20, 22, 23) have been published which not only appraise the surgical methods used hitherto, but also point to the dangers threatening the ultimate results of surgical treatment. This evaluation of therapeutic procedures, surgical methods and principles of postoperative rehabilitation has greatly contributed to the improvement in the care of patients with cleft and thus to better results of the treatment.

Every surgeon operating on a cleft is fully aware of the responsibility and contribution to the ultimate result of surgical treatment borne by the paediatrician who selects the patient for surgical treatment, prepares him for it and provides for his postoperative care. This is the reason why this paper dealing with the evoluation of results after primary operation for cleft lip and palate, carried out at the University Department of Plastic Surgery in Prague in the period between 1962 and 1967, is not only concerned with surgical criteria, but also with any other (paediatric) complication affecting the healing and rehabilitation of the operated on child.

Tab. 1. Types of Cleft Lip

Unilateral incomplete	168
Unilateral complete	167
Bilateral incomplete — two-stage operation	26
Bilateral complete — two-stage operation	112
Bilateral incomplete — one-stage operation	13
Bilateral complete — one-stage operation	9

Primary suture of a cleft lip is carried out at an age between five and nine months. Complete bilateral cleft si treated at the earliest possible age, complete unilateral cleft at about seven months and incomplete clefts later still. Not only the weight of the child, but the child's general condition in its entire complexity is taken as decisive criterion for the operation.

Whatever type of suture we, at the Prague Department, choose for the skin, particular care is taken of proper reconstruction of the nasal floor, insertion of the ala nasi, suture of the labial muscles and complete coverage with mucous membrane of all exposed tissues in the oral cavity.

For operation of a cleft palate, the child is admitted at the age of three. This operative term has been decided upon on the basis of a more than fourty-year old experience of the Prague Department with the systematic treatment of cleft, the chief criteria for the choice of it being the stage of development of the jaws and soft tissues of the lip when operating on the lip and the development of jaws and speech when operating in the palate. Every child with cleft is regularly checked up by the surgeon, the orthodontist and the paediatrician of the Department, and this team of doctors ensures its preoperative preparation and postoperative care. In the first half of the third year of age, every child with cleft palate is examined by the phoniatrician who arranges for its preoperative logopaedic care, preferably in the district of the child's residence.

Operation on the palate is carried out by the two-, three- or four-flap method, the terminal arteries in the edges of the mucoperiosteal flap are ligated

with catgut, the neurovascular bundle emerging from the greater palatine foramen is carefully spared and the palate is retropositioned as far back as possible using a double Z-plasty on the nasal mucosa. The pterygoid hamuli are broken off exceptionally. The defect in the posterior wall of the pharynx created by the formation of the pharyngeal flap, is meticulously closed by a crowded catgut suture after the ligature of larger bleeding vessels. The

Tab. 2. Types of Cleft Palate

Total unilateral	114
Total bilateral	77
Cleft of palate only	254

pharyngeal flap is then sutured into a short cross incision on the surface of the velum with six catgut stitches. As a routine, pharyngofixation with a cranial pedicle is carried out in addition to primary operation on the palate. This has been done at our Department in the majority of patients ever since 1946. The repaired palate is usually covered with a swab soaked in a mixture of gelatine 160.0 g., Famosept 2.0 g. and oil of cloves 12 drops. This swab is removed on the third day after operation.

Only exceptionally, i.e. in severe chronic infection or extreme hypertrophy of tonsils, do we require tonsillectomy to be carried out prior to operation for cleft.

The child is admitted for operation only from environments clear of infection, in relative good general condition, a sufficiently long time after a possible illness or after vaccination and prepared for the operation according to our directives for feeding, i.e. with food containing an adequate amount of protein, iron and vitamins.

The current laboratory tests are carried out at the policlinic near the patient's residence and the results are submitted on admission. Swabs from the nasopharynx are taken at the Department immediately after admission.

Tab. 3. Methods of Operation for Cleft Lip

Veau's modified	387
(plus implantation of bone graft into maxilla	25)
Tennison-Randall's	34
Brown-McDowell's	13
Millard's	61

We wish to emphasize the necessity of creating a favourable psychological atmosphere around the child during its stay in hospital.

Local and general complications are reduced to the minimum by the rotation system and strict hygiene. After admission, the child is warded in a four-bed room until the day of operation, i.e. for two to three days. The first 24 hours after operation, the child stays on the resuscitation ward and then it is trans-

ferred to an absolutely clean room, where it remains under struct supervision for five to seven days. In this way it is possible to detect and isolate a child with local or general infection and prevent its spreading all over the Department.

In order to ensure proper function of the blood during general anaesthesia, we require a haemoglobin value of at least 70%, i.e. 11 g%. In the course of preoperative treatment, an attempt is made to cure any possible anaemia by

Tab. 4a. Methods of Operation for Cleft Palate

Retropositioning and suture plus 2 mucoperiosteal flaps	144
Retropositioning and suture plus 3 mucoperiosteal flaps	267
Retropositioning and suture plus 4 mucoperiosteal flaps	84

nutrition and medication; only exceptionally do we resort to substitutional therapy by blood transfusion. Transfusion of full blood during operation, however, is considered very useful for the replacement of blood losses and as a means of preventing shock, and that is why we give it almost to every child operated on for cleft.

Up to the year 1950, children, at the Prague Department, were anaesthetized by insufflation of ether vapours. Since then, endotracheal anaesthesia through an oral air way is given as a routine. Up to 1964, ether was used as anaesthetic; since then we give Fluothane (or Narcotan which is the Czechoslovak trade mark of a substance having the same properties as Fluothane). In all instances the soft tissues of the operation field are infiltrated with a ¼ % solution of Procain plus adrenalin (or octapressin) in order to facilitate dissection and reduce capillary bleeding. This also reduces consumption of the inhalatory anaesthetic, because anaesthesia may thus be kept at a low level.

The child already comes round in the theatre immediately after conclusion of the operation and only after careful extubation and removal of mucus from the canules and mouth by suction, is it taken to the resuscitation ward.

Complication after operation are divided, according to their nature, into two categories: surgical and paediatric. Comparing the vari-

Tab. 4b

Simultaneous pharyngofixation with upper pedicle	472
Simultaneous pharyngofixation with lower pedicle	1
Without pharyngofixation	32

ous data, we search for possible mutual relationships and probable causes. This makes it possible to qualify and elucidate the development of a surgical failure by, maybe, some cause of paediatric origin (e.g. dehiscence of a suture due to rhinopharyngitis) or, on the other hand, it may become evident that an illness of general character has developed due to a postoperative surgical complication (e.g. laryngitis due to the laryngeal mucosa damage from the endotracheal tube).

The following factors may be regarded as causes of failure after operation for cleft lip and palate: inadequate or technically imperfect surgical procedure, tension in suture, contamination of wound, haemorrhage and surgical shock (causing impaired blood supply to and subsequently retarded healing of the wound). Even if actually only the first two factors are of pure technical character, theoretically all of them may be accounted for incorrect care of the patient and can, therefore, be avoided or prevented.

Tab. 5. Suture Material Used

Catgut	159 times
Chromicized catgut	178 times
Nylon	168 times

We, at the Prague Department of Plastic Surgery, have always been aware of these factors, and this was the reason why we have constantly endeavoured to create and ensure such conditions which would enhance the chances of successful treatment. In the first place, this concerns the choice of surgical methods and the optimal age of the patient for operation. Equally important is, of course, the personal and material equipment during operation. Much emphasis is laid on preventing infection of the wound. That is why the nasopharyngeal flora is examined in each patient before operation and, if haemolytic streptococcus is found, operation is postponed. However, caution is also indicated, where other pathogenic organisms, such as coliform bacilli, pseudomonas pyocyanea, proteus, staphylococcus aureus, etc., are present. In the postoperative course, all efforts are made to prevent infection of the upper respiratory tract, because this always constitutes a danger to the healing of the surgical wound. That is why children are selected for operation with particular caution at the season at which affection by these diseases is more probable than at any other time of the year, i.e. in the rainy months of late autumn and early spring. As preoperative treatment, almost every child is given penicillin or another antibiotic chosen according to the sensitivity of the nasopharyngeal flora.

Tab. 6. Surgical Complications in Operations for Cleft Lip

Total dehiscence of suture in patient with eczema	1
Suppuration of wound	2
Haematoma	1

Every failure has been the subject of meticulous analysis aimed at discovering its possible cause. However, in order to obtain a more precise and complete picture of the complications, developing after primary operation for cleft, we, at the Prague Department, have introduced exact registration, apart from the case paper, of all circumstances which otherwise would escape notice, but could later show some relationship with complications of the postoperative period. This kind of note-taking was started on 1 Jan., 1962, i.e. at a time,

when we could base our experience on more than 4,000 patients treated at the Department for cleft.

By 16 May, 1967, i.e. not quite five-and-a-half years later, the number of children thus registered reached 1,000. This number was considered to be sufficiently conclusive and evaluable from a statistical point of view.

Tab. 7. Paediatric Complications in Operations for Cleft Lip

Death (dystrophic child, aged 2 + 1/2, with perinatal encephalopathy and complete bilateral cleft of lip + palate)	1
Suppurative otitis media (in both cases it developed 10 to 14 days prior to operation and recurred after operation)	2
Paracardial bronchopneumonia (simultaneous in one of otitis media cases)	1
Laryngeal stridor after endotracheal anaesthesia	1
Acute laryngitis 2nd day after tracheotomy	1
Constitutional and generalized eczema	1

ANALYSIS OF REGISTERED CASES AND DELIBERATION

We have set ourselves the task to determine the incidence and causes of complications developing after primary operation for cleft lip and palate, detect the factors contributing to possibly poor results of the treatment (and which could have been avoided) and pick out the factors favourable to healing.

We have centered our attention on complications which are due to imperfect healing, leaving out cosmetic and functional shortcomings resulting

Tab. 8. Mortality Rate After Primary Operation for Cleft Lip

Author	Year	Number of operations on lip	Number of deaths	Mortality rate
Junkin	1932	1250	4	0.32%
Fogh-Andersen	1946	623	31	5.00%
Fogh-Andersen	1948	1043	36	3.50%
Oldfield	1949	224	4	1.80%
Oldfield	1958	530	4	0.75%
Reidy	1959	166	3	1.80%
McClelland-Patterson	1962	102	—	—
Whalen-Conn	1963	219	—	—
Conway-Bromberg-Hoehn-Hugo	1966	256	3	1.17%
Wilhelmsen-Musgrave	1966	585	2	0.34%
Our series	1967	495	1	0.20%

from faulty surgical technique, such as asymmetrical lip, inadequately retropositioned palate, etc., because we have made the analysis of these failures and their relationship with various surgical methods the subject of another study.

Of the 1,000 investigated cases, 495 were operations of cleft lip and 505 operations of cleft palate. Distribution as to the various types of cleft

can be seen from tab. 1 and 2. We have been unable to furnish proof of any of those types or of the severity of cleft being responsible for the incidence of complications.

Neither did the surgical method employed (which, of course, could be made responsible for the cosmetic and functional result of the operation)

Tab. 9. Surgical Complications After Operations for Cleft Palate

Dehiscence of uvular suture	20
Perforation above uvula	27
Perforation in vault	15
Retroalveolar perforation	4
Dehiscence of velar suture	3
Total dehiscence	3
Detachment of pharyngeal flap	14
Haemorrhage (from anterior part of palate or from lateral incisions)	6

show any significant influence on the incidence of postoperative complications, as can be seen from tab. 3, 4a and 4b.

We have also studied with great pains the influence of the suture material on the healing of an operated on palate (see tab. 5).

Complications in the healing of the surgical wound after operation for cleft lip were registered in 0.83% of cases, as can be seen from tab. 6.

Resuture of a completely dehiscent suture of a lip in one child who had been suffering from persistent chronic eczema not only of the face, but of the whole body, together with hypoproteinaemia, was carried out with succes after four months of intensive treatment for eczema resulting in, at least, temporary improvement.

In another two cases, the complication was purulent discharge from the wound; only the current flora could be cultivated from the pus. In the one case, this was due to elimination of a many-strand nylon stitch inserted into

Tab. 10. Paediatric Complications After Operation for Cleft Palate

Mucopurulent Rhinophyrangitis	11
Acute exacerbation of chronic bronchitis	1
Dental caries	6
Herpes febrilis	1
Hypochromic anaemia	1
Bacillary dysentry	1
Death	1

the muscle below the threshold of the nostril, in the other, there was a small necrosis in the labial muscle evidently due to too firm fastening of the catgut stitches and subsequent impairment of local blood supply. In a fourth child, we found a haematoma which we were able to clear up by two punctures.

We assume that haematoma and dehiscence of the suture in the oral vestibule, which was earlier seen quite frequently, can be avoided by careful im-

mobilization of the child during the postoperative period. This, at least, will prevent bruising of the operation site by the patient himself.

Postoperative complications of a paediatric nature are shown in tab. 7.

In the first place, there is the only death in our series of patients after operation on the lip (0.2%). We could have avoided this mishap, had we not given in to the institute in care of the patient insisting on operation. — The girl, B. H., case paper No 54,489, age two-and-a-half years, with complete and bilateral cleft of lip, jaw and palate, was transferred to the Department from the babies' home with the urgent request for operation. The baby was suffering from severe somatic and psychic sequelae of perinatal encephalopathy and had great dificulty in breathing and the intake of food.

Tab. 11. Mortality Rate After Primary Operation for Cleft Palate

Author	Year	Number of palato-plasties	Number of deaths	Mortality rate
Rayner	1925	124	1	0.70%
Veau	1931	500	19	3.80%
Fogh-Andersen	1946	537	3	0.55%
Bentley-Watkins	1947	100	—	—
Jolleys	1954	253	6	2.30%
Marcks-Trevaskis-Tuerk	1955	100	—	—
Reidy	1957	134	5	3.70%
Oldfield	1959	710	7	0.90%
Musgrave-Bremmer	1960	780	2	0.26%
McClelland-Patterson	1962	98	—	—
Conway-Bromberg-Hoehn-Hugo	1966	337	1	0.29%
Our series	1967	505	1	0.19%

The child was severely dystrophic with a weight of 7,000 g. (at birth she weighed 3,200 g. and measured 50 cm.). There were signs of a tonoataxic type of early spastic infantile cerebral paralysis. She was unable to sit, even to lift her head, to speak and only very slightly reacted to stimuli from without. Apart from the facial cleft, she had deformed feet by syndactyly and the missing of the second toes. She died from cerebral oedema one hour and 50 minutes after operation during which there had been no complication.

Tab. 8 shows the mortality rate after operation for cleft lip as published by the various authors in different years.

None of the two cases which we had operated on and which had shown abrasions of the cornea as a postoperative complication, resulted in scarring of the cornea. We consider paraffin oil as an adequate means of preventing this complication. We, therefore, put it into the eyes of every patient prior to the induction of anaesthesia.

Only in a single case of our series of patients operated on for cleft lip did we find any relationship between surgical and paediatric complications. This

happened in the above described case of hypoproteinaemia in chronic eczema. The total dehiscence of the suture four days after operation was surely due to the poor general condition of the child.

Surgical complications after operation for cleft palate were registered 92 times in 88 children out of a total of 505 operations, i.e. in 18,2% or 17.4% resp. (see tab. 9). Thirty of these cases had been sutured with ordinary

Tab. 12. Surgical Complications Based on Paediatric Complications

Chronic rhinopharyngitis	4
Hypochromic anaemia	1
Acute respiratory infection 1 month prior to operation	1
Haemorrhage due to increased fibrinolysis	1

catgut, 26 with chromicized catgut and 32 with one-strand nylon. This shows that there is no significant difference testifying in favour or against one or the other suture material. In all the children who developed complications in the healing of the surgical wound, the following microorganisms had been cultivated from the nasopharyngeal smears taken before operation: streptococcus alpha, pneumococcus, Neisseria, micrococcus albus, staphylococcus albus and occasionally staphylococcus pyogenes aureus. The operation had always been carried out under an antibiotic screen corresponding to the sensitivity of the flora as tested prior to operation.

Complications of paediatric nature developing after operation are shown in tab. 10.

Apart from the usual paediatric care, we, at the Department, make every effort to avoid these complications, mainly by isolating the children from contact with anybody, but the hospital personnel. We take good care that the ban of visiting the children's ward is strictly carried into effect not only for visitors from outside, but also for personnel of other wards of the Department.

Death of a child after operation for cleft palate occurred only once (i.e. in 0.19% of the 505 operated on cases), but the more dramatic it was for it.

Tab. 13. Paediatric Complications Based on Surgical Complications

Anaemia due to haemorrhage from wound after operation (which had to be treated by transfusion)	2
Conjunctivitis in one eye	1
Corneal abrasion	2

It was most probably caused by anaphylactic shock after the administration of penicillin.

