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THE EFFECT OF INADEQUATE VENOUS OR ARTERIAL BLOOD SUPPLY ON THE SURVIVAL OF ABDOMINAL ISLANDS FLAPS IN RATS

H. HEINER†, A. TILGNER, P. OSWALD, T. ERMICH

The initial survival of free skin flaps results from an adequate blood flow in the anastomosed vascular pedicle. Occasional occlusions of the supplying vessels do not always appear simultaneously but they may occur either in the artery or in the vein. Thrombosis may be the chief reason for the occlusion. It need not occur immediately after anastomosis but also later on to cause disorders of flap viability.

Some variations exist as to the significance of arterial or venous occlusion for flap tissue survival. In addition, it is not clear for how long inadequate blood flow through the artery or vein is tolerated following the flap transplantation. Some authors (1, 2, 8, 9, 12), contrary to others (3, 5, 6, 12) believe that adequate arterial blood supply is more important for flap survival than sufficient venous outflow.

Arterial and venous neovascularization was studied in island flaps from rats, rabbits and pigs (7, 10, 14, 16, 17). Experiments showed the beginning of arterial and venous neovascularization within 2 to 3 days of flap transplantation. Opinion differs as to what is meant by sufficient neovascularization. Nakajima (1978), Tsur et al. (1980), McKee et al. (1981) and others found arterial and venous neovascularization sufficient 3 to 4 days after flap transplantation whereas Serafin et al. (1977) demonstrated that stage at 5 days. Those differences evidently depend on the variety of flaps used (type, position, dimension), on the animal species (rat, rabbit, pig) as well as on the different methods used for testing neovascularization.

Using a special method for the ligation of the supplying vessels, the following studies were undertaken in order to clarify the correlation between arterial or venous occlusion and the survival capacity of island flaps in the rat in terms of time.

MATERIAL AND METHOD

Experiments were performed on 50 male and female white Wistar rats weighing about 300 g each. Surgery was done under unsterile conditions, using Brevinarcon® anaesthesia. The abdominal region was shaved. In each rat, paired 3 by 2 cm abdominal island flaps created according to Strauch and Murray (1967) were carefully dissected under the dissecting microscope. The pedicle nerves were cut through. A loose double knot (5/0 synthetic suture material) was placed around the epigastric artery or vein. The ends of this loose ligature were fixed to the skin so that the pedicle artery or vein could be ligated without a new incision at any time after flap replantation (Tilgner and Heiner, 1981). The rats' incisors were cut so as to prevent untimely ligation of the pedicle vessels and destruction of the flaps.

The artery or vein were ligated at 2, 3, 4 and 5 days following flap replantation. 92 flaps were tested. In eight of them complications were seen before vascular ligation. These flaps were eliminated. In order to estimate flap viability clinical symptoms (skin colour, oedema) were registered, and the shrinkage as well as the necrotic area were measured according to Tilgner and Heiner (1981) for 7 days. After that no changes in the surviving flap tissue could be seen. The Student t-test was used for statistical evaluation of the results.

RESULTS

1. Clinical findings

The abdominal flaps of the rats became more or less intensely cyanotic and oedematous in relation to the time of venous ligation. Some flaps were prominent due to haemorrage. The prominences disappeared during the periods of time examined. Those symptoms did not appear after arterial ligation. In this case we sometimes did observe remarkable post-ligation paleness although clinically ascertainable flap tissue alterations resulting from venous or arterial blood flow interruption were not always a symptom of incipient tissue loss. The percentage of necrotic, partially necrotic and viable flaps depended on the time of vascular ligation after flap replantation (Fig. 1).

At 2 days postoperatively, the ligation of the vein as well as that of the artery caused total necrosis in all the flaps examined.