The boy S. V., case paper No 40,320, age five years and ten months, suffered from an isolated cleft of the hard and soft palate. In his family history, we found bronchial asthma. Two of his siblings died after birth. The patient had

had measels, mumps and alergic, vesiculopapular exanthem. Laboratory tests were within the norm.

Nine days after admission, plastic repair of the palate with three flaps, retropositioning of the velum and pharyngofixation on a cranial pedicle were carried out without complication under an uneventful intubation anaesthesia lasting 45 minutes. After operation and the removal of the intratracheal tube,

Tab. 14. Surgical Complications and Haematological Disorders

Low haemoglobin	2
Leucocytosis	4
High sedimentation rate	12
Total	18

All these 18 cases were children with chronic or recurrent infections of the upper respiratory tract.

the child had a pink colour, was breathing spontaneously and even reacted to questions. Seventy five minutes afterwards, sudden respiratory and cardiac arrest set in, but heart action could be revived by open heart massage. The ECG then showed normal curves. However, since this event, the child remained deeply unconscious. His heart action was good, but he was incapable of spontaneous breathing, and respiration had to be maintained passively (controlled respiration) for eight days by way of a tracheotomy. The post-mortem showed extensive changes in the central nervous system which could be summed up as demyelinization, on the one hand, and as dyscycloischaemic phenomena with their maximum in the cerebellum and the cerebral cortex, on the other, both sequelae of the acute anaphylactic shock which probably had developed after penicillin.

Tab. 11 shows the mortality rate after operation for cleft palate as published by the various authors.

Tab. 15. Relationship Between Surgical Complications and Date of Operation

Year	January	February	March	April	May	June	July	August	September	October	November	December	Yearly number of complications
1962	2	2	1	3	2	—	2	2	1	1	—	—	16
1963	—	1	1	1	—	1	4	—	2	—	—	—	10
1964	1	5	5	1	3	1	1	3	3	1	1	—	25
1965	1	2	—	2	1	—	1	—	—	1	2	—	10
1966	3	1	3	3	1	—	2	—	3	4	1	—	21
1967	1	1	1	1	2								6
	8	12	11	11	9	2	10	5	9	7	4	—	88

Number of complications in the different months

Incidence of a surgical complication most probably based on a disorder of paediatric nature was registered in seven cases, as can be seen from tab. 12.

The opposite chain of events, i.e. in which a paediatric was followed by a surgical complication, was observed in four children (see tab. 13).

Tab. 14 shows the relationship between surgical complications and haematological disorders. All these 18 children suffered from chronic or recurrent infections of the upper respiratory tract.

The relationship between the occurrence of surgical complications and the date of operation becomes evident from tab. 15. The high incidence of complications in February, March and April is statistically significant and corresponds with the lowered resistance of the organism after the season of winter. The relative high incidence in July and September is probably due to the circumstance that more cases of cleft are operated on at the Prague Department in these months, while in August there is much less activity due to the general cleaning and distempering of the walls in the children's ward usually carried out at that time. In percentage, the occurrence of complications does not exceed the average of the summer months.

The influence of operating under an antibiotic screen on the incidence of surgical or paediatric complications cannot be evaluated, because we have no control group of patients operated on without it.

Unlike other authors (Nylen and Wahlen), we have never observed postoperative haemorrhage after pharyngofixation, and this holds good not only for the 473 cases of pharyngeal flaps referred to in this study, but also of the many hundred cases operated on at the Department in Prague before this period. We assume that meticulous suture of the secondary defect in the pharyngeal wall, careful removal of the intratracheal tube, careful sucking off of mucus from the patient's throat and the care for the absolute rest of the child's body and mind, when coming round from the anaesthetic, are the factors which ensure an uneventful postoperative course and smooth healing. Adherence to these principles of care immediately and some time after operation contribute in the same way to the undisturbed postoperative course after all other surgical procedures referred to above.

Our results are, to a certain, even if not significant extent, unfavourably influenced by the fact that the Department of Plastic Surgery in Prague is the postgraduate training centre for young plastic surgeons who thus are given the oportunity of carrying out their first operation for cleft. In an operation for cleft lip, the more experienced assistant may well forego any shortcoming in the operating surgeon's technique, but he can hardly prevent some error during an operation on the palate which then will become evident by postoperative complications.

Inspite of this, we do not attempt to shirk from our responsibility for any complications occurring after operation for cleft. Even if it might be very difficult to further reduce the incidence of postoperative complications, it seems quite certain that the complex surgical and paediatric care of the patient before and during operation, during resuscitation and postoperative treatment,

together with the strictly responsible work of the surgical, nursing and laboratory personnel should ensure much more favourable perspectives for the uneventful healing in the operated on child.

SUMMARY

The increasing incidence of cleft malformations and the demand for better cosmetic and functional results after surgical treatment require both quantitative and qualitative improvement in the care of these patients. A critical evaluation of the complications registered in 1,000 cases during and after primary repair of cleft carried out at the University Department of Plastic Surgery in Prague in the last period of five-and-a-half years (495× suture of lip and 505× repair of palate, 473× of which together with pharyngofixation) points to the importance of a perfect cooperation between the surgeon on the one hand and the family paediatrician, the hospital paediatrician and the anaesthesiologist on the other. Only the complex preoperative treatment preparing the child for the operation, the meticulous performance of the operation and the correct postoperative care of the patient can ensure an uneventful postoperative course and good results of the surgical treatment.

No connection of the incidence of complications in the healing of the surgical wound with the severity of the cleft or the sort of suture material used or even with the method of operation employed, could be detected.

The connection between certain species of bacteria found in the flora of the nasopharynx prior to operation and the incidence of complications in the healing of the surgical wound as well as between the operation carried out in February, March or April and an increase in postoperative complications, has been pointed out.

By comparison, it could be shown that surgical complications are influenced by the simultaneous occurrence of paediatric complications and vice versa.

The authors report on 0.85% complications including one death (0,20%) after primary suture of a cleft lip and 17.4% complications including one death (0.19%) after primary repair of a cleft palate.

RÉSUMÉ

Les complications de la guérison des suttures primaires dans les becs-de-lièvre et les divisions palatines

J. Hrivnáková, M. Fára, V. Chlupáčková

Avec la fréquence des défauts en bec-de-lièvre augmentante et les prétentions plus élévées quand à l'esthétique et la fonction des résultats post-opératoirs il nous faut absolument une ammélioration perpétuelle du soin de ce défaut soit quantitative soit qualitative. Une évaluation critique des complications post-operatoires chez 1000 des opérations de la dernière période de 5 ans et demi à la clinique de la chirurgie plastique à Prague touchant les suttures primaires des défauts en question (dont 495 des suttures de la lèvre, 505 opérations du palais, 473 en ont été accompagnées de la pharyngofixation contemporaine) souligne la nécessité de la collaboration parfaite entre le chirurgien, le pédiatre de la maison de même que de celui de la clinique et

entre l'anésthésiologue. Ce n'est qu'un soin pré-opératoir complet, l'opération mise-en point soigneusement accompagnés du soin postopératoir juste qui nous assurent la guéri son satisfaisante et le bon résultat opératoir de succès.

Aucune cohérence de l'existence des complications postopératoires vis-à-vis du degrès de la déformité, de la sorte du matériel respectif de la sutture en question, ou de la méthode opératoire elle-même n'a pas été trouvée.

Au contraire une certaine cohérence entre certes types de la flore bactérielle du nasopharyngs dans la période préopératoire et la fréquence des complications a été prouvée de même que les échecs plus fréquents chez des enfants ayant subi l'intervention au mois de février, mars et avril.

Une correlation a été faite et une influence réciproque des complications chirurgicales avec celles pédiatriques a été soulignée.

Les complications dans la guérison de la sutture primaire du bec-de-lièvre étaient présentes dans le 0,83 pour cent des cas un exitus en surplus (0,20), dans la guérison de la sutture primaire de la division palatine dans le 17,4 pour cent, un exitus en surplus de même (0,19 pour cent).

ZUSAMMENFASSUNG

Komplikationen der Wundheilung nach primären Operationen an Lippe und Gaumen bei Spaltbildungen

J. Hrivnáková, M. Fára, V. Chlupáčková

Das ständig steigende Vorkommen von Lippen- und Gaumenspalten sowie die erhöhten ästhetischen und funktionellen Ansprüche, die an die Operationsergebnisse gestellt werden, erfordern eine quantitative und qualitative Verbesserung der Therapie dieser kongenitalen Missbildungen. Eine kritische Bewertung der Komplikationen der Wundheilung bei 1000 primären Operationen von Spaltbildungen (495 Lippensuturen und 505 Gaumenoperationen, davon 473 mit gleichzeitiger Pharyngofixation), die in der letzten 5½ Jahren an der Klinik für plastische Chirurgie in Prag vorgenommen wurden, zeigt die Wichtigkeit einer einwandfreien Zusammenarbeit des Chirurgen mit dem Kinderarzt im Terrain und im Krankenhaus sowie mit dem Anästhesiologen. Einzig und allein die komplexe Vorbereitung des Kindes für den chirurgischen Eingriff, die sorgfältig durchgeführte Operation und eine einwandfreie postoperative Betreuung sind imstande, einen günstigen Verlauf der Wundheilung und ein einwandfreies Operationsergebnis zu gewährleisten.

Ein Zusammenhang von Komplikationen der Wundheilung mit dem Grad der Missbildung oder der Art des Nähmaterials bzw. dem Typ der Operationsmethode konnte nicht nachgewiesen werden.

Die vorliegende Arbeit weist auf den Zusammenhang des Befundes mancher Bakterienarten im Nasenrachen vor der Operation mit dem Auftreten von Komplikationen der Wundheilung sowie auf die häufigeren Misserfolge bei Operationen, die im Feber, März oder April vorgenommen werden, hin.

Ein durchgeführter Vergleich ergab, dass die chirurgischen Komplikationen höchstwahrscheinlich gleichzeitig aufgetretene pädiatrische Komplikationen beeinflussen und umgekehrt.

Die Komplikationen der Wundheilung nach primärer Lippensutur machten 0,83 % plus 1 Exitus (0,20) aus, nach primären Gaumenoperationen 17,4 % plus 1 Exitus (0,19 %).

RESUMEN

Las complicaciones en la cicatrización de las operaciones primarias de las escisiones del labio y del paladar

J. Hrivnáková, M. Fára, V. Chlupáčková

El aumento de la frecuencia de las escisiones y más altas exigencias estéticas y funcionales de los resultados operativos, requieren un mejoramiento cuantitativo y cualitativo del tratamiento de este defecto congénito. La valoración crítica de las complicaciones en la sanación de 1000, en los últimos 5 y medio años, en la clínica de cirugía plástica de Praga, realizadas como operaciones primarias de escisiones (495 suturas del labio y 505 operaciones del paladar, de éstas 473 con una faringofijación simultánea) demuestra la importancia de la cooperación total entre el cirujano, el pedíatra práctico o docente y el anestesiólogo. Únicamente la preparación completa del niño antes de la operación, una operación realizada con sumo cuidado y un cuidado post-operatorio correcto, aseguran el desarrollo exitoso de la sanación y un buen resultado operativo.

No se observó ninguna relación entre las complicationes en la sanación de las heridas operativas con la gravedad del defecto, ni con la especie de material para suturas, ni con el tipo de método operativo.

Se muestra la relación del hallazgo de ciertos tipos de flora bacteriana en la nosofaringe antes de la operación con el hallazgo de complicaciones de la sanación y el más a menudo fracaso en el desarrollo de los niños, operados en febrero, marzo y abril.

Se realizó una comparación entre la probable influencia mutua de las complicaciones quirúrgicas con las complicaciones simultáneas pediátricas y al revés.

Las complicaciones en la cicatrización de la sutura primaria del labio fueron de un 0,83 % más 1 muerte (0,20), y en las operaciones del paladar 17,4 % más 1 muerte (0,19 %).

REFERENCES

1. **Bentley, F. H., Watkins, I.:** Speech after repair of cleft palate. Lancet, 2, 1947 : 862.
2. **Burian, F.:** Chirurgie rozštěpu. (Surgery of Cleft.) Praha, SZdN 1954.
3. **Conway, H., Sromberg, B., Hoen, R. J., Hugo, N. E.:** Causes of mortality in patients with cleft lip and cleft palate.
4. **Duffy, M. M.:** Fever folloving palatoplasty: an evaluation based on „fever volume". Plast. reconstr. Surg., 38, 1966 : 32.
5. **Fogh-Andersen, P.:** Hare-lip and cleft palate: 1000 patients submitted to operation. Acta Chir. scand., 94, 1946 : 213.
6. **Fogh-Andersen, P.:** Hareskaar og ganespalte : 1400 operede patienter. Nord. Med., 38, 1948 : 894.
7. **Jolleys, A.:** A review of the results of operations on cleft palates with reference to maxillary growth and speech function. Brit. J. plast. Surg., 7, 1954 : 229.
8. **Jolleys, A., Savage, J. P.:** Healing defects in cleft palate surgery — the role of infection. Brit. J. plast. Surg., 16, 1963 : 134.
9. **Junkin, C. I.:** Anesthesia for hare-lip and cleft palate repair. Canad. Proc. Anesth. Soc., 1952 : 30—38.
10. **Karfík, V.:** Otázka vhodné doby k operaci rozštěpu patra. (Problem of the Most Suitable Time for Operation of Cleft Palate.) Čs. Pediat., 10, 1955 : 20.
11. **Marcks, K. M., Trevaskis, A. E., Tuerk, M.:** 100 palatoplasties. Plast. reconstr. Surg., 16, 1955 : 352.

12. **McClelland, R. M. A., Patterson, T. J. S.:** The preoperative, anesthetic and postoperative management of cleft lip and palate. Plast. reconstr. Surg., 29, 1962 : 642.
13. **McClelland, R. M. A., Patterson, T. J. S.:** The influence of penicillin on the complication rate after repair of clefts of the lip and palate. Brit. J. plast. Surg., 16, 1963 : 144.
14. **Musgrave, R. H., Bremner, J. C.:** Complications of cleft palate surgery. Plast. reconstr. Surg., 26, 1960 : 180.
15. **Nylen, B., Wahlen, A.:** Post-operative complications in pharyngeal flap surgery. Cleft Pal. J., 3, 1966 : 347.
16. **Oldfield, M. C.:** Modern trends in hare-lip and palate surgery: a review of 500 cases. Brit. J. plast. Surg., 37, 1949 : 178.
17. **Oldfield, M. C.:** Some observations on the cause and treatment of hare-lip and cleft palate, based on the treatment of 1041 patients. Brit. J. plast. Surg., 46, 1959 : 311.
18. **Schweckendiek, W.:** Die Besonderheiten der Gaumen- und Lippenspaltenpatienten für das Hals-, Nasen-, Ohrengebiet (Peculiarities of Patients with Cleft Lip and Palate Concerning ENT Surgery), Acta Chir. plast. (Praha), 8, 1966 : 169.
19. **Rayner, H. H.:** The operative treatment of cleft-palate. A record of results in 125 consecutive cases. Lancet, 1, 1925 : 816.
20. **Reidy, J. P.:** Cleft lips and palates: survey of 370 cases. Brit. J. plast. Surg., 12, 1959 : 215.
21. **Veau, V.:** Division palatine (Cleft Palate). Paris, Masson et Cie 1931.
22. **Whalen, J. S., Conn, A. W.:** Anesthetic management for repair of cleft lips and cleft palates. Canad. Anesth. Soc. J., 10, 1963 : 584.
23. **Wilhelmsen, H. R., Musgrave, R. H.:** Complications of cleft lip surgery. Cleft Pal. J., 3, 1966 : 223.

Dr. J. Hrivnáková, Šrobárova 50, Praha 10, Czechoslovakia

Kirov Military Medical Academy, Leningrad (USSR)

TOTAL PHALLOPLASTY

M. V. MUKHIN

Loss of the penis causes serious psychological stress to the patient. This is why its reconstruction is of such great significance. Loss of the penis can be the consequence of a gun shot injury, an accident at work or at home and sometimes, but rarely, of an amputation as indicated in a malignant tumour.

The first plastic reconstruction of a penis was carried out in the USSR by Bogorazov in 1936. In this case he used a tubed Filatov flap. Shortly afterwards, Bogorazov's method was acknowledged abroad (Maltz, 1946; Gillies, 1948; Bergmann et al., 1948).

Many Soviet surgeons (Vovk, Gnilorybov, Ivanov, Karpukhin, Mayat, Mukhin, Frumkin, Shchuplik and others) modified and greatly improved the original method of phalloplasty, but up to date, some details have not yet been elaborated to the ultimate finish. It is, for instance, quite insufficient to just reconstruct the body of the penis from a tubed flap; the orifice of the urethra, too, must be placed to the tip of the body. Or it is extremely important that the reconstructed penis should properly function during sexual intercourse, the more so, if the testes were intact.