In the 3-day venous-ligation group, 7 flaps out of 10 flaps had been surviving fully. In the arterial-ligation group, only 4 out of 17 flaps displayed complete survival (Fig. 1). The number of partially or completely necrotic flaps consisted of two island flaps and 1 flap out of 10 respectively on the 3rd day following venous ligation. After arterial ligation 9 out of 17 flaps (53 %) showed partial survival, and 4 out of 17 flaps (24 %) had necrosed completely (Fig. 1). By that time, greater disadvantages were due to arterial rather than to venous occlusion. The final amount of the surviving flap tissue was generally found on the 5th day following venous or arterial ligation. Until the 5th day, it was still possible for apparently viable flaps to become partially necrotic or for partially necrotic flaps to degenerate into complete necrosis. Complete flap

survival without oedema was obtained at 4 days following venous ligation. However, in the case of arterial ligation, one flap out of 15 necrosed partially and two flaps had become totally necrotic. Virtually complete survival was attained in the arterial-ligation group at 5 days postoperatively.

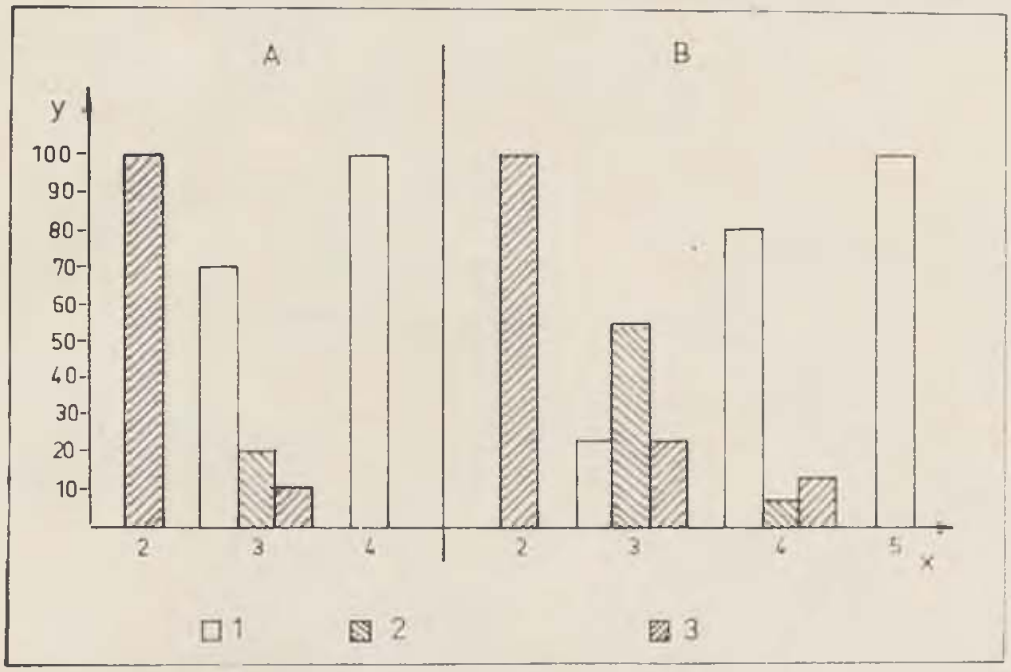

Fig. 1. Percentage of viable, partially necrotic and totally necrotic abdominal island flaps of the rat in relation to the time of ligation of the epigastric artery or vein. x — day of ligation after flap replantation, y — number of flaps in per cent, A — ligation epigastric vein, B — ligation epigastric artery, 1 — viable, 2 — partially necrotic, 3 — totally necrotic

2. Shrinkage

Extensive shrinkage of flap tissue could be seen when the flaps necrosed after arterial or venous ligation at 2 days (Fig. 2).

When the venous outflow was inadequate the shrinkage increased rapidly in proportion to the loss of flap tissue viability. Inadequate arterial inflow caused less shrinkage (8 %) by the second post-ligation day. After that, the flap area decreased continuously and the shrinkage was about 30 per cent when flap necrosis was visible.