Fortunately, total loss of the penis is met with infrequently. Hitherto, only series of one to three cases of total phalloplasty have been published (Leyfer, 1957; Tagirov, 1958; Gelb et al., 1959; Morgan, 1963). In 1950, we published, in the journal "Vestnik khirurgii", an account of four completed phalloplasties in total loss of the penis caused by war injury. These patients had been operated on in the period between 1946 and 1949. In all instances the result as to function was good. In recent years, eight patients underwent treatment for total loss of the penis, in whom we carried out phalloplasty by using a Filatov flap for the body and, in addition, reconstructed the urethra. Thus our experience in total reconstruction of the penis is based on twelve cases.

Our method of total phallo- and urethroplasty consists in the employment of two tubed flaps which, depending on the turgor of the skin and the distribution of scars in it, may be formed either both on the abdomen or one on the abdomen and the other on the upper third of the thigh near its medial aspect. Three to four weeks later, the two pedicles, one of each flap, are transposed to the stump of the penis and the two flaps are partly sutured to each other lengthwise. In some cases, however, we carry out suture of the two flaps only.

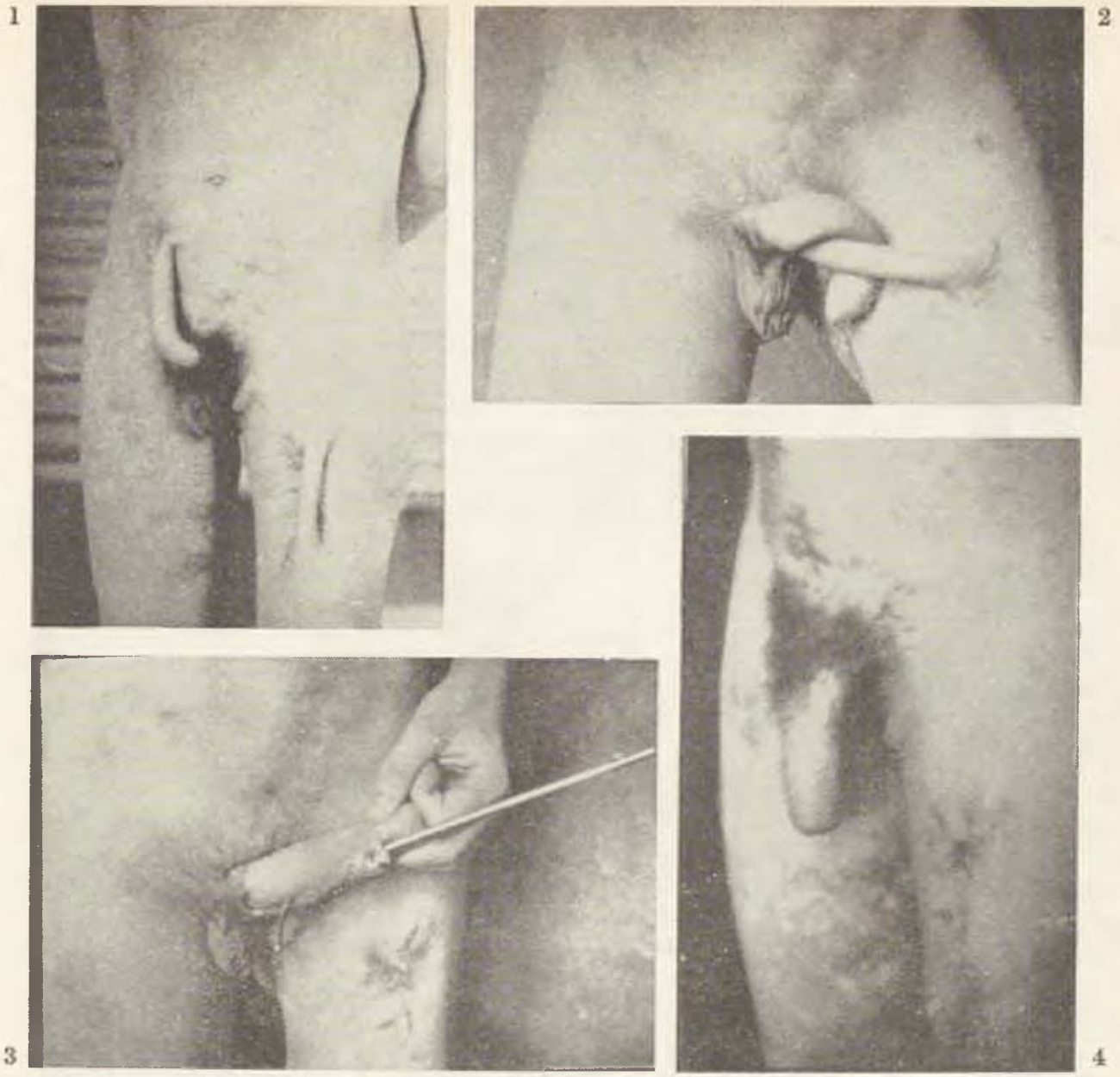


Fig. 1. *Patient D.:* Lateral pedicle of tubed abdominal flap transferred to penis stump. Second flap formed on anterior of left thigh. — Fig. 2. Distal pedicle of flap of thigh united with flap on abdomen with one pedicle implanted into penis stump. Second pedicle of abdominal flap separated and flap left temporarily hanging. (In the years 1944—1945, we were still afraid to suture the two flaps lengthwise at this stage of the operation.) — Fig. 3. The two flaps sutured together lengthwise and urethral tube reconstructed with catheter introduced into it. — Fig. 4. Finished reconstruction of penis

After that, i.e. when the two flaps have united lengthwise, the urethra is reconstructed from one of them. The large experience gathered with tubed Filatov flaps used in plastic operations for manifold indications has convinced us that the larger part of its fatty tissue may be excised without risking necrosis. The vascular network situated in the loose tissue between dermis and fat, however, must be spared at all costs. For the formation of the urethra, a large amount

of fatty tissue is excised in order to avoid compressing the vascular network when suturing the skin, which otherwise might lead to necrosis developing after operation. Reconstruction of the urethra is shown in fig. 16a, b, c, d, e.

In the next stage, the reconstructed urethra is sutured to the orifice of the original urethra in the penis stump. In nine patients, we made a cystostomy prior to the operation, in three young patients healing proceeded smoothly even

Fig. 5. *Patient P.:* Age 19 years, loss of penis after accident. Tubed Filatov pedicle flap formed from the skin-fat layer of abdominal wall measuring 25 × 8.5 cm. — Fig. 6. Because the length of the flap was 25 cm., it could be bent into hair pin shape at the following stage of the plasty and both halves sutured together lengthwise

without cystostomy. In the last stage of the operation, an auto- or homogenous cartilage graft is introduced into the fatty tissue of the reconstructed penis with the proximal end well anchored in the corpus cavernosum of the stump.

The following short excerpts of case histories and the illustrations may serve as confirmation of the said.

1. War invalid D., born 1926, was admitted to the Sverdlovsk Institute of Traumatology and Orthopaedics in March 1947, i.e. at the age of 21, because of total loss of the penis caused by a granade splinter injury which he had sustained in 1944. The member was missing completely; under the pubis were scars and in their lowest part, there was the orifice of the urethra. The scrotum was deformed by scars, the left testicle was missing but the right one was intact. Under the pubis, at the scrotal margin, a small remainder of the corpora cavernosa could be pulpated. Micturition was unimpeded, but urine was passed in a spray instead of a jet.

Phalloplasty by the above-described method (using two pedicle flaps) was carried out. The reconstructed penis was 11 cm. long with a diameter fully

corresponding to that of a normal member. The urethral orifice opened at the tip of the penis and the urethra was passable for catheler of average dimensions. Micturition was normal and urine was not passed in a spray any more. In Jan., 1949, the patient came back complaining of a sharp, paroxysmal pain in the right lumbar region. On X-ray, there was a stone in the renal pelvis. We decided to carry out a chromocystoscopy. The cystoscope was introduced

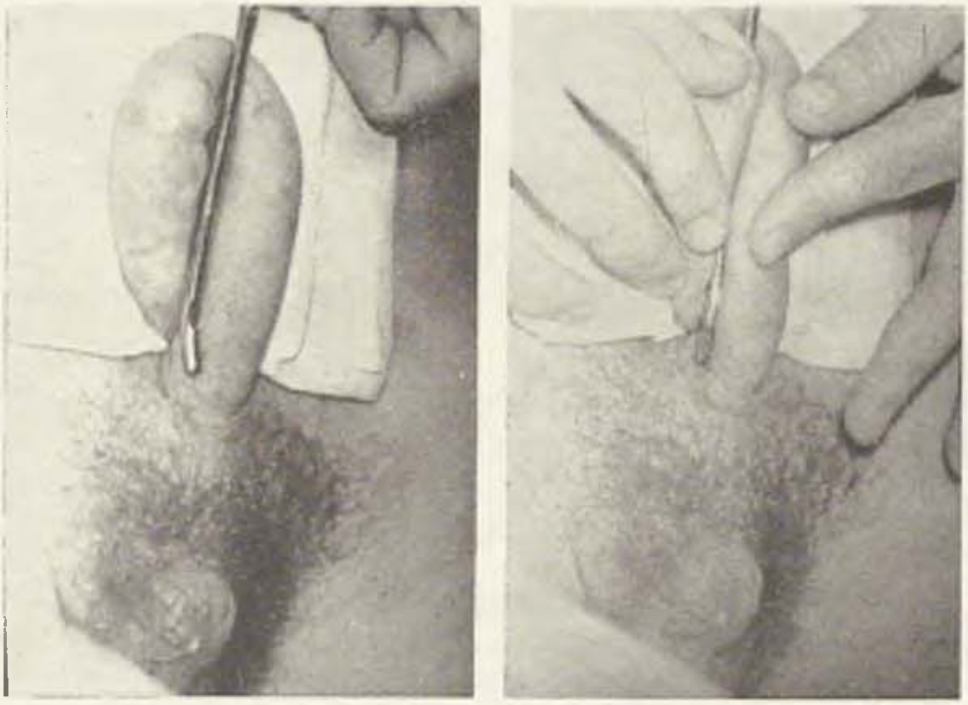


Fig. 7a, 7b. Such a pedicle flap also suffices for reconstruction of the urethra

through the reconstructed urethra without any difficulty and even the cartilage graft in the penis was no obstacle to it. A few days later a number of small stones were removed from the renal pelvis (operation performed by Bogopolsky). There was also pus in the pelvis, but the postoperative course was uneventful. Two years later, the patient stated that he had no difficulty in micturition; his sexual life was normal (fig. 1—4).

2. Patient P., aged 19, was admitted on 29 Aug., 1960, because of total loss of the penis. In 1949, at the age of eight, he had had an accident as a result of which the penis had to be amputated. On admission, there was a stump of the penis 1.5 cm. in length with the urethral orifice in its centre. The patient passed urine without difficulty and with a strong though thin et, because scars had narrowed the opening of the urethra. Reconstruction of the penis was carried out with one Filatov flap which had been formed on the right side of the abdomen on 7 Sept., 1960, and measured 8.5 × 25 cm. One month later, the upper pedicle was separated, the flap divided lengthwise down to half its diameter and fatty tissue together with the postoperative scar excised. Then it was bent over by 180^0, sutured into the shape of a double barrel and left hanging down on one pedicle above the pubis. On 21 Dec., 1960, reconstruction of the

penis and the urethra was carried out from this doubled flap in one stage by the following method: Two deep and straight incisions were made parallel to and at a distance of 1 cm. to either side of the postoperative scar. Then a metal catheter was placed on the thus formed strip of skin whose edges were sutured

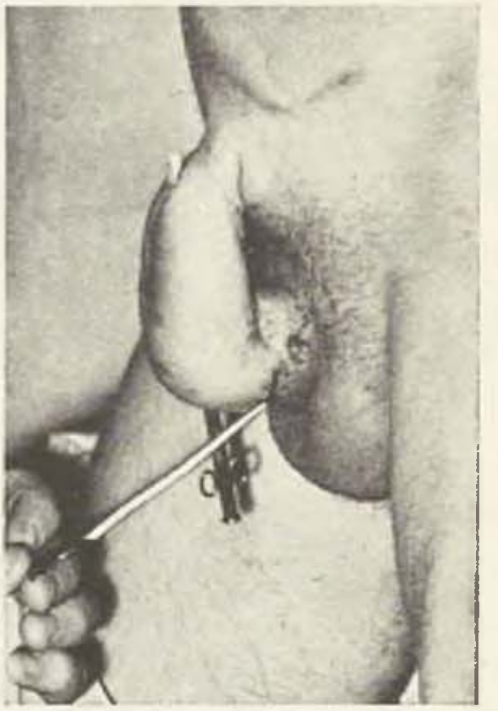


Fig. 8. Catheter freely passed through reconstructed urethra. — Fig. 9. Free end of reconstructed penis and urethra united with penis stump

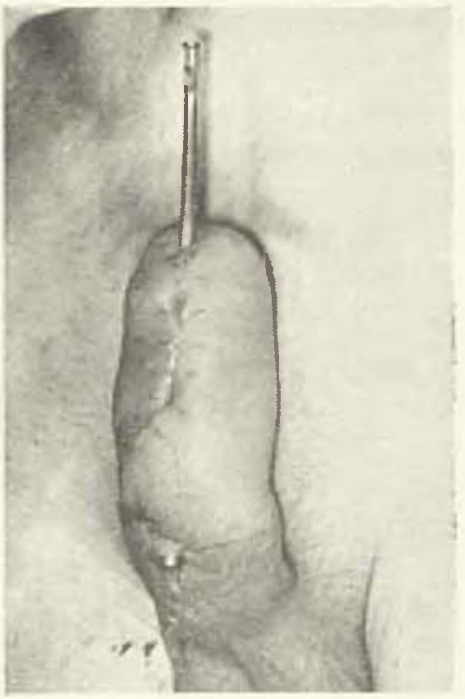


Fig. 10. Reconstructed body of penis and urethra separated from abdominal wall. Catheter introduced in reconstructed urethra shows proximal opening near the orifice of urethral stump — Fig. 11. Finished reconstruction of penis

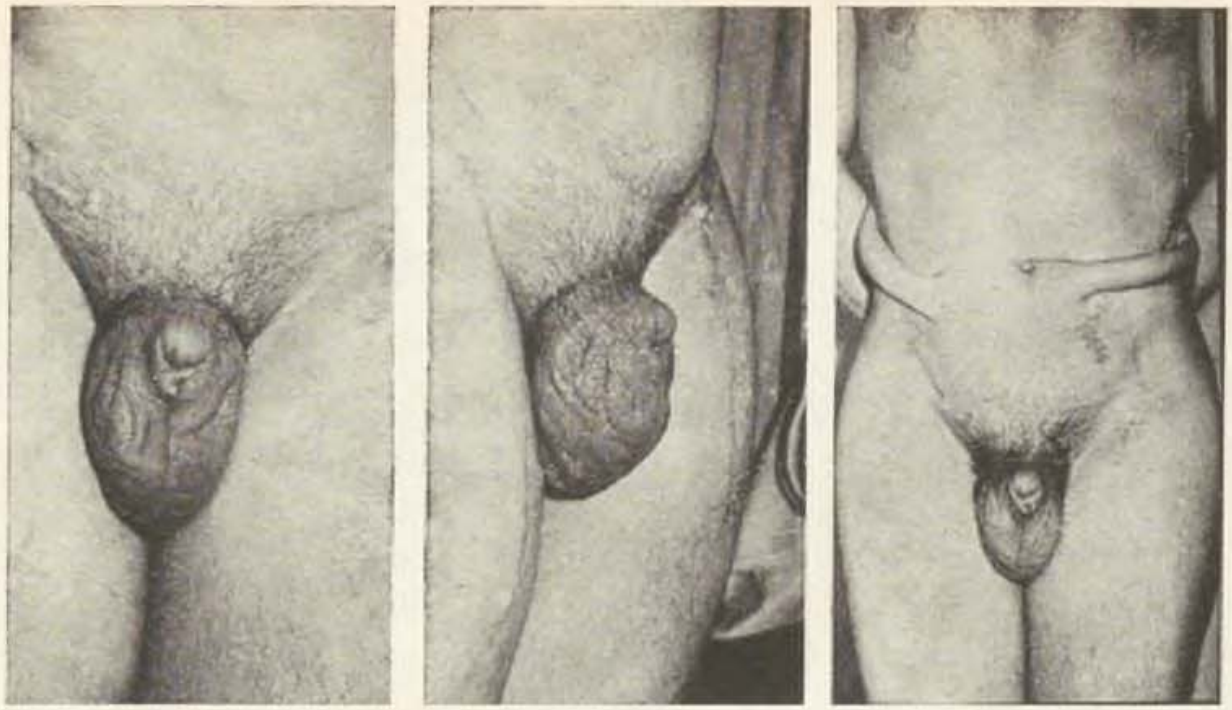


Fig. 12a, 12b. *Patient B.:* Age 36, loss of penis after amputation for tumour. — Fig. 13. Two tubed flaps formed on abdomen

over it with catgut stitches. Afterwards again some of the fatty tissue was excised and the lateral edges of the two incisions were joined with each other. On 10 Feb., 1961, the free end of the reconstructed penis (with the new urethral canal running inside it) was sutured to the penis stump in such a way that the urethral orifice of the stump and that of the reconstructed penis were no more than 1 cm. apart from each other. Thus the patient was able to pass urine through the opening in the stump. On 3 March, 1961, the second pedicle was separated and thus the reconstructed member remained hanging on the penis stump. On 14 April, 1961, the patient was discharged from hospital for a four-months interval in his treatment.

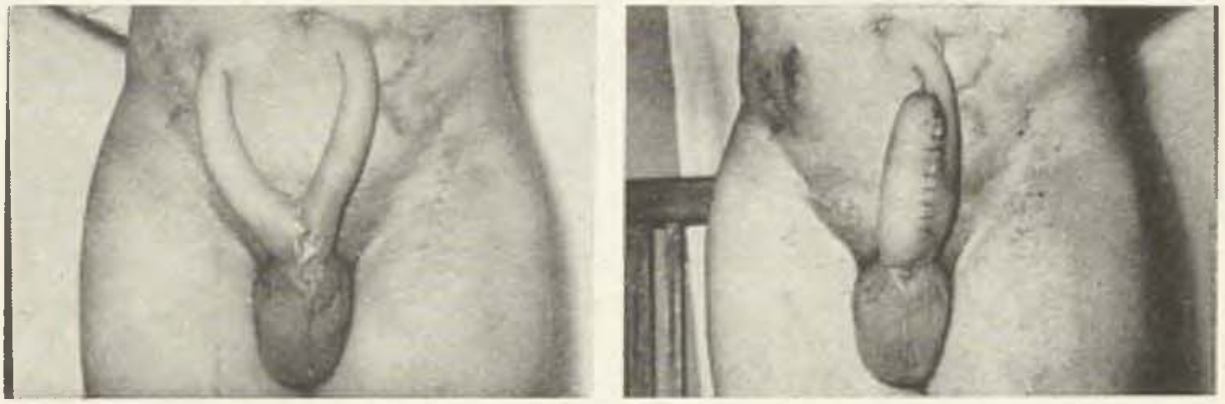
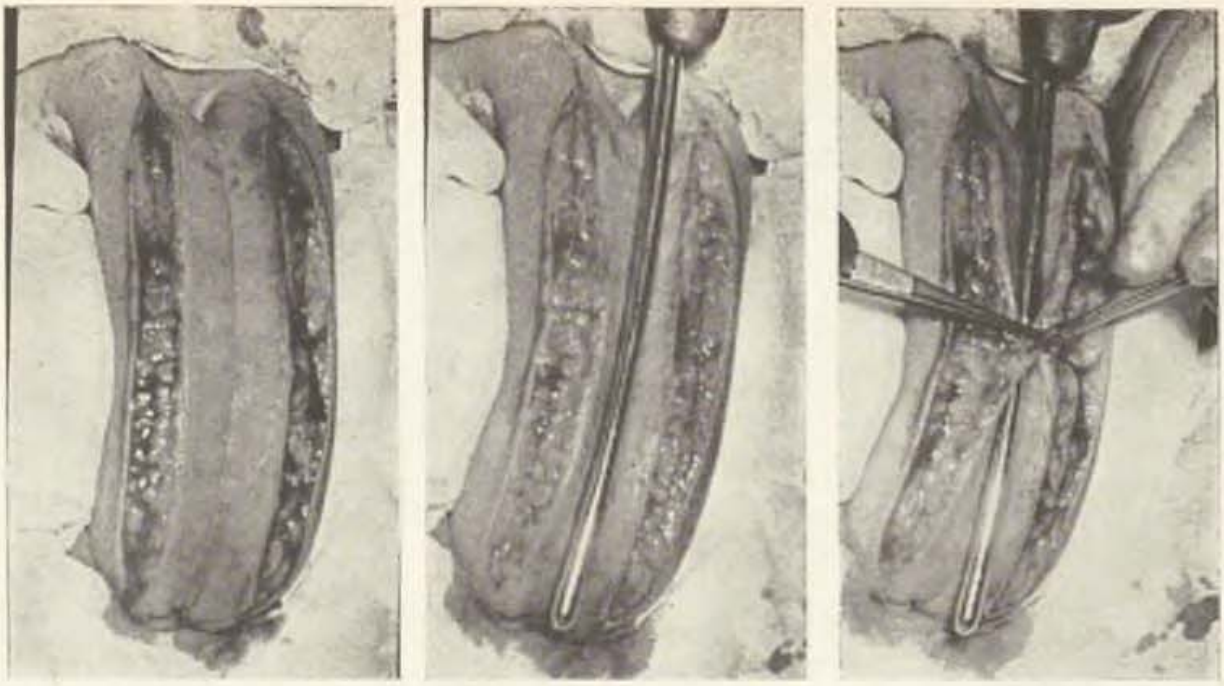
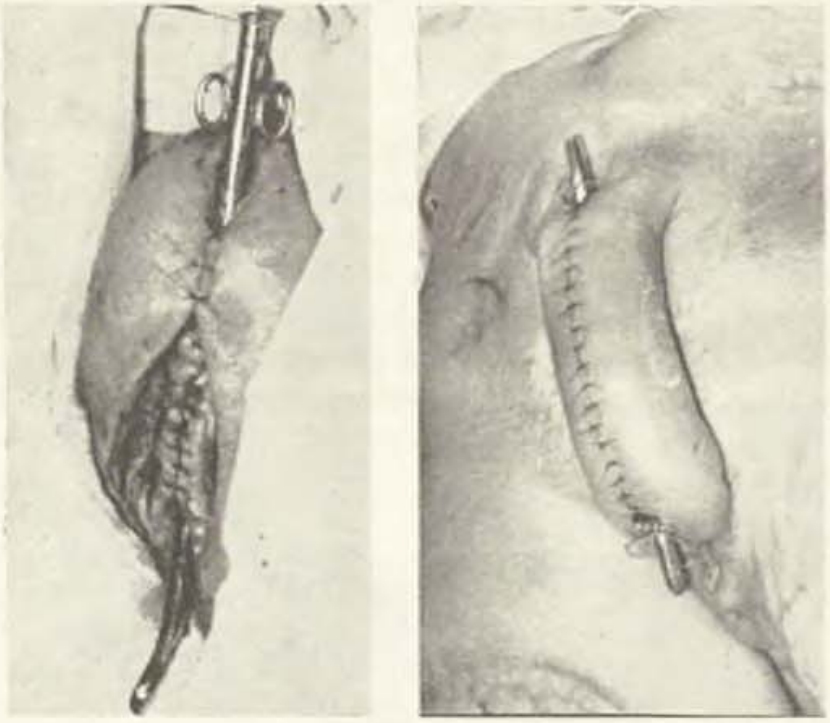


Fig. 14. Lateral pedicle of each flap transposed to penis stump near urethral orifice. — Fig. 15. Right flap separated from abdomen and sutured to left flap along its entire length



a b c



d e

Fig. 16a, b, c, d, e. Stages of reconstruction of urethra. At this stage, a large amount of fatty tissue is excised

He was re-admitted on 9 Sept., 1961 and up to Jan., 1962, a number of corrective operations were carried out. On 31 Jan., 1962, cystostomy above the pubis was established and on 14 Feb., the urethra of the penis stump was united with the urethral tube in the reconstructed part of the penis. One month later,

the cystostomy was closed and the patient started to pass urine through the reconstructed urethra. On 19 April, 1962, he was discharged from hospital and went home, but after a month he was re-admitted for the implantation of a cartilage graft into the reconstructed penis (fig. 5—11).

3. Patient B., aged 36, was admitted to the Institute on 6 April, 1964, because of a total loss of the penis. On 3 Dec., 1962, amputation of the penis had been carried out because of cancer. Prior to and after amputation he had received actinotherapy. On 8 April, 1964, phalloplasty was started and concluded in March 1965. In the intervals between stages of the operation, the patient was discharged home several times (fig. 12—17).

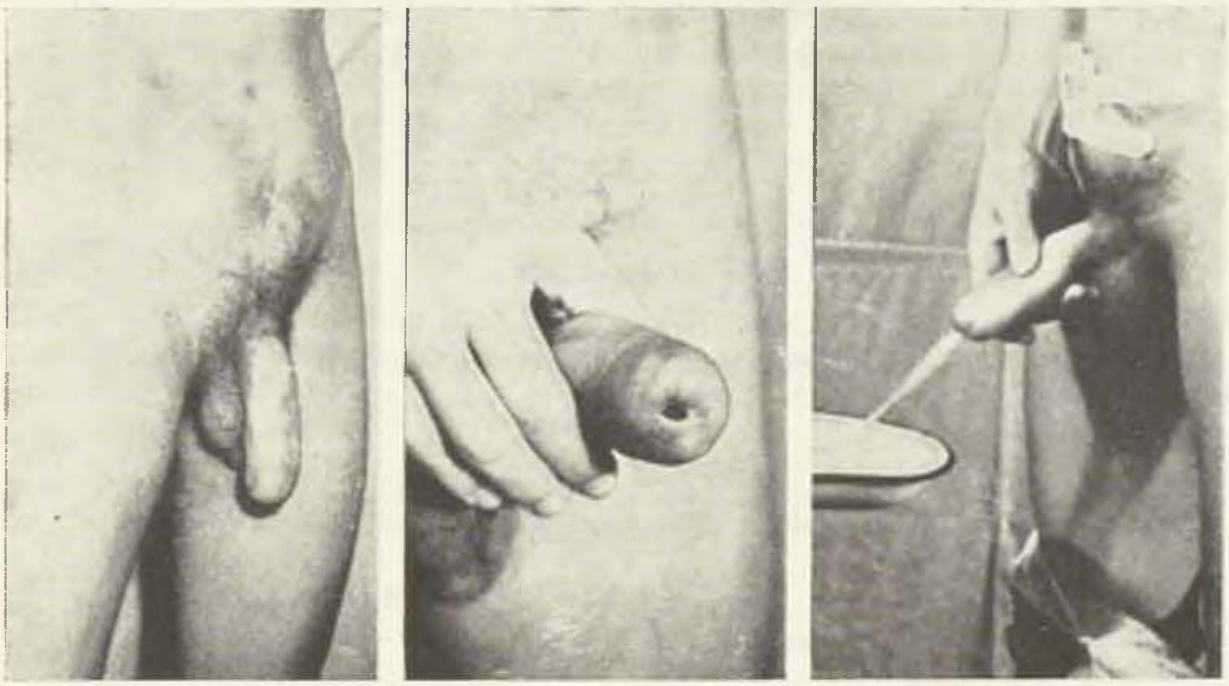


Fig. 17a, b, c. Finished reconstruction of penis. It shows normal dimensions. Urethral orifice is of normal caliber and placed at tip of penis. Micturition is normal

The above described method of total phalloplasty somewhat prolongs the whole period of treatment, if compared with the methods referred to by other authors. However, it ensures very good final results which may be judged by the following criteria: 1. the penis has adequate shape and dimensions; 2. micturition is normal; 3. the reconstructed organ is satisfactory even for sexual function; 4. in cases in which one of the testes has remained intact, even reproduction is possible.

SUMMARY

The author describes his own method of reconstruction of the penis after total loss using Filatov pedicle flaps. A total of twelve patients have thus been treated and the results are good.

RÉSUMÉ

Plastie totale de la verge

M. V. Mukhin

L'auteur décrive sa propre méthode destinée à restituer la verge faute de sa perte totale, à l'usage du lambeau pédiculé de Filatov. Il a traité ainsi douze de ses malades ayant obtenu de bonnes résultats.

ZUSAMMENFASSUNG

Totale Phalloplastik

M. V. Mukhin

Der Verfasser beschreibt seine eigene Methode der Penisrekonstruktion nach Totalverlust, wobei er Filatowsche gestielte Hautlappen verwendet. Insgesamt wurden 12 Patienten auf diese Weise behandelt; die Ergebnisse waren günstig.

RESUMEN

Faloplastia Total

M. V. Mukhin

En este artículo el autor describe su método de la reconstrucción del pene después de su pérdia total empleando colgajos pediculados. Doce pacientes en total fueron tratados de tal manera y los resultados adquiridos son buenos.

REFERENCES

1. **Bogoraz, N. A.:** Sovetsk. Khir., 8, 1936 : 303.
2. **Vovk, A. A.:** Theses of paper read at the XVIIth Complete Scientific Conference of the Dnepropetrovsk Medical Institute. 1955, p. 154.
3. **Gnilorybov, T. E.:** Clinical Use of Tubed Filatov Pedicle Flap. Kiev, 1936, p. 232.
4. **Ivanov, I. A.:** Papers of Permsk Medical Institute. 35, 1962 : 177.
5. **Karpukhin, V. T.:** Urologiya, 6, 1962 : 43.
6. **Leyfer, L. Y.:** Urologiya, 3, 1957 : 40.
7. **Mayat, V. S.:** Urologiya, 5, 1960 : 51.
8. **Mukhin, M. V.:** Vestn. khir., 3, 1950 : 31.
9. **Tagirov, K. G.:** Khirurgiya (Mosk.), 7, 1958 : 122.
10. **Frumkin, A. P.:** Scientific papers of the Moscow Clinical Hospital, 1956, p. 161.
11. **Shupik, P. L.:** Vrack. delo, 9, 1950 : 807.
12. **Bergman, R. T. et al.:** J. Urol. (Baltimore), 59, 1948 : 1174.
13. **Gillies, H.:** Brit. J. plast. Surg., 1, 1948 : 8.
14. **Gelb, J. et al.:** Plast. reconstr. Surg., 24, 1959 : 62.
15. **Maltz, M.:** Evolution of Plast. Surg. New York, Frobin Press 1946.
16. **Morgan, B.:** Plast. reconstr. Surg., 32, 1963 : 467.

M. V. Mukhin, ul. Smirnova 8, flat 3, Leningrad K-9, USSR

University Department of Plastic and Reconstructive Faciomaxillary Surgery,
Thallwitz, GDR
Director O. M. R. Prof. W. Bethmann, M. D.

FINDINGS ON JAWS AFTER VELO-PHARYNGOPLASTY FOR CLEFT

W. BETHMANN, U. SCHWARZENBERGER

It is well known that the dorsal extension of the palate is formed by the soft palate (velum palatinum) which, like a mobile muscular veil, cranially delimits the entrance into the pharynx. Its connective tissue basis is represented by the palatine aponeurosis which passes over into the periosteum of the hard palate. Function of the soft palate during phonation is ensured by its striated muscle tissue which pervades the whole organ and forms the following muscles: tensor veli palatini, levator veli palatini, palatoglossus and palatopharyngeus. While the tensor veli palatini receives its nerve supply from a special nerve (nervus tensoris veli palatini) originating from the mandibular nerve, the other muscles get their innervation via the pharyngeal branches (rami pharyngei) of the vagus.

On swallowing, the soft palate closes the nasopharynx off by being lifted up as a result of the contractions of the levator veli palatini and tensor veli palatini, so that it presses against the Passavant bar and in this position, part of its nasal surface, i.e. an area of about 5 mm. above the root of the uvula, clings to the dorsal wall of the pharynx. On speaking, the soft palate rises and falls thus regulating the flow of air or, if necessary, shuts off the naso- from the oropharynx. On proper breathing, the uvula comes to lie between the two palato-pharyngeal arches thus closing off the oral cavity from the passage of air. The knowledge of these functions leads to the understanding of possible functional disorders. These may be disorders of speech, of the intake of food, of respiration or the danger of contaminating the air ways (Rosenthal, Kältegärtner). Their causes can be paralysis of the soft palate, too wide a mesopharynx, too short a velum (as primary developmental disorder or secondary as a result of scar shrinkage after surgery, e.g. after operation for cleft), etc. It also becomes quite feasible that a surgically not repaired cleft of the soft palate will never meet the functional demands. For its proper function in speech, in particular, the soft palate must be long enough, well mobile, elastic and properly innervated. However, one sometimes finds a somewhat short

velum which, provided it is well mobile and elastic, may function alright, and, on the contrary, there may be an adequately long velum whose function is defective, because it is rigid and not sufficiently mobile. The investigations of Rosenthal and Andrä disclosed that, in some cases, the velum touched the dorsal wall of the pharynx just above the Passavant bar. This goes to show that this bar is not the only means for or of any great importance to the correct occlusion of the nasopharyngeal cavity. It is also known that enlarged palatine or pharyngeal tonsils facilitate the closing-off of the nasopharyngeal from the oropharyngeal cavity. Research has been conducted in many ways for possibilities of repairing functional disorders of the velum, persisting in patients operated in for cleft palate. Eckstein introduced paraffin, while Perthes transplanted cartilage into the pharyngeal wall. Ernst and Küster lengthened the velum by cross incisions in front of the uvula cutting through all the layers, so that the uvula could be pulled out backwards. Schuchardt recommended lengthening of the velum by zig-zag incisions and subsequent suture of both sides. Velum lengthening by mobilization of the palato-pharyngeal and palato-glossal arches was recommended by Immenkamp and carried out by Wassmund. Campbell achieved improvement of speech by using a vomer flap with which it was possible to give the soft palate a W-shaped extension towards the back wall of the pharynx. In some cases, retropositioning, as recommended and performed by Immenkamp, Rosenthal and Wassmund, has resulted in a sufficiently long and well functioning velum. In America, the method of Dorrance and Bransfield and in the Soviet Union that of Limberg, are being employed. Hynes, using a rotation flap, formed an eminence of mucous membrane on the dorsal wall of the pharynx. Trauner and Gillies, too, reported on their own methods.