In the 3-day ligation group different results were also found concerning the shrinkage of flaps supplied by inadequate venous or arterial blood flow. The flap shrinkage was significantly greater after arterial than after venous ligation (Fig. 3).

Shrinkage in flaps after venous ligation could first be registered on the 3rd post-ligation day. This was obviously due to flap oedema which occurred immediately after venous ligation. After that, no more significant shrinkage alterations were observed in this group.

The differences in shrinkage were more remarkable between the arterial- and venous-ligation groups at 4 days postoperatively (Fig. 4).

After the pedicle vein occlusion in flaps appearing viable, no shrinkage was measured in comparison with the abdominal island flaps with the supplying vessels intact. Arterial occlusion, however, was still able to cause a roughly 20% decrease in the size of the flap area. In the island flaps,

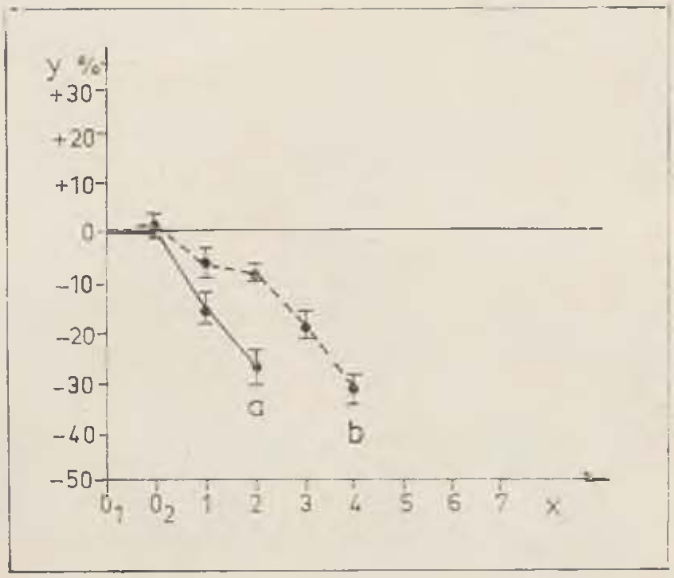

Fig. 2. Shrinkage (in per cent) of rat abdominal island flaps following ligation of the epigastric artery or vein on the 2nd post-replantation day. y — shrinkage (in per cent), x — day after ligation, a — vein, b — artery

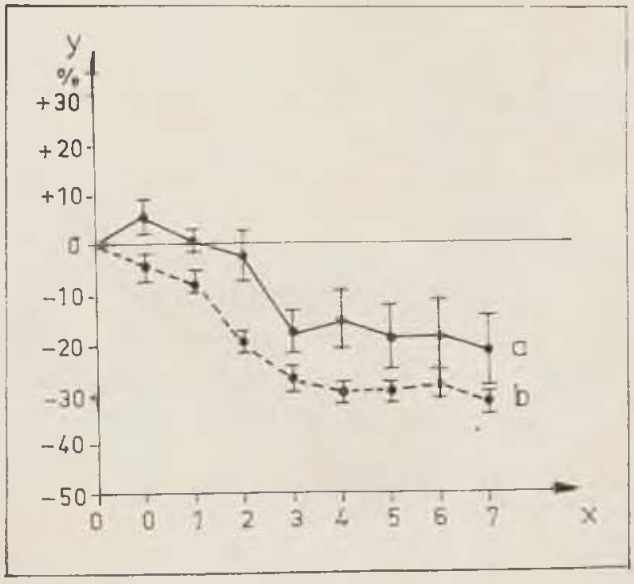

Fig. 3. Shrinkage (in per cent) of rat abdominal island flaps following epigastric artery or vein ligation on the 3rd post-replantation day

disorders of venous outflow were compensated well before those of arterial inflow, i. e. insufficient nutrition and oxygen supply of the flap tissue.

By the 5th post-replantation day, arterial as well as venous neovascularization had grown sufficient so that the ligation of the pedicle vessels did not affect the flap tissue. The flaps showed no significant shrinkage (Fig. 5).