The widest usage is given to the method called velo-pharyngo-plasty. A muscle-mucosa flap is formed on the dorsal wall of the pharynx, the donor site is closed by primary suture and the flap is sutured to the soft palate. In velo-pharyngo-plasty according to Schönborn-Rosenthal, the flap is connected with the pharyngeal wall by a caudal pedicle, while in the method of Schönborn-Rosselli, it has a cranial pedicle. Some time after operation, these pharyngeal flaps usually shrink a little, because their wound surfaces have not been covered with epithelium primarily, but have healed by granulation and secondary epithelization. This leads, particularly, in the flaps with caudal pedicles, to the velum being pulled downwards. On the whole, an improvement of speech can be achieved with these pharyngeal flaps which is evidently based on a number of factors. At first, the pharyngeal cavity, which has still to be closed off by the velum and the pharyngeal wall, has thus grown smaller. Then, the velum is brought nearer to the pharyngeal wall by the pull of the pharyngeal flap. Finally, it may be expected that the muscle fibres of the dorsal wall of the pharynx, which are included in the flap, will convey functional impulses to the muscles of the velum (in the way muscle neurotization is effected), as we have frequently seen in patients with inadequately

functioning soft palate (but without a cleft), in whom we had former a pharyngeal flap and sutured it ot the velum.

In principle, velo-pharyngo-plasty may be carried out as primary operation. If it is executed together with the repair of a cleft palate, one speaks of palato-pharyngo-plasty. The earliest age, in which according to our experience, this operation may be indicated, is about three-and-a-half years. Secondary velo-pharyngo-plasty is carried out in cases in which a preceding palato-plasty has resulted in a functionally inefficient soft palate. The decision as to primary or secondary velo-pharyngo-plasty differs with the various authors. Gelbke, for instance, employed the method of Schönborn-Rosenthal only as secondary operation in combination with retropositioning of the velum, while we, at our Department, have increasingly been using primary velo-pharyngo-plasty in recent years. Our results as to healing and function have been good.

From the observations and investigations of numerous authors it is known that maxillary development in patients operated on for cleft palate greatly differs from that in normal patients. The development of the maxilla, of course, greatly depends on the type and shape of the cleft, the age at which operation is carried out, the method of operation, the surgical technique and the trend of maxillary and midface development. Retrusion and over-bite of incisors, partial or complete protrusion of the premaxilla, crowding of teeth, cross-bite, maxillary compression, false, masked true and even true prognathism and other deformities have been described as sequelae of operations for cheilo-gnatho-palato-schisis. In surgically untreated cleft of the hard and soft palate, however, occlusion of the pharynx is supposed to be normal which would be borne out by the observations of many authors as well as our own. In these, non-operated on patients, a rather broad palate is found in later age, in contradistinction to the narrow palate of maxillary compression developing after treatment. Maxillary changes after operation are slight in cases in which the cleft only involved the soft palate.

We carried out check-up examinations in patients who had a velo-pharyngo-plasty carried out at the Thallwitz Department (founded by W. Rosenthal) up to 31 Dec., 1963. This was a series of 303 patients, in 169 of whom secondary velo-pharyngo-plasty of Schönborn-Rosenthal, in 73 primary velo-pharyngo-plasty of Schönborn-Rosenthal, in 31 secondary velo-pharyngo-plasty of Schönborn-Rosselli and in 30 primary velo-pharyngo-plasty of Schönborn-Rosselli, had been performed. In order to be able to appraise maxillary development, we only examined patients for check-up who were at least twelve years old. This reduced the number of patients to 195, but only 52 of those responded to our notification and called for check-up examination. On evaluation we registered the following data: age at operation, method of operation, findings in the palatine cleft (presence of residual apertures, etc.), length and breadth of soft palate, distance between velum and dorsal wall of pharynx, anatomical and functional condition of velum, breadth of mesopharynx, breadth of stem of pharynx, development of pharyngeal muscles, breadth of pseudochoanae, presence of tonsils, whether or

not orthodontic treatment had been given, parafunctions and the conditions of teeth and bite. We were unable to find any mention in the literature of a similar investigation having been carried out before.

Models of the maxilla and mandible made from "Kalzinat" impressions were orientated into three planes (raphe-median, tuber and chewing planes) with the model formed of Korkhaus, modified by Brückl et Groth. Since in patients with cleft the raphe-median plane could not be determined in the usual way (point of palatine raphe crossing the second transverse palatine fold and transition of hard into soft palate) because of the missing transverse palatine folds, the midline had to be marked ont the wax-bite on taking the impression, so that this point could be used as the anterior landmark of the raphe-median plane on mounting the casts on the model former. After mounting, the model was analysed on hand of Brückl's orthodontic treatment chart. The transverse deviation of each maxilla was measured using Pont's index, modified by Korkhaus. Sagittal deviations of each maxilla were recognized by determining the length of its dental arch using either Schönherr calipers or measuring stencils. Cephalometric X-rays were taken with the Korkhaus device. For demonstrating the velum in these X-rays, "Alitrast B" was used in a 1:1 solution. Two profile X-rays were taken for this purpose, one with the velum in the position of occlusion, the other on ee-phonation. This was supposed to demonstrate the mobility of the velum thus made visible on X-ray by the contrast substance. Evaluation of the profile X-ray pictures was carried out in the usual way and the following distances and angles were measured: 1) nasion-sella line, 2) length of maxilla, 3) length of mandibular body, 4) length of mandibular ramus, 5) basis angle, i.e. angle between basic plane of mandible and spine plane, 6) angle between spine plane and axis of upper incisors, 7) angle between basic plane of mandible and axis of lower incisors, 8) facial angle between nasion-sella and frontomaxillary lines, 9) gonion angle and 10) inclination angle. The contrast substance for X-ray demonstration of the velum was injected into the nose.

RESULTS OF EVALUATION

In 46.9 % of case there was deviation of the midline, in 86.5 % transverse deviation, in 33.3 % sagittal deviation from normal occlusion and in 30.8 % various degrees of mandibular prognathism. From cephalometric X-rays, it could be ascertained that the length of the maxilla was normal in 62.7 % of cases.

With regard to the method of operation, we divided the series of patients into the following groups: A total of 47 cases, i.e. 90.4 %, had been operated on by the method Schönborn-Rosenthal (17 primary, 28 senconary velo-pharyngo-plasties and two unidentifiable cases) and five cases, i.e. 9.6 %, by the method Schönborn-Rosselli (three primary and two secondary velo-pharyngo-plasties).

On evaluation of cephalometric X-rays it was found that after operation of Schönborn-Rosenthal, the maxilla was normal in 28 cases, whereas in 18 cases it appeared too small. In the patients operated on by the method

of Schönborn-Rosselli, the maxilla, on cephalometric X-ray, was found to be normal in four cases and too small in one case. If in cephalometric X-rays the cases operated on by the method of Schönborn-Rosenthal as primary plasty were compared with those in which operation was carried out as secondary measure, the difference proved in favour of primary velo-pharyngo-plasty. Certain degrees of prognathism could be seen on cephalometric X-rays after primary Schönborn-Rosenthal velo-pharyngo-plasty in three and after secondary plashty in twelve cases. In the χ^2-test with the 2.2 table (corrected by Yates) a significant difference in favour of primary velo-pharyngo-plasty could be ascertained with a level of significance of 5 %.

If the cases with cleft of the secondary palate were taken separately (leaving out the cases of cheilo-gnatho-palato-schisis), it was found, on evaluation of cephalometric X-rays, that after primary Schönborn-Rosenthal velo-pharyngo-plasty (nine cases) the maxilla had developed normally in 88.9 %, whereas after secondary plasty only in 62.5 %. This shows that the better results were achieved in cases operated on by primary velo-pharyngo-plasty. Measurements of the orthodontic models, too, disclosed that in the cases with cleft of the secondary palate operated on by primary velo-pharyngo-plasty there were less dysgnathic abnormalities than after secondary operation.

In cheilo-gnatho-palato-schisis (eight cases after primary and 19 cases after secondary plasty) evaluation of cephalometric X-rays showed that after primary plasty the maxilla had developed normally in 62.5 %, while after secondary plasty only in 47.8 % of cases. This method of evaluation, therefore, also disclosed the better results after primary plasty. Evaluation of orthodontic models — like the preceding methods — also proved that even in cheilo-gnatho-palato-schisis there were less dysgnathic abnormalities after primary than after secondary velo-pharyngo-plasty.

On comparison of the patients in whom cheilo-plasty had to be carried out with those without operation on the lip, evaluation of cephalometric X-rays showed that the maxillary basis had developed normally in most of the cases without cheilo-plasty. So did the measurements of orthodontic models, i.e. patients, in whom no cheilo-plasty had had to be performed showed a smaller number of cases with the above-described anomalies than those after cheilo-plasty. In the χ^2-test with the 2.2 table, deviation of the midline showed a significant difference in favour of the patients without preceding cheilo-plasty.

In previous years (and some of the patients chosen for this check-up had been operated on at that period), not all clefts of the maxillary margin used to be closed by operation. That is why a marginal cleft was found, among other anomalies, in 61.5 % of cases of our series. The patients, who had had a marginal cleft in the maxilla, showed this cleft closed on check-up examination in 18.8 % and unclosed in 81.2 % of cases (whereby, in the latter, the marginal segments lay close to each other leaving but a narrow fissure between them). On evaluation of cephalometric X-rays, it was found that the maxilla had developed normally in a higher percentage of cases with closed than with unclosed

marginal cleft. Similar results were attained on measurement and evaluation of orthodontic models.

We then compared patients with a well mobile velum with others whose velum was poorly mobile. On evaluation of cephalometric X-rays and orthodontic models it emerged that the better developed maxilla and the lesser occurence of transverse and sagittal deviations from normal occlusion was found in the patients with o poorly mobile velum. Lesser midline deviations and lesser degrees of prognathic abnormalities, on the contrary, were found in the patients with a well mobile velum.

The pharynx musculature was found well developed in 56 %, satisfactory in 40 % and poorly developed in 4 % of the checked-up patients. Evaluation of cephalometric X-rays showed more favourable results in the patients with well developed pharyngeal muscles. On evaluation of the orthodontic models, midline deviations and the degree of prognathic abnormalities were lesser in the group of patients with well developed pharyngeal muscles, but results of the examination for transverse and sagittal deviations from normal occlusion were more favourable in the group of patients with poorly developed pharyngeal muscles.

Comparing the patients with a pharynx stem of a width up to 10 mm. with those whose pharynx stem was more than 10 mm. wide, evaluation of cephalometric X-rays proved in favour of the group with more than 10 mm. pharynx stem while, on the contrary, evaluation of the orthodontic models was more favourable in all four investigated anomalies to the group with pharynx stem width below 10 mm. (The differences obtained on model evaluation, however, were very small). The differences obtained on evaluation of orthodontic models between a group of patients after tonsillectomy and another of patients in whom no tonsillectomy had been carried out, were also very small. Evaluation of cephalometric X-rays with regard to the results of orthodontic treatment which 64 % of our checked up patients had received, disclosed very interesting findings, because they were more favourable in the group of patients without treatment. Evaluation of models gave identical results with regard to midline and sagittal deviations from normal occlusion and the degree of prognathic abnormalities, but with regard to transverse deviation the results corresponded with those found on evaluation of cephalometric X-rays, i. e. more favourable in the group of patients who had not undergone any orthodontic treatment. This surprising disclosure may probably be explained by the fact that the cases which had had preceding orthodontic treatment, were, a priori, less affected by dysgnathism. These conditions seemed to have had a continuous effect in the same direction on the group of patients in whom orthodontic treatment had already been concluded.

We then compared patients with an abnormal number (plus or minus) with those with a normal number of teeth. There was only a difference with regard to midline deviations and the degrees of prognathic abnormalites. These anomalies do occur in patients with an abnormal number of teeth more frequently. The most suitable age for operation emerged to be between 11 and 15 years.

SUMMARY

Of the 303 patients, in whom velo-pharyngo-plasty had been carried out at the University Department of Plastic and Reconstructive Faciomaxillary Surgery in Thallwitz, G.D.R., up to 31 Dec., 1963, 62 patients who appeared for check-up examination were over twelve years old. It became evident that development of the maxilla, as judged from evaluation of cephalometric X-rays and orthodontic models, had less been inhibited by primary than be secondary velo-pharyngo-plasty. The differences are statistically significant. In cases with cleft palate and lip, i.e. in which cheilo-plasty had to be performed prior to velo-pharyngo-plasty, showed the strong influence of cheilo-plasty on inhibiting maxillary development. This goes to show that neither velo-pharyngo- nor palato-plasty alone could be made responsible for the deviations in maxillary development. The best results were achieved in patients who had been operated on at an age between eleven and fifteen years. There was some difference between the various types of cleft, but it differs in the various anomalies. In closed marginal cleft, maxillary development had been less inhibited than in open marginal cleft. On cephalometric X-rays, the maxillary basis appeared to be better developed in patients with a pharynx stem wider than 10 mm., but the results of model measurements were better in those with pharynx stem width below 10 mm. Maxillary development in patients after tonsillectomy seemed to be somewhat better than that in patients without tonsillectomy. In patients with an abnormal number of teeth, various degrees of prognathic abnormality and midline deviation were found more frequently than in those with a normal number of teeth.

RÉSUMÉ

Les changements des mâchoires en suite de la vélo-pharyngo-plastie des fentes

W. Bethmann, U. Schwarzenberger

De l'assemblée des 303 malades traitée à l'aide de la vélo-pharyngo-plastie jusqu'au 31 décembre 1963 à la clinique de la chirurgie plastique et réconstructive universitaire à Thallwitz (en RAD), 62 en avaient l'âge de douze ans. On a prouvé que le développement de la mâchoire, à en juger des données des rayons X céphalométriques et des modèles orthodontiques, est en retard bien plus significant chez les malades à la vélo-pharyngo-plastie précoce en comparaison avec ceux à la même plastie secondaire. Cette différence est de signification statistique. Chez les malades à la division palatine et le bec-de-lièvre, c'est-à-dire chez ceux qui ont subi la chiloplastie avant que la vélo-pharyngo-plastie a été mise au point, on a trouvé une influence exprimée de cette chiloplastie quand au développement retardée de la mâchoire. Cela prouvant que la vélo-pharyngo-plastie n'est point la seule responsable des déviation du développement de la mâchoire. Les résultats les meilleurs ont été trouvés chez les malades ayant subi l'opération à l'âge de douze à quatorze ans. Il y a aussi une différence entre les types variés des fentes, mais celle-ci est variable dans des différentes anomalies. Dans des cas du bec-de-lièvre incomplet de développement de la mâchoire est moins endommagé que dans des cas du bec-de-lièvre complexe. Les données des rayons X céphalométriques plaident pour le développement plus favorable de base de la mâchoire chez les

malades à la base du lambeau pharyngien plus large de dix milimètres, tandis que les données des mésures en modèle plaident pour ceux dont la largeur de la base n'atteint pas les dix milimètres.

Le développement des mâchoires chez les malades ayant subi la tonsilectomie semblent être plus favorable en comparaison avec ceux sans la tonsilectomie absolvée. Les malades, dont le nombre des dents est a normal, montrent des degrès variés des anomalies prognatiques de même que la déviation de la ligne centrale beaucoup plus fréquemment que ceux possédant un nombre normal des dents.

ZUSAMMENFASSUNG

Kieferbefunde nach Velo-Pharyngoplastik bei Spaltträgern

W. Bethmann, U. Schwarzenberger

Von 303 Patienten, bei denen bis zum 31. 12. 1963 Velo-Pharyngoplastiken durchgeführt worden waren, waren 62 Patienten im Alter über 12 Jahre zur Nachuntersuchung erschienen. Es zeigte sich, dass die Kieferentwicklung, beurteilt an der Fernröntgenaufnahme und der Analyse des kieferorthopädischen Modelles, durch die primäre Velo-Pharyngoplastik weniger gehemmt wird als durch die sekundäre Plastik. Die Unterschiede sind signifikant. In den Fällen, in denen zur Gaumenspalte noch eine Lippenspalte hinzukam, in denen also vorher eine Lippenplastik notwendig geworden war, zeigte sich der starke Einfluss der Lippenplastik auf die Kieferentwicklung im Sinne einer Entwicklungshemmung nach durchgeführter Lippenplastik; es ist also die Velo-Pharyngoplastik nicht allein für das Ergebnis verantwortlich zu machen, wie auch die Gaumenplastik allein sicherlich nicht dafür verantwortlich ist. Die besten Ergebnisse wurden hinsichtlich des Operationsalters gefunden, wenn das Alter von 11 bis 15 Jahren gewählt worden war.

Zwischen den einzelnen Spaltformen besteht zwar ein Unterschied, er ist jedoch bei den einzelnen Anomalien verschieden. Bei geschlossenen Kieferrandspalten ist der Oberkiefer in seiner Entwicklung weniger gehemmt als bei den noch offenen Kieferrandspalten. Bei einer Breite des Pharynxstieles von über 10 mm war zwar die Oberkieferbasis besser entwickelt (Fernröntgenaufnahme), jedoch die Ergebnisse der Modellausmessung waren bei einer Breite des Pharynxstieles unter 10 mm besser.

Während bei Patienten nach Tonsillektomie die Kieferentwicklung etwas besser zu sein schien als bei solchen ohne Tonsillektomie, wurden progene Situationen und Mittellinienverschiebungen bei Anomalien der Zahnzahl häufiger gefunden als bei normaler Zahnzahl.

RESUMEN

Hallazgos adquiridos de las mandíbulas después de la velofaringo-plastia realizada a causa de la fisura

W. Bethmann, U. Schwarzenberger

Desde el número de 303 pacientes con la velo-faringo-plastia llevada a cabo en el Departamento Universitario para la Cirugía Plástica y Reconstructora Faciomaxilar, Thallwitz, la República Democrática Alemana, hasta 31º de Diciembre de 1963, 62 pacientes que fueron re-examinados tuvieron más que doce años. Se hizo evidente que el desarrollo del hueso maxilar juzgado a base de la evaluación de los rayos X cefalométricos y módelos ortodónticos fue menos inhibido por la velo-faringo-plastia primaria que por la secundaria. Las diferencias son desde el punto de vista de la estadística importantes. En los casos con el paladar y labio fisurados, es decir en los cuales fue

ejecutada la quiloplastia antes de la velo-faringo-plastia, se mostró una influencia fuerte de la quiloplastia que inhibió el desarrollo maxilar. Esto demuestra que ni la velo-faringo-plastia ni la palato-plastia solas pueden tener responsibilidad de las deviaciones en el desarrollo maxilar. Los resultados mejores fueron obtenidos en los pacientes que fueron operados en la edad entre once y quince años. Hubo cierta diferencia entre los tipos diferentes de la fisura pero ésta difiere en las anomalías varias. En la fisura marginal cerrada, el desarrollo maxilar fue menos inhibido que en las fisuras marginales abiertas. Los rayos X cefalométricos mostraron un mejor desarrollo de la base maxilar en los pacientes con el faringo más ancho que 10 mm. pero los resultados de la medición de modelo fueron mejores en los pacientes con el faringo de la anchura menos de 10 mm.

El desarrollo maxilar en los pacientes después de la tonsilectomía pareció un poco mejor que en los pacientes sin tonsilectomía. En los pacientes con el número anormal de los dientes, varios grados de la anomalía prognata y la deviación mediana fueron hallados con más frecuencia que en los pacientes con el número normal de los dientes.

R E F E R E N C E S may be obtained from the authors.

Dr. W. Bethmann, Schlossklinik, Thallwitz 7251, G.D.R.

Ear, Nose and Throat Department, Charité Hospital, Berlin
Director Prof. I. Kaiser-Meinhardt, M. D.

CLINICAL EVALUATION OF IMPLANTED MATERIAL USED IN SADDLE NOSE CORRECTION

K. HAAKE

Corrective operations for saddle nose represent a large percentage of the plastic operations carried out in the region of the nose. The aim of such operations is not only the improvement of appearance, but also the restoration of nasal breathing which has been affected by the deformation of the outer nose.

This report deals with the check-up of shape and function of the saddle nose operated on at our Department since 1945, especially with regard to the various substances used as implant material which we compared with each other as to their suitability for clinical usage. Before the report itself there is made a short survey is given of the hitherto used materials, which also deals with the advantages and disadvantages of the different substances from the point of view of the various authors.

The material of an implant to be used for the correction of saddle noses should:

1) be easy to sterilize,

2) be easy to mould,

3) be well tolerated by the recipient tissue, produce but a slight foreign body reaction and, particularly, have no cancerogenous influence, and

4) be elastic and chemically stable so as to reduce the reaction of the recipient tissue and prevent later changes in shape.

Prior to the introduction of plastic material into reconstructive surgery, ivory was the alloplastic material used most. Its advantage lies in its firmness which excludes post-operative changes in the shape, and in its chemical stability preventing any damage to the recipient tissue. Its disadvantages were its weight which caused bone absorption at the site of contact with subsequent displacement of the implant, and the difficulty with which it lent itself to in processing the proper shape (Joseph). Injections of paraffin, although early cosmetic results were excellent because the material could easily be moulded into shape, did not prove suitable because of the subsequent intensive tissue reaction (leading to the formation of paraffinomas) (Auersbach, Eckstein).

Blegvad recommended india-rubber implantations, which he started to use in 1928, after his failures with paraffin. He regarded the advantages of india-rubber in its elasticity and the facility with which it lent itself to moulding.

Hauberisser used cork as implant in the correction of saddle noses. Its advantages were supposed to be light weight, easy moulding and good elasticity. He did not, however, deal with tissue reaction and later changes in shape.

Of the metals, gold, aluminium and mainly tantalum (Ashley) were employed. Particularly tantalum nets or lattices were reported suitable (Fox, Pressmann), because they were easy to mould and were well tolerated by the recipient tissue giving no rise to tissue reaction. Zühlke, however, observed signs of local irritation and pain from tantalum implants quite frequently.

With the development of plastic material, the above alloplastic substances were mostly crowded out from use in reconstructive surgery, mainly by two groups of the new substances:

1) the metacrylates (1936), such as Plexiglas, Paladon, Piacryl and later Palavit,
2) the polyamides (1940), such as Perlon, Nylon and Supramid.

Plastic material had many advantages over the substances used up to then. It was of lighter weight, easier to mould, firmer against breaking than most of the above-described alloplastic substances, and also easy to sterilize. However, in spite of these idubitable advantages, the metacrylates and polyamides do not possess all the qualities required of an ideal alloplastic implant. Metacrylates, for instance, are not sufficiently elastic and tension in the material leads to fissures and fractures (Bienert). On the basis of stomatological investigations, Neugebauer reported on signs of material fatigue shown by plastic substances even without loading. We, however, have not found any communication in the available literature about Paladon implants having to be removed because of these changes. Zühlke referred to skin reactions and pressure sores developing due to rigidity of the implant. Kukowski and Link were of the opinion that polyamides were more suitable as inlay material in saddle noses than Paladon or Piacryl, because they were more elastic; Paladon or Piacryl implants could be displaced by even the slightest trauma.

Chronic inflammatory reactions to the chemical properties of implanted acrylates or polyamides could be detected neither in experiments on animals nor after corrective operations on saddle noses, provided, however, that polymerization was absolutely complete, i.e. no remainders of monomer were introduced into the tissue. Goedel and Bienert found polished material still less irritant. In experiments on animals, Virenque and Beckmann observed a tendency towards granulating in the recipient tissue which they considered favourable to the maintenance of position of the implant. This was confirmed by Lindner and Schwaiger. Druckrey and Schmähl assumed to have observed a tendency towards developing sarcoma after intraperitoneal and subcutaneous implantation of polyamides in a certain strain of rats. Schubert and Uhlmann, however, pointed out that this strain was known to be tainted with the tendency towards developing malignant tumours, and repeated the experiments of Druckrey and Schmähl. The latter's results, however, could not be confirmed. Neither could we find any indication

in the available literature of malignancy developing after implantation of plastic material.

Some of the disadvantages of Paladon and Piacryl were overcome by the polyamides and the later developed acrylates (Legler, Zühlke). As soon as industry brought autopolymerizing substances (Palavit and Piacryl SH) onto the market, it became obvious that these, too, should be utilized for reconstructive surgery. Their advantages lay in that they were liquid and could be injected into the tissue where they solidified through the coupling of both their components (the liquid monomer and the solid polymer) after about ten minutes, in which interval moulding by outside pressure could be effected. The reaction proceeding in the recipient tissue, however, soon quenched the hope placed in this material, although Hoppe, among others, maintained that he had not observed any permanent damage in experiments on animals or after corrective operations. Hoffmann, however, injected liquid monomer to rabbits and all died within ten days. The exogenous heat of 70—100 °C, generated on polymerization within the tissue (Legler), causes protein coagulation and necrosis on the contact surfaces (Hoffmann). Protracted inflammatory processes and exuberant granulations with subsequent contractures and oedema of the eyelids are other consequences of this treatment (Dörfel). In addition, tissue pH deviation and disorders in blood coagulations were observed (Werner and Munder). The remainder of monomer within the tissue after polymerization leads to the development of fistulae (Dörfel). The distribution of the material within the tissues cannot be regulated which makes removal of the implant, which may become necessary later, very difficult (Legler).

About the beginning of this century, the opinion prevailed that only autoplastic material had any chance of take. This concept, however, was abandoned in the last decades, because, on the one hand, alloplastic substances with improved properties became available and homogenous and heterogenous transplants, on the other hand, acquired better chances of take due to improved methods of conservation (Axhausen). Homo- and heterotransplants have the advantage over autoplastic material in that they do not require any surgical interference preceding the actual operation.

Cartilage and bone are tissues with a poor metabolism, which makes their reaction to individually non-specific transplantation less intensive that it would be in tissues with a rich metabolism. In spite of this, the recipient still develops a resistance against the alien protein. Antibodies are formed, the quantity of which depends on the kind of transplant and its surface area. This process, evoked by the difference in protein specificity of the two tissues, can only be countered by the suppression of the immunological reactions which, in the given instance, is mainly effected by special methods of conservation. Of these, lyophilization has proved best (Betzel and Schilling), whereas other methods, for instance embedding in plastic material (Idelberger, Hoffmann, K.), did not bring about such good results. With this treatment, the homogenous and heterogenous tissues acquire properties approximating those

of indifferent foreign bodies, and the actual purpose of transplantation, i.e. to transplant viable tissue, has been lost. The reaction of the organism to heterogenous tissue is more intensive than that to homogenous tissue. In many cases, the transplant later undergoes resorption without ever having been replaced by the organism's own tissue (Axhausen).

In autogenous tissue, on the other hand, formation of antibodies can hardly be observed due to its individual specificity, and regeneration can partly arise from the surviving elements of the transplant. In children, Dupertius even observed growth of transplanted autogenous cartilage. Betzel and Schilling examined various cartilage transplants in experiments on animals and compared their respective properties: Reduction in size and resorption were lowest in autogenous grafts and highest in heterotransplants. This was confirmed by the investigations of Bablik. Surviving cells were only found in autogenous material. Tissue reaction developed from all grafts, but from heterotransplants it was most intensive. Participation in the metabolism of the surrounding tissues was only observed in autogenous material.

Even on the choice of tissue, the opinion was not uniform. Seeley recommended (as did Cottle, King and Gerrie) bone, because — according to his opinion — its blood supply was better ensured and its firmness guaranteed more favourable results than cartilage. Zühlke, on the contrary, considered cartilage more suitable because of its being more elastic. Frühland, Klicpera, Salinger and Wieland, too, prefered cartilage as material for transplantation.

AUTHOR'S OBSERVATIONS

In the period between 1945 and 1964, 311 patients were operated on for saddle nose at our Department, 236 of whom were notified to call for a check-up examination in 1967. Most of them were young people who since had many a time changed their residence, so that for 93 of them the post office was unable to deliver our notification. Another 31 patients did not call for re-examination inspite of repeated notification. The remaining 112 followed our notification and called for re-examination.

Six patients stated that their saddle nose had persisted ever since birth. One girl, had her cleft lip and palate operated on elsewhere, another, aged 16, had positive serological tests for syphilis, so that, in addition, she had to be given antisyphilitic treatment.

In 57 patients, trauma was the cause of saddle nose, in ten infectious diseases, and 21 patients could give no history explaining the origin of their deformity.

In 18 patients, saddle nose developed one to four years after submucous resection of the septum nasi.

In 47 patients, saddle nose was combined with obstruction of nasal breathing, the other 65 patients, requested corrective operation for cosmetic reasons only.

In almost all cases, corrective operation was preceded by submucous resection of the deviated septum nasi, in order to prevent obstruction of nasal breathing. In some patients, in whom deformation of the nose developed as a result of septum nasi resection, even re-correction of the septum had to be carried out.

On comparison of the various operations performed over a period of 19 years, no uniform surgical procedure could be expected, because many surgeons had come and gone through our Department in the course of these years.

In most cases the graft was implanted through a median incision on the bridge of the nose, but in 18 cases the approach was chosen through the vestibule.

On review of the case documentation it became evident that ivory had almost been exlusively used as alloplastic material till 1949, and only then had it been replaced by the metacrylates Paladon and Piacryl. No other alloplastic substances (autopolymerizing substances, metals, etc.) had been used. Since 1957, the surgeons implanted ever more autogenous, less frequently homogenous cartilage.

Among the 112 patients who came to our Department for re-examination, there were four of whom the implants (2× ivory, 2× plastic material) had to be removed three to seven years after operation, because trauma had led to their displacement and thus to deterioration of function and cosmetic appearance.

Of the remaining 108 patients, 16 had been submitted to corrective operations on the nose prior to the operations which were the object of our check-up. The implants had been of gold, ivory or Paladon and had to be removed four to twenty years (gold) after implantation, because they would no longer met functional and cosmetic requirements.

In those 108 cases, four times ivory, 76 times plastic material (Paladon or Piacryl), five times homogenous cartilage and 23 times autogenous cartilage had been implanted as inlay material. In 32 cases, angulated grafts of all the above substances had to be employed, in order to effect the necessary straightening of the tip of the nose.

The operation had been — almost without exception — carried out under an antibiotic screen, and the patients had after operation stayed in the Department ward for an average of 6 to 7 days.

Up to the time of our check-up, the implants had remained in the tissue over periods between three and 17 years. The oldest of those was of ivory, the oldest implant of Paladon had stayed in situ for 15 years, and the oldest autogenous cartilage graft for eight years.

RESULTS OF CHECK-UP EXAMINATIONS

In two of the four cases with ivory implants, the tip of the nose had dropped in the course of years. No changes were observed on the dorsum nasi.

The implants of plastic material had been displaced quite frequently (17×), and in most of these cases saddle nose had recurred (12×). These changes

had taken place between the second and tenth year after operation. Four patients complained that the back of their nose had grown broader due to the implant of plastic material. Only in two patients did we find lateral displacement of the implant, and in three patients a step had formed on the dorsum nasi (at the site where the plastic implant touched the nasal bone) two to four years after operation.

In patients in whom cartilage grafts had been used the tip of the nose had also dropped in two cases two to three years after operation, and in one case, in which homogenous tissue had been employed, a knob had formed on the dorsum nasi three years after operation.

The patients in whom changes had taken place after operation, however, stated that the cosmetic effect was still better than their appearance prior to operation. Only three patients requested re-operation.

In most cases, operation led to improvement of nasal breathing. Three patients (in whom plastic material had been implanted and changes in outer appearance had taken place after operation) complained of air passage through the nose having become worse after operation than it had been before it, in 14 patients (1× ivory, 12× plastic material and 1× autogenous cartilage), nasal breathing, though improved after operation, was not found quite adequate. The sense of smell was markedly reduced in 17 patients (15 with metacrylate and two with cartilage grafts), in eleven of them, however, this disturbance had already existed before the operation.

Three patients complained of great tenderness of the operated nose to the slightest trauma, five patients had ozaena of many years standing which had not been influenced by the corrective operation. Six patients (with plastic material implants) stated that they sometimes had headaches which three of them located to the forehead. The check-up examination could not disclose any pathological findings which could be regarded as the cause of these complaints, so that the foreign bodies themselves had to be taken as the trigger factors.

The cosmetic result of the operation was found to be better in almost every case than the preoperative condition and, therefore, satisfactory. In 19 cases, in which the deformity of the nose had been corrected with the employment of a plastic material implant, we found various degrees of saddle nose recurrence. This we never observed with autogenous grafts, although in four cases the nose appeared somewhat flat, even if improved when compared with photographs of the preoperative condition. Knobs and steps had developed in one case with ivory, in five cases with plastic material and in one case with homogenous cartilage. All implants of ivory or plastic material were distinctly palpable and could be shifted against the surrounding tissue to various degrees, but could never be dislocated. No tenderness to pressure was reported by any patient. The autotransplants and some homotransplants, on the other hand, could not be determined with certainty on palpation, nor could they be shifted against the surrounding tissue (except in one case with homogenous cartilage) and all of them appeared to have taken well and preserved their elasticity.