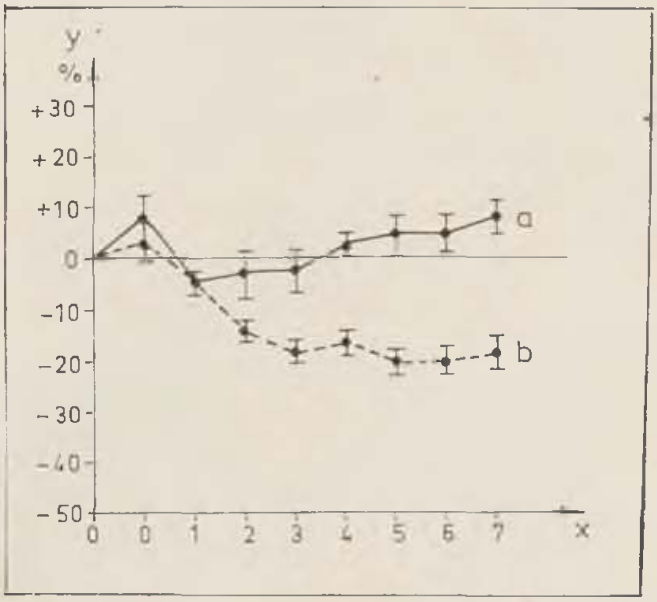

Fig. 4. Shrinkage (in per cent) of rat abdominal island flaps following epigastric artery or vein ligation on the 4th post-replantation day

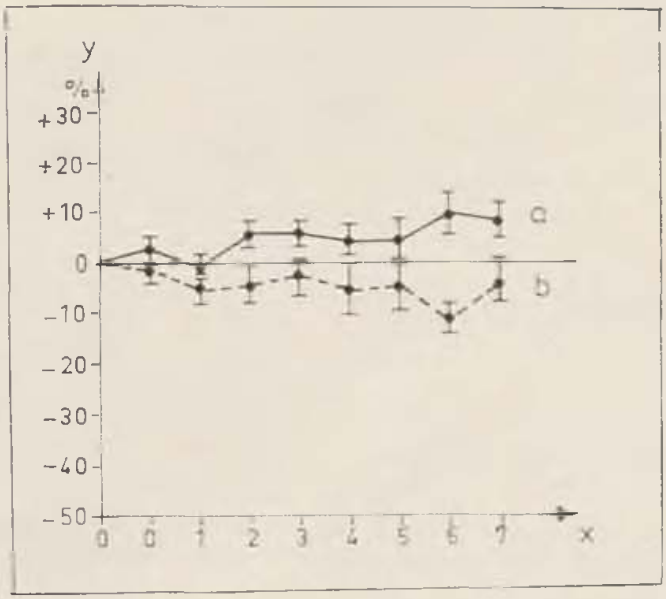

Fig. 5. Shrinkage (in per cent) of rat abdominal island flaps following epigastric artery or vein ligation on the 5th post-replantation day

3. Necrosis

At two days postoperatively, interruption of the venous outflow or arterial inflow through the pedicle vessels led to total flap necrosis. 100 per cent necrosis was already visible on the 2nd day following the ligation of the vein. In the arterial-ligation group, 100 per cent skin necrosis was first noted on the 4th post-ligation day.

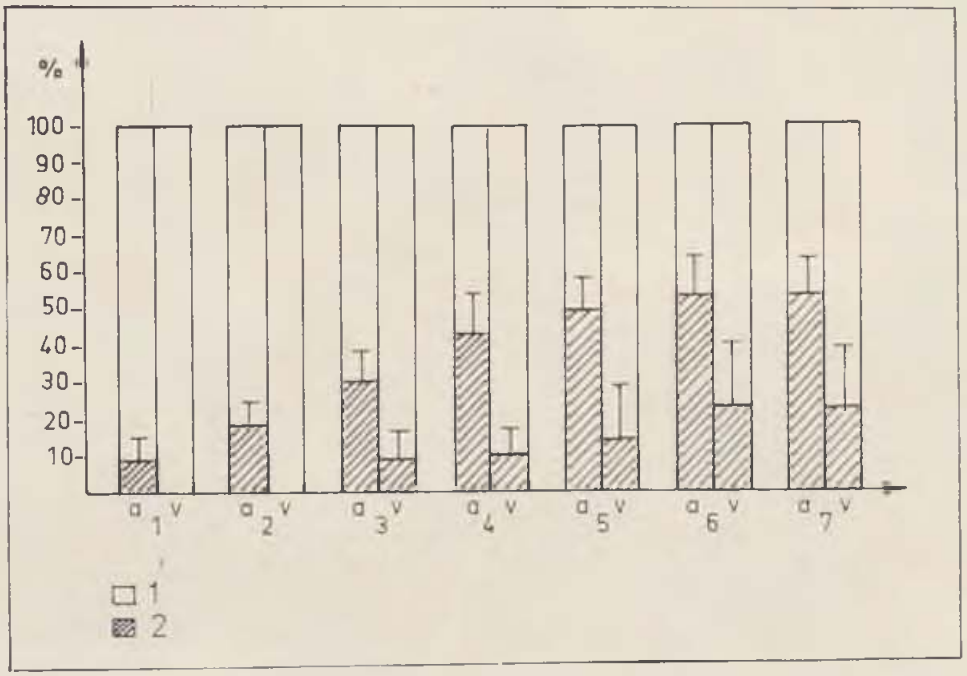

Fig. 6. Necrosis of rat abdominal island flaps following epigastric artery or vein ligation on the 3rd post-replantation day, 1 — viable, 2 — necrotic, a — artery, v — vein, x — day of ligation, y — flap necrosis (in per cent)

The 3-day artery- and vein-ligation groups showed unequal necrosis rates (Fig. 6). This amounted to about 50 % in the arterial-ligation flaps after an interval of 7 days. Only 20 % of the flap surface necrosed in the venous-ligation group. By the 4th post-operative day all of the venous-ligation flaps had healed without complications in contrast to the arterial-ligation flaps where an 18 % necrosis could still be observed. At 5 days after the flap replantation, arterial ligation no longer affected flap viability either.

DISCUSSION

During the initial period of healing, the survival of island flaps depends on adequate blood flow through the pedicle artery and vein. Necrosis occurs when the supplying vessels become thrombosed before neovascularization is sufficient. Flap survival in rats following loss of artery and vein occurs within up to 5 days (8) or 6 to 7 days (16, 17). In pigs flap survival was found already up to 4 days (17). Provided the pedicle vein or artery has been occluded complete survival is seen earlier. Nakajima (1978) studied the vascularization of epigastric island flaps in Wistar rats. He found the first vas-

cular channels as early as the 2nd post-replantation day. The neovascularization process developed rapidly so that the severance of the pedicle vein is already tolerated from the 3rd post-operative day. From then on, venous drainage occurs through the collaterals and through the new venous channels, respectively. Tsur et al. (1980) demonstrated flap survival following ligation of the vein at 3 to 4 days not only in epigastric island flaps of rats but also in flank flaps of pigs. McKee et al. (1981) confirmed those findings. On the other hand, Serafin et al. (1977) observed complete survival of ear flaps following loss of the vein after the 5th day. Occlusion of the pedicle vein is a hazard for an uncomplicated healing process in the case of abdominal island flaps of rats up to 3 days postoperatively. In accordance with Fujino (1977) and Serafin et al. (1977) cyanotic and oedematous flaps need not always become necrotic. After the 4th postoperative day, full survival was obtained in those island flaps, in which the pedicle artery had been ligated. The same result was also found by Serafin et al. (1977) using the ear flap of the rabbit. According to Tsur et al. (1980) that point is reached on the 4th day following flap replantation. McKee et al. (1981), however, found the survival of abdominal island flaps in the rat no longer dependent on the intact pedicle artery as from the 3rd postoperative day. Contrary to this, Naumann et al. (1981), using fluorescent microangiography, observed the first but functionally unimportant vascular anastomoses through the suture line at 4 days.

Our results showed that an effective neovascularization of the venous system is available one day earlier than that of the arterial system. These findings are in keeping with those made by Serafin et al. (1977) and Tsur et al. (1980) but in contrast to McKee et al. (1981). The definitive amount of surviving flap tissue was generally seen on the 5th day following the ligation of the artery or vein. McKee et al. (1981), however, observed the final result on the 3rd day.

We suppose that the reason why different opinion should exist as to the significance of both vascular systems to island flap survival rests in that the effectiveness of arterial and venous neovascularization shows differences as to time. Flap tissue survives, following loss of the pedicle artery or vein, at 5 days postoperatively. By that time, the question of which is more important for flap survival: the arterial or venous blood flow — is no longer relevant. But before that date, arterial interruption is a higher risk than venous occlusion. After the ligation of both pedicle vessels, the epigastric island flaps of rats which clinically had a viable appearance continued to show shrinkage (16). Contrary to those findings, there is an unambiguously correlation between the clinical appearance and shrinkage following venous or arterial ligation. In island flaps without visible viability disorders no shrinkage could be observed.

With respect to the different morphological structures of the human and rat skin it is not possible to apply those results to clinical practice without qualification. Nevertheless, the findings do provide a basis for possible drug treatment to prevent flap disorders. J. H.

SUMMARY

Using a special vascular ligation technique, arterial and venous neovascularization were studied in 92 abdominal island flaps in Wistar rats. The study was undertaken to clarify the functional significance of the arterial and venous circulation for the island flaps viability. — Ligation of the epigastric artery (n = 53) or epigastric vein (n = 39) was carried out on the 2nd, 3rd, 4th and 5th post-replantation days. Shrinkage and necrosis were measured daily for seven days after vascular ligation. 7 flaps out of 10 showed signs of survival after venous ligation on the 3rd post-replantation day. The shrinkage was 20 %, necrosis 25 %. — Following arterial ligation, 4 flaps out of 10 were found viable, shrinkage was 27 %, necrosis 50 %. In the 4-day venous-ligation group, all flaps healed without complications whereas after the pedicle artery occlusion about 18 per cent of the flap necrosed, and shrinkage was 20 per cent. Ligation of the artery or the vein performed on the 5th post-operative day caused no flap tissue disorder. Venous ligation was responsible for less shrinkage than arterial occlusion. During the first 5 days following flap replantation, the flap tissue responded differently to the occlusion of the pedicle artery or vein. Venous outflow disorders were compensated for earlier than those of the arterial inflow.

RESUME

Action d'alimentation sanguine inadéquate des veines et des artères sur la prise d'un lambeau abdominal chez des rats

Heiner, H. †, Tilgner, A., Oswald, P., Ermich, T.

On a étudié une néovascularisation artérielle et veineuse par une méthode spéciale des ligatures sur des artères. Comme matériel d'études servaient 92 lambeaux abdominaux en forme d'ilôt chez des rats Wistar. Des expériences devaient donner l'éclaircissement sur l'importance fonctionnelle de la circulation sanguine artérielle et veineuse pour la prise des lambeaux. Des ligatures d'arteria epigastrica (n = 53) ou de vena epigastrica (n = 39) ont été exécutées deuxième, troisième, quatrième ou cinquième jour après la replantation des lambeaux. Au cours des 7 jours qui suivaient la ligature, quotidiennement on a mesuré une constriction et des necroses des lambeaux. Si une veine ligaturée 3ème jour après la était replantation des lambeaux, 7 lambeaux sur 10 ont survécu; constriction a été remarquée en 20 %, nécroses en 25 % des cas. Si c'était une artère ligaturée, des lambeaux survivaient en 4 sur 10, constriction se manifestait en 27 %, nécrose en 50 %. Dans le groupe avec une ligature veineuse, exécutée 4ème jour, tous les lambeaux survivaient sans complications. Dans le groupe des ligatures artérielles, à peu près 18 % des lambeaux se nécrotisaient et 20 % d'entre eux étaient constrictifs.

Des ligatures exécutées 5ème jour après une replantation, soit artérielle, soit veineuse ne gênaient pas le tissu des lambeaux. Des ligatures veineuses ont entraîné une constriction moins importance que des ligatures artérielles.

Au cours des premiers jours après une replantation, le tissu des lambeaux a présenté des réactions bien différentes. L'interruption du cours veineux était compensée plus tôt que celle du cours artériel.

ZUSAMMENFASSUNG

Die Wirkung einer nichtadequaten venösen oder arteriellen Blutversorgung auf das Einheilen abdominaler Insellappen der Ratte

Heiner, H. †, Tilgner, A., Oswald, P., Ermich, T.

Mit einer speziellen Gefäßligatur-Methode wurde die arterielle und venöse Neovaskularisation an 92 abdominalen Insellappen von Wistar-Ratten untersucht. Diese Versuche sollten die funktionelle Bedeutung der Venen- und Arterienzirkulation beim Einheilen eines Insellappens verständlich machen. Die Unterbindung der A. epigastrica (n = 53) oder der V. epigastrica (n = 39) wurde am 2., 3., 4. oder 5. Tag nach Lappenreplantation vorgenommen und die Schrumpfung sowie die Nekrosefläche über 7 Tage nach Gefäßligatur gemessen. Nach Ligatur der Vene am 3. Tag nach Lappenreplantation überlebten 7 von 10 Insellappen. Die Lappenschrumpfung betrug 20 %, die Nekroserate 25 %. Nach Unterbindung der Arterie überlebten 4 von 10 Lappen, die Lappenschrumpfung betrug 27 %, die Nekroserate 50 %. Bei Venenligatur am 4. postoperativen Tag überlebten alle abdominalen Insellappen ohne Komplikationen, während nach Arterien-Unterbindung noch etwa 18 % des Lappengewebes nekrotisch wurde und die Lappenschrumpfung 20 % ausmachte. Unterbindung der Stielarterie oder -vene am 5. postoperativen Tag hatte keinen Einfluß mehr auf das komplikationslose Einheilen des Lappengewebes. Venenligatur verursachte eine geringere Schrumpfung als die der Arterie. Während der ersten 5 Tage nach Replantation war die Realetion des Gewebes auf die Unterbrechung des venösen oder arteriellen Blutflusses unterschiedlich. Storungen des venösen Abflusses wurden eher kompensiert als die Insuffizienz des arteriellen Zuflusses.

RESÚMEN

Efectos de un abastecimiento sanguino venoso o arterial inadecuado en la cicatrización del trasplante abdominal en las ratas

Heiner, H. †, Tilgner, A., Oswald, P., Ermich, T.

Mediante un método especial de ligaduras vasculares se estudió la neovascularización arterial y venosa en 92 trasplantes aislados en ratas Wistar. Los experimentos tenían por objetivo evidenciar la significación funcional de la circulación venosa y arterial en la cicatrización de los trasplantes. Las ligaduras de la arteria epigástrica (n = 53) o de la vena epigástrica (n = 39) fueron realizadas 2., 3., 4., o 5. día después de la reimplantación del trasplante; la contracción y la necrosis de los trasplantes fueron sometidas a control por medición diaria durante 7 días después de ligados los vasos. Ligada la vena, al tercer día de la replantación de los trasplantes sobrevivían 7 de los 10 casos; se pudo observar la contracción en un 20 % y la necrosis en un 25 % de los casos. Al ligarse la arteria sobrevivían 4 de los 10 trasplantes, produciéndose la contracción en un 27 % y la necrosis en un 50 % de los casos. En el grupo con la ligadura de la vena, efectuada el cuarto día, sobrevivían todos los trasplantes sin complicaciones, mientras que, interrumpida la circulación en el hilo de la arteria, alrededor de un 18 % de los trasplantes presentaron necrosis y en un 20 % se pudieron observar contracciones. Las ligaduras realizadas el quinto día después de la replantación, tanto arterial como venosa no afectaban el tejido de los

trasplantes. Las ligaduras venosas provocaban menores contracciones que las arteriales. Durante los cinco primeros días de hecha la replantación el tejido de los trasplantes reaccionaba de forma diferente a la interrupción de la circulación en el hilo de la arteria o vena. La interrupción de la circulación venosa se compensaba antes que la arterial.

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SURGICAL TREATMENT OF MAXILLOCRANIOFACIAL DEFORMITIES

K. KOBUS, J. WROŃSKI, M. WYTYCZAK, J. STEPNIEWSKI

Mid-face underdevelopment and orbit involvement with eventual cranial vault deformities belong among the most characteristic features in the majority of compound maxillocraniofacial anomalies. Until quite recently, surgery for the severest and most disfiguring deformities had been limited to no more than palliative procedures such as eyebrow transposition in hypertelorism or an onlay bone graft application in the management of facial bone retrusion. Extensive bone stripping and osteotomies as well as intracranial interventions were almost forbidden except in vital indications, or at least treated as unreasonable, too risky and very dangerous procedures.

Proceeding from the pioneering works commenced over 50 years ago by Wassmund and elaborated later on by Gillies and Harrison, a major breakthrough was made, beginning from 1967, by Paul Tessier, a French surgeon who developed detailed methods for an approach to deformities until then reckoned to be incurable and outside the scope of surgery. Tessier recognized that subperiosteal exposure allowed extensive osteotomies and safe modelling of the craniofacial bones, the transposition of the so-called functional orbits included. Moreover, he proved the efficacy of the simultaneous correction of practically all deformities, as well as the unquestionable advantages and surprisingly low risk offered by the intracranial approach.

The frequently encountered deformities which demand maxillocraniofacial surgery include severe facial clefts, faciostenosis, craniofacial microsomia, Treacher-Collins syndrome, craniostenoses, and consequences of extensive trauma. Nearly all the above mentioned congenital disorders can be connected with, or produce orbit displacement commonly called hypertelorism.

The quite common division into maxillofacial (MF) and craniofacial surgery (CFS) applies rather to the extra- or intracranial approach without suggesting either the severity of congenital disorders or their classification into the "cranial" or "facial" groups. Thus, for example, surgical operations for severe "maxillary" post-cleft deformities can prove even more difficult than surgery

for "cranial" orbit displacement, and in some disorders regarded as essentially "cranial" (e. g., plagiocephaly) careful examination can reveal concomitant facial malformations. Apart from that, even the approach criterion may be misleading as, for instance, both the transcranial and the infrabasal routes can be used for dealing with hypertelorism.

The vague distinction between some MF and CF surgery reflects, to a certain degree, the results of embryonic and anatomical studies which have proved many cranial and facial malformations to be interrelated in keeping with the theory that the cranial base functions as a template for upper face development.

Summed up, apart from the practical and didactic reasons, sticking to a strict nomenclature for the surgical procedures is rather irrelevant, all the more so as in many severe deformities a combined approach is the inevitable common practice.

As extensive MF and CFS are very difficult operations involving a degree of hazard, all indications for them must be extremely careful and well considered. The contemporary results are very good, indeed, and probably better than those at the very beginning; nevertheless, the death rate is still in the region of 2 %, and the total number of complications exceeds 15 % of the cases concerned (6). For those reasons, in order to avoid any possible charge of punishable or even experimental activity, we do not, as a rule, agree to operate on mentally handicapped patients as they can neither appreciate nor profit from such surgery. Obviously, if there is an option of minor