Neither in these cases did the patients complain of tenderness of the nose to pressure.

On examination of the inner nose, narrowing of variuos degrees usually together with impaired nasal breathing, was found in 17 cases with plastic material. In cases, in which bone grafts from ribs had been used, this could never be observed. The relative large number of cases with wide nasal passages and a dry mucous membrane with, sometimes, even a tendency to the formation of scabs, was quite conspicuous; 22 cases with plastic material, one case with homogenous and two with autogenous cartilage.

EVALUATION OF RESULTS

Since ivory had completely been replaced by plastic material (because of the latter's lighter weight and easier processing), there seems to be no need to deal with it on evaluation. The above-described advantages of plastic over all other alloplastic materials were confirmed in the course of our check-up examinations. Signs of material fatigue and foreign body reaction, which would molest the patient, were not observed. Nor did we find any skin reaction in these cases. A decisive disadvantage of plastic material used in the above series of patients was its rigidity and due to it having remained loose, so it could be shifted within the tissues. Trauma, therefore, could bring about dislocation of the implant. This disadvantage and the dangers connected with it have partly been eliminated by the introduction of elastic artificial substances in reconstructive surgery.

Narrowing of the nasal passage, as found in many cases with metacryl implants, could be explained by exuberant granulations developing after operation and by the narrowing effect of the implant itself.

The described disadvantages did not seem to be present when autogenous cartilage had been used for grafting. (The cases with homogenous cartilage grafts could not be used for comparison because of their small number.) Autogenous tissue took well almost in every case, so that the implanted graft could not be distinguished from the surrounding tissue by palpation on check-up examination. No dislocation of the graft nor narrowing of nasal passage was found. The only disadvantage of autogenous tissue is, therefore, the surgical interference necessarily preceding the actual operation.

Although in our series of patients, i.e. up to 1964, the number of cases, in which autoplastic material was used, had not yet reached that of cases with artificial plastic material, it already becomes evident on comparison that many disadvantages of artificial substances could be overcome by using cartilage as graft material.

SUMMARY

Evaluation by comparison of 108 cases in which various implant materials (ivory, artificial substance (Paladon and Piacryl), autogenous and homogenous cartilage) had been used for surgical correction of saddle noses, was carried out. Cartilage grafts proved best on check-up examination.

RÉSUMÉ

Une évaluation clinique du matériel implanté en tant que réparation du nez afaissé

K. Haake

L'auteur présente l'évaluation en comparaison des 108 cas cliniques ou un matériel variable — tel que l'ivoire, des substances artéficielles comme Paladon et Piacryl de même que le cartillage auto et homogène était d'usage en tant que matériel réconstructif du nez affaissé. L'épreuve ont subi au résultat meilleur les greffes du cartillage.

ZUSAMMENFASSUNG

Klinische Bewertung des Implantatmaterials bei Korrekturen von Sattelnasen

K. Haake

Nach einem Vergleich der verschiedenen zur Implantation bei Sattelnasenkorrekturen verwendeten Materialien werden 108 Fälle ausgewertet, bei denen Nasenkorrekturen mit Elfenbein, Kunststoffen (Paladon und Piacryl), autoplastischem Knorpel und homoioplastischem Knorpel vorgenommen wurden. Dabei erbrachten die Knorpelimplantationen die besten Nachuntersuchungsergebnisse.

RESUMEN

Evaluación Clínica del Material Implantado Empleado en la Correción de la Silla de Nariz

K. Haake

En este artículo el autor hizo evaluaciones por medio de la comparación de 108 casos en los cuales varios materiales [marfil, substancias artificiales (Paladon y Piacril), cartílagos autógenos y homógenos] fueron empleados para la corrección quirúrgica de la silla de nariz. Los injertos de cartílago resultaron como los mejores durante la examinación comprobadora.

REFERENCES

1. **Ashley, F. L., King, E. D.**: Plast. reconstr. Surg., 5, 1950 : 536.
2. **Amersbach, K.**: In: Denker, A., Kahler, O.: Handbuch der Hals-, Nasen- und Ohrenheilkunde. Teil 2, Band 2. Berlin, 1926.
3. **Axhausen, P.**: Fortschr. Med., 79, 1961 : 317.
4. **Bablik, L.**: Arch. Ohr.-, Nas.- u. Kehlk.-Heilk., 180, 1962 : 383.
5. **Beckmann, W.**: Med. Mschr., 3, 1949 : 264.
6. **Betzel, F., Schilling, H.**: Zbl. Chir., 85, 1960 : 1170.
7. **Bienert, F.**: HNO (Berl.) 4, 1954 : 247.
8. **Blegvad, N. Rh.**: Pract. oto-rhino-laryng. (Basel), 10, 1948 : 162.
9. **Bockmühl, F.**: Dtsch. Gesund.-Wes., 17, 1962 : 259.
10. **Cotte, M. H., Loring, R. M.**: Ann. Otol. (St. Louis), 58, 1949 : 135.
11. **Dörfel, W.**: Klinische und tierexperimentelle Erfahrungen mit der Injektion eines selbsthärtenden Kunststoffes (Palavit) in der HNO-Heilkunde. (Diss.) Heildelberg, 1956.
12. **Druckrey, H., Schmähl, D.**: Z. Naturforsch. B., 9, 1954 : 529.
13. **Dupertuis, S. M.**: Plast. reconstr. Surg., 5, 1950 : 486.

14. **Eckstein, M.:** Nach Amersbach zit., s. d.
15. **Fox, S. L.:** Ann. Otol. (St. Louis), 58, 1949 : 40.
16. **Frühwald, V.:** Korrektive Chirurgie der Nase, der Ohren und des Gesichtes. Wien, Maudrich 1952.
17. **Gerrie, J., Cloutier, G. E.:** Plast. reconstr. Surg., 6, 1951 : 196.
18. **Goedel, R.:** HNO (Berl.), 1, 1948 : 89.
19. **Hauberisser, E.:** Ästhet. Med., 3, 1954 : 266.
20. **Hoffmann, H.:** Feingewebliche Untersuchungen zur Verträglichkeit von Palavit im Tierversuch. Verhandl. D. Dtsch. Orthopäd. Gesellsch. 42. Kongr., Salzburg, 1954. Stuttgart, Enke 1955.
21. **Hoffmann, K:** HNO (Berl.), 6, 1957 : 124.
22. **Hoppe, W.:** Dtsch. zahnärtzl. Z., 11, 1956 : 837.
23. **Idelberger, G.:** Knochenkonservierung in Palavit und durch Gefriertrocknung. Verhandl. d. Dtsch. Orthopäd. Gesellschaft 43. Kongr. Hamburg, 1955. Stuttgart, Enke 1956.
24. **Joseph, J.:** Nasenplastik und sonstige Gesichtsplastik etc. Leipzig, Kabizsch 1931.
25. **King, E. D.:** Arch. Otolaryng., 51, 1950 : 459.
26. **Klicpera, L.:** Mschr. Ohrenheilk., 89, 1955 : 26.
27. **Kukowski, H.:** Z. Laryng. Rhinol., 36, 1957 : 542.
28. **Legler, U.:** Z. Laryng. Rhinol., 36, 1957 : 215.
29. **Lindner, F., Schwaiger, M.:** Chirurg, 17, 1946 : 675.
30. **Link, R.:** Z. Laryng. Rhinol., 30, 1951 : 84.
31. **Neugebauer, G.:** HNO (Berl.), 1, 1949 : 266.
32. **Pressman, J. J.:** Laryngoscope (St. Louis), 62, 1952 : 532.
33. **Salinger, S.:** Ann. Otol. (St. Louis), 61, 1952 : 533.
34. **Schubert, G., Uhlmann, G.:** Dtsch. med. Wschr., 80, 1955, 2 : 1530.
35. **Seeley, R. C.:** Plast. reconstr. Surg., 4, 1949 : 252.
36. **Virenque, M.:** Mém. Acad. Chir., 76, 1950 : 948.
37. **Wieland, H.:** Z. Laryng. Rhinol., 36, 1957 : 342.
38. **Werner, R.:** Arch. Ohr.-, Nas.- u. Kehlk.-Heilk., 181, 1962—1964 : 329.
39. **Werner, R., Munder, P. G.:** Arch.-, Ohr.-, Nas.- u. Kehlk.-Heilk., 181, 1962—1964 : 334.
40. **Zühlke, D.:** HNO (Berl.), 8, 1959 : 88.
41. **Zühlke, D.:** Arch. Ohr.-, Nas.- u. Kehlk.-Heilk., 180, 1962 : 379.

Dr. K. Haake, Schumannstr. 20/21, 104 Berlin, GDR

Department of Face and Neck Surgery, Medical Faculty (Charité), University, Berlin
Director Prof. H. Mennig, M. D.

METHODS OF ASCERTAINING VERTICAL DISPLACEMENT OF THE EYE BALL

E. ROGGENDORF

After extensive crush fracture of one half of the face with eye ball displacement, the original topographic position of the eye ball can, in many cases, only be inexactly determined with the methods of examination hitherto at our disposal. In order to prevent diplopia and for cosmetic reasons, however, exact measurements of eye ball displacement is essential for reconstructive surgery.

Asymmetry of the facial skeleton, including the relationship between the two orbits, and the lack of suitable bony landmarks in the surroundings of the eye ball make exact anatomical determination of the original eye ball position impossible. These obstacles are yet augmented by seft-tissue swelling and possibly also by the loss of orbital fat accompanying fractures of the facial skeleton. We, therefore, examined the relationship between the true horizontal and the interpupillary lines on assuming the straight position of the head by the patient himself, and for comparison, we also investigated the relationship between the interpupillary line and the median line of the face.

According to D e l a g e, man, from an upright position, is capable of determining the vertical, horizontal and frontal directions with closed eyes exactly but for an error of three to four arc seconds.

For orthopaedic purposes of maxillar surgery, M o o r r e e s and K e a n recommend the true horizontal as the basic line for reference.

V. H o l s t, too, mentions the high degree of precision with which man can determine any deviation from the perpendicular position of the head.

METHODS

Two millimeter scale sticks, each 5 cm. long, are horizontally fixed to the forehead and the chin of the subject. With two plumb-lines hung up in front of him, the true perpendicular can be projected onto the sticks after the subject has assumed the straight position of his head which he does with closed eyes. At the same time, in order to call in the aid of the posture sense, the subject is made to orientate himself as to the true horizontal by putting his hands on the edge of a board horizontally placed in front of him at chest level. Then, using a chequer, the relationship between the pupillary line and the true horizontal can be ascertained.

RESULTS

Fifty subjects aged between 17 and 31 years and without vestibular disorders, changes in vision or anomalies of the skeleton in their case history or clinical findings, were examined. The deviation of the interpupillary line from the true horizontal may be expressed by the level difference between the two pupils. In the above series it was 1.7 mm. on an average. For the purpose of our investigation, however, the highest level differences are of importance. In two subjects it was 5 mm., in another two 4 mm. and in seven 3 mm. (see Tab. 1). These differences make the measurement in the individual case not sufficiently exact for the restoration of the original position of the eye in eye ball displacement.

Tab. 1. Vertical Deviation Measurements of Eye Ball Position

	Subjective horizontal	Median line
Number of subjects	50	50
Maximal deviation	5 mm. (2 subjects)	0
	4 mm. (2 subjects)	0
	3 mm. (7 subjects)	0
	2 mm. (12 subjects)	2 mm. (2 subjects)
	<2 mm. (22 subjects)	<2 mm. (31 subjects)
No deviation	5 subjects	17 subjects
Mean deviation	1.7 mm.	0.7 mm.

Comparison examinations relating the interpupillary line to the median line of the face, i.e. to the glabella-midchin line, showed, in the same series of subjects, a mean deviation of 0.7 mm. and in two subjects a pupillar level difference of 2 mm, representing the maximum of the series: In 17 subjects the interpupillary line was exactly at right angles to the median line. The above values prove the higher exactitude of this method. However, in extensive fractures of the facial skeleton, it might be difficult to determine the median line. Swelling of soft tissues and dislocation of bone fragments bring about an asymmetrical deformation of the face, which in many cases, only permits to obtain approximate or estimated values.

SUMMARY

Deviation of the interpupillary line from the true horizontal on assuming the straight position of the head was ascertained in 50 subjects. The employment of this method for the restoration of the vertical eye ball position in fractures of the facial skeleton cannot be recommended because of the large differences among normal individuals. The exactitude in values improves, if the interpupillary line is related to the median line of the face. However, even this method only permits approximate or estimated values of fresh fractures of the facial skeleton.

RÉSUMÉ

L'Évaluation des différences en hauteur de la position des globes oculaires

E. Roggendorf

Chez cinquantes des personnes ayant subi des examens complets les déviations de la ligne interpupillaire de la propre ligne horizontale en position subjectivement redressée de la tête respective ont été fixées. L'emploi de cette méthode pour la réconstruction de la position verticale des globes oculaires en suite des fractures des os de la face n'est pas récommendable faute des variations individuelles trop exprimées. Des données plus précises sont à obtenir de la corélation de la ligne interpupillaire avec la partie médiale de la face. Mais, en somme, de même cette méthode, appliquée chez les fractures des os de la face récentes ne présente que des données approximatives ou, que pire, des suppositions.

ZUSAMMENFASSUNG

Untersuchungen zur Bestimmung der Vertikalverlagerung des Augapfels

E. Roggendorf

An 50 Probanden wurden die Abweichungen der Interpupillarlinie von der wahren Horizontalen bei subjektiver Geradstellung des Kopfes bestimmt. Die Anwendung dieser Untersuchungsmethode bei der Wiederherstellung der vertikalen Bulbuslage nach Gesichtsschädelfrakturen kann wegen zu grosser Einzelabweichungen nicht empfohlen werden. Genauere Werte ergeben sich, wenn die Interpupillarlinie auf die Medianlinie des Gesichtes bezogen wird. Aber auch diese Methode lässt besonders bei frischen Gesichtsschädelfrakturen nur Annäherungs- oder Schätzwerte zu.

RESUMEN

La determinación de las diferencias de altura en la posición de los globos oculares

E. Roggendorf

En 50 personas examinadas fueron determinadas las desviaciones de la línea interpupilar del plano real horizontal con la cabeza subjetivamente erguida. El uso de este método de reconocimiento en la reconstrucción de la posición vertical de los bulbos en las fracturas de los huesos de la cara no se puede recomendar debido a las grandes desviaciones individuales. Unos valores más exactos son posibles obtener, si se lleva a cabo la comparación de la línea interpupilar en relación con la línea central de la cara. También permite este método principalmente en las fracturas frescas de los huesos de la cara, solamente valores y cálculos aproximados.

Dr. E. Roggendorf, Schumannstr. 20/21, 104 Berlin, GDR

Clinic of Plastic Surgery, Charles University, Prague, Czechoslovakia
Director Prof. V. Karfík, M.D., D.Sc.

NEW PROCEDURE IN REPLACEMENT OF EYE BROW
(Preliminary report)

V. KARFÍK, J. ŠMAHEL

Replacement of a missing eye brow is, up to now, being carried out with a flap or a free graft of hairy skin. There are both positive and negative sides to these surgical procedures. The chances of a good result after flap plasty are fairly safe, but the operation is technically not easy and leaves more scars than a free skin plasty which is simple, but the take of the graft is not safe and the results are worse than after flap plasty, because a smaller or larger part of the graft is usually lost by necrosis and the number of hair follicles is always markedly reduced.

One of the causes of failure after free transplantation of hairy skin is the layer of fatty tissue at the bottom of the graft, which harbours the hair follicles. It is generally known that the pressence of fatty tissue in a skin graft is an obstacle to its take. However, this fact has not yet been fully explained. Hynes (1954), Karfík (1958) and Rees (1960) assumed that fatty tissue prevented tissue fluid of the recipient bed from entering the graft and probably also impedes formation of a vascular link between graft and bed. These opinions are supported by the discovery [Šmahel et Charvát (1964) and others] of the fat lobules presenting organs each with a terminal blood circulation and without any connection with the vascular system of the corium. It, therefore, is feasible that the scanty fibrous septa between these lobules offer the only route for revascularization of the transplant both by way of recanalization of the septal vessels and of invasion of vessels from the bed. A more promising route for this process is that starting at the edges of the defect. Rees (1960) dealt with the free transplantation of skin plus fatty tissue in clinical practice and stated that successful take of the graft can be achieved only, if anastomoses between the wessels of the edges of the defect and the transplant are formed very soon after implantation. The take of the graft, therefore, depends on the speed with which blood circulation is renewed in the transplant and, thus of course, also on the size of the transplant. Experience gathered in this respect by observations of composed transplants [Davenport et Bernard (1959), DeHaan et Stark (1961) and Symonds et Crikelair (1966)] has proved that the metabolic requirements

of grafts consisting of skin plus fatty tissue are considerable which makes speediest renewal of blood supply to the transplant imperative.

Any surgical procedure aimed at a successful take of such grafts must take heed of these circumstances either by lowering the metabolic demands of the graft or by ensuring its speedy revascularization. The first route, i.e. lowering of metabolism, was taken by Rees et al. (1963) and Reichert (1964) who recommended cooling of the graft after implantation. They reported on favourable results from this procedure. The other route, i.e. speeding up the renewal of blood supply to the graft, was tried by DeHaan (1961) and Stark (1964) in experiments on rabbits. For increasing vascularization, they used histamine iontophoresis on skin marked for operation. On defects created in skin prepared in this way, even grafts composed of skin and cartilage or skin and dermal muscle took well. The results of these experiments were supposed to improve the chances of take for composed transplants, such as parts of an auricle composed of all layers, including cartilage which impedes the take of a graft still more. As difficult and complicated as this is transplantation of free skin plus hair, most frequently employed in the replacement of a missing eye brow.

For replacement of an eye brow with a free graft of hairy skin, we, at the Department of Plastic Surgery in Prague, have tried another surgical procedure, in order to ensure a speedy renewal of blood supply to the graft. Our method is based on the utilization of a phenomenon which is generally known both from experiments and clinical practice: A healing wound which is torn apart a few days after infliction, heals after resuture in a shorter time than it would have healed after primary suture. Detailed studies [Savlov et Dunphy (1954), Weiber (1961) and Šmahel (1965)] showed that shortening of the healing time in a resutured skin wound is caused by the reparative process in the already well vascularized and cellulized tissues starting immediately, i.e. without the preceding stage of latency. It could, therefore, be justifiably presumed that the large number of proliferating capillaries on the floor and in the edges of a healing wound torn apart would form anastomoses with the vessles of the transplant and thus renew its blood circulation much sooner than would happen in a fresh wound.

We have tried the following procedure:

In the region of the defective eye brow, an area of skin is marked with dye to the extent intended to be replaced by hairy skin. This area is then excised and after meticulous control of bleeding the defect is closed by a fine suture or better still by adhesive straps. Five to seven days later, the wound is reopened by careful unsticking of its edges. A graft of hairy skin is then taken from about 2 cm. inside the hair line behind one auricle, placed into the renewed defect and fixed to its edges by fine interrupted stitches. This part of the operation must be carried out very carefully, without using sharp instruments and avoiding any additional traumatization of the tissues. On inspection with the naked eye, already, the rich vascularization of the tissues in the defect is very conspicuous. Bleeding, which usually occurs on separation of the wound edges, has the character of capillary haemorrhage and soon ceases spontane-

ously. Close contact of the graft with the tissues of the bed is imperative and can be achieved by slight pressure of the dressing fixed to the site with adhesive straps. No haematoma must be permitted to form under the transplant.

So far, results are promising. The question as to the optimal interval between the two operations, still remains unanswered. We consider five days as the most suitable interval. However, this time also depends on the scar changes in the operation field and the surgical technique used. We have never tried to take off the surplus fat from the bottom of the graft, because this is always connected with injury to the hair follicles.

SUMMARY

The authors present a new method of free transplantation of skin plus hair into a defect of an eye brow by preparing the wound bed five to seven days prior to implantation. At the time of implantation the tissues of the thus prepared bed are richly vascularized and cellulized and already at the anabolic stage of the healing process.

RÉSUMÉ

Une nouvelle méthode dans le remplacement des sourcils

V. Karfík, J. Šmahel

Les auteurs présentent une nouvelle méthode du transfer libre de la peau poilue dans le défaut des sourcils par la méthode de la «préparation» du lit dans la période de 5—7 jours. Les tissus du lit ainsi préparé possèdent au temps de l'implantation une vascularisation du même que cellulisation importante et se trouvent ainsi dans la phase anabolique du procès de la guérison.

ZUSAMMENFASSUNG

Ein neues Verfahren beim Ersatz der Augenbrauen

V. Karfík, J. Šmahel

Die Verfasser schlagen in der vorliegenden Arbeit eine neue Art der freien Übertragung behaarter Haut in Augenbrauendefekte vor, wobei die Übertragung 5 bis 7 Tage nach Vorbereitung des Wundbetts erfolgt. Zur Zeit der Implantation sind dann die Gewebe des entsprechend vorbereiteten Wundbetts bereits reichlich vaskularisiert und zellulisiert und befinden sich in der anabolischen Phase des Heilprozesses.

RESUMEN

Un nuevo método en la restitución de las cejas

V. Karfík, J. Šmahel

Los autores presentan un nuevo método de transplante libre de piel vellosa en el defecto de las cejas con la preparación del lugar escogido y la transplantación después de 5—7 días. Los tejidos del lugar preparado en el tiempo de la implantación ya están ricamente vascularizados y celulizados y están ya también en la fase anabólica del proceso de sanación.

REFERENCES

1. **Davenport, G., Bernard, F. D.:** Plast. reconstr. Surg., 24, 1959 : 175—182.
2. **De Hann, C. R., Stark, R. B.:** Plast. reconstr. Surg., 28, 1961 : 577—583.
3. **De Hann, C. R., Stark, R. B.:** Plast. reconstr. Surg., 34, 1964 : 547—554.
4. **Hynes, W.:** Brit. J. plast. Surg., 7, 1954 : 97—107.
5. **Karfík, V.:** Rozhl. Chir., 37, 1958 : 368—375.
6. **Rees, T. D.:** Plast. reconstr. Surg., 25, 1960 : 556—564.
7. **Rees, T. D., Guy, C., Wood-Smith, D., Converse, J. M.:** Transaction of the Third International Congress of Plast. Surg., Washington, 1963. S. 821—827.
8. **Reichert, H.:** Langenbecks Arch. klin. Chir., 308, 1964 : 1039—1044.
9. **Savlov, E. D., Dunphy, J. E.:** Surgery, 36, 1954 : 362—370.
10. **Symonds, F. C., Crikelair, G. F.:** Plast. reconstr. Surg., 37, 1966 : 433—437.
11. **Šmahel, J.:** Acta chir. plast., 7, 1965 : 92—100.
12. **Šmahel, J., Charvát, Z.:** Acta chir. plast., 6, 1964 : 223—228.
13. **Weiber, A.:** Acta chir. scand., 121, 1961 : 1—7.

Prof. dr. V. Karfík, Šrobárova 50, Praha 10, Czechoslovakia

The Schweitzer Hospital in Lambaréné (Gabon)

REPORT FROM LAMBARÉNÉ HOSPITAL

J. SEDLÁČEK

In Memory of Academician F. Burian

The extensive help given to underdeveloped and developing countries has brought to light new knowledge and with it new problems. They urgently need solution. Questions are coming to the forefront today which were raised already fifty years ago by the founder of the hospital in Lambaréné, Dr. Albert Schweitzer. It is to Africa that we in Europe should primarily direct our interest. We should hasten to remove the consequences of the neglect of previous generations and also help in solving the problems which are peculiar to Africa. We need to consider them in our own interest and in the interest of peace throughout the world.

Albert Schweitzer. I do not intend at this point to say anything about Schweitzer's life, although I had the opportunity of working with him for a year. I want us to appreciate the fact that he founded, built up and to recently ran a hospital in the middle of Africa, and that this hospital provided and provides a medical service of very good standard. On the one hand it can easily stand up to the criticism of medicine in advanced countries, and on the other it enjoys the unbounded confidence and devotation of the local people, especially for the particularly way in which it has been adapted to local conditions.

Gabon. Much has changed and continues to change since the time Schweitzer wrote his "Journal from Lambaréné". Lambaréné is now a regional town with a population of 4,000. It has air, road and the original water communications with the outside world and with the capital. The inhabitants of Gabon are not homogeneous. They number half a million and are composed of four tribes. They unite the growing feeling of Gabon nationalism with French influence modified to "petit francais". The common interest to see the break up of the tribal system conflicts with external interests and also with the fact that the tribal languages cannot be mutually understood. The low living standards do not permit more consistent political life. The country is under direct French influence at the level of a kind of protectorate. Technical advance is penetrating further and further into the jungle of the interior to obtain the rare wood and still more rare metals.

After the death of its founder, the hospital came into the hands of the Strasbourg "Society of Friends of A. Schweitzer". It is now maintained by means of similar societies throughout the world.

Over 6,000 patients pass through the hospital annually. The scope and style of its work is comparable to that of a Regional Institute of National Health with a Polyclinic. The following departments are situated in 50 pavilions: medical, surgical, traumaticological, plastic surgery, gynaecology and

obstetrics, children's department, infectious diseases, tuberculosis, psychiatry and a department for chronic diseases. Half a mile from the general hospital there is the Leprosarium with 200 beds. The laboratories and Radiological Department do work comparable to that of the Institute of National Health departments. Some special investigations are carried out in European Universities. The Czechoslovak Institutes cooperating in this work are the Second University Dermatological Clinic (Prof. Trapl), the University Clinic of Plastic Surgery in Prague (Prof. Karfík) and the Tissue Bank in Hradec Králové (Doc. Klein).

The medical service, treatment, drugs and food are free of charge. Auxiliary services are covered by help in the form of brigades by members of the families of in-patients (gardiens). To a certain extent the hospital is self-supporting from the yields of its own garden, plantations, animal husbandry and fishing.

Towards the end of his life Albert Schweitzer extended the specialized services provided in his hospital. When he realised the part that could be played by plastic surgery in the treatment of diseases previously incurable or cured only with great difficulty, such as leprosy, tuberculosis, tropical ulcers, infections and malignant tumours, he asked for help from Czechoslovakia. By aid of the Union of Brethren with the help of the Red Cross, a surgeon was sent

Table 1. Surgery at Lambaréné in 1965

Number of patients operated on	1158	Caesarian section	32
Number of operations	1644	Bone operations	28
Hernia	690	Curettage	29
Plastic surgery	237	Haemorrhoids	17
Hydrocele	128	Abdominal Emergencies	15
Urology	107	Fistula Uro-Procto-Gyn.	10
Gynaecology	93	Thyroidectomy	6
Traumatology	53	Splenectomy	2
Strangulated hernia	52	Nephrectomy	1
Circumcision	36	Others	45
Ophthalmic operations	31		1644

to the Schweitzer Hospital from the Prague University Hospital of Plastic Surgery in October 1964.

It cannot be denied that the situation has become very serious recently. The number of doctors has fallen from seven to four and the number of paramedical personnel from 20 to 11. Of the African nurses and laboratory technicians about 40 still remain.

SURGERY

A short review of the operations carried out during 1965 provides a survey of the surgical work in the Lambaréné Hospital.

Two surgeons operate at two tables three times a week. The operating theatre has modern equipment, only air-conditioning is lacking. A. Schweitzer was not enthusiastic about it.

The number of hernias and hydroceles in the list is surprising. They make up half the number of operations. Undoubtedly, filariasis plays a major part in their etiology.

Table 2. Congenital Abnormalities 1965—6

Digiti sexti rudim. bilat.	18
Hare-lip	2
Glandular hypospadias	2
Syndactyly	1
	23

Most urological operations are for strictures and fistulae resulting from chronic gonorrhoea. Infection with venereal disease can be estimated at 90%.

Circumcisions were, and still are, carried out as a religious rite in the villages. When we observed the removal of the skin or even amputation of the penis after these rites we started to perform circumcision according to the method of Burian for operating on phimosis.

Histologically confirmed malignant tumours are not early such a rare finding as previously thought. It is, of course, true that the doctor in the tropics, who must rely only on clinical diagnosis, finds it very difficult to distinguish

tumours of inflammatory or parasitic origin from malignant tumours. Moreover, the one develops into the other.

The high incidence of uterus myomatosus with large fibroids almost completely filling the entire abdominal cavity, is difficult to explain. A total of 67 hysterectomies were carried out for this cause in one year Goitres also have special characteristics. They are nodular, nonfunctional goitres with large nodes resembling thyroid adenomas. They must be operated on only on account of their gigantic size, since they endanger the life of the patient by their sheer progressive increase in mass. The histologist is usually nonplussed. He finds cells of the Langhans type, "foreign body cells" and eosinophilia. Local and generalized eosinophilia is always present. One often finds in the conclusion: "Parasites were not demonstrated". Many authors have searched for the connection between parasitosis and malignant proliferation, most of them looking for the cause in Bilharziasis (Wirchow 1888, Bowlby 1889, Kartulis 1898, Askanazy 1900 and later the experiments of Fibiger on rats). In the conditions prevading at Lambaréné it could well be filariasis.

PLASTIC SURGERY

The scope of plastic surgery is wide, from general surgery, traumatology and burns to research in biology, physiology and the study of congenital abnormalities. Impulses were provided from sexuology, psychology and sociology, X-rays and radiology (radiation sickness, burns and radiation ulcers). It has undertaken the treatment of chronic ulcerations of all types and finally has come to the help of tropical medicine. It has become the kindly and final court of appeal in the treatment of chronic tropical ulcers and leprosy. Plastic surgery has firm routes at the Equator in Lambaréné and has demonstrated its usefulness. It dominates the field in tropical surgery and it can even be said that surgery in the tropics is more plastic than general. There are two pavilions for plastic surgery with 50 beds.

One of our aims was to determine the incidence of congenital abnormalities in the local population of Equatorial Africa. We are unable to give an exact account since we have not sufficient large statistical material.

Albert Schweitzer assured me that congenital abnormalities are very rare. In over 50 years of work he only met two cases of hare-lip. When asked whether the parents do not dispose of such infants, be replied in the negative. He was convinced that they would certainly bring them to the hospital. This is supported by experience of the psychology of the local inhabitants. They do not look on congenital abnormalities as defects, but on the contrary, consider them as a sign of special favour of the gods.

Perhaps because I literally searched for congenital defects I managed to find and operate on two simple cases of hare-lip in the course of two years in Lambaréné. The population covered was more then 20,000, making the incidence of hare-lip in Gabon 0.1 per thousand.

It is certain that it would be possible to show that congenital defects occur relatively and absolutely less frequently among the local population of Equatorial Africa than in Europe.

CONCLUSION

A Czechoslovak Plastic Surgeon reports on his work and experience after two years in the hospital of Albert Schweitzer.

RÉSUMÉ

L'Hôpital de m. A. Schweitzer a Lambaréné

J. Sedláček

Le chirurgien plastique d'origine de Tchécoslovaquie présente un rapport quand à l'activité et aux expériences des deux années du travail à l'Hôpital d'Albert Schweitzer a Lambaréné.

ZUSAMMENFASSUNG

Das Albert-Schweitzer-Krankenhaus in Lambarene

J. Sedláček

Ein plastischer Chirurg aus der Tschechoslowakei berichtet über Arbeit und Erfahrungen während seines zweijährigen Wirkens im Albert-Schweitzer-Krankenhaus.

RESUMEN

El hospital de Schweitzer en Lamberené

J. Sedláček

Un cirujano en cirugía plástica informa de sus actividades y experiencias de 2 años de trabajo en el hospital de Albert Schweitzer.

Dr. J. Sedláček, Moravian Church Hospital, Sikonge BP 29 Tabora, Tanzania

CZECHOSLOVAK SPAS

have been successfully treating pacients from all over the world for centuries

KARLOVY VARY (CARLSBAD)
digestive disorders — diabetes mellitus

MARIÁNSKÉ LÁZNĚ (MARIENBAD)
diseases of the kidneys and urinary organs, non specific respiratory diseases

FRANTIŠKOVY LÁZNĚ (FRANZENSBAD)
gyneacological diseases, cardiovascular diseases, diseases of the locomotor apparatus

JÁCHYMOV — PIEŠŤANY — TRENČIANSKE TEPLICE
diseases of the locomotor apparatus

PODĚBRADY — SLIAČ
cardiovascular diseases

NOVÝ SMOKOVEC — ŠTRBSKÉ PLESO
non specific respiratory diseases

TEPLICE in Bohemia — TŘEBOŇ
diseases of the locomotor apparatus

LUHAČOVICE
non specific respiratory diseases, diabetes mellitus

BARDEJOV
digestive disorders, non specific respiratory diseases

JESENÍK (GRÄFENBERG)
nervous diseases, non specific respiratory diseases

JANSKÉ LÁZNĚ
poliomyelitis, encephalomyelitis and myelitis

OPEN ALL THE YEAR ROUND.

For detailed information apply to the respective spa managements or

REPREZENTACE ČS LÁZNÍ A ZDROJŮ
BALNEA

BALNEA
Representation of Czechoslovak Spas and Mineral Springs
PRAHA 1, PAŘÍŽSKÁ 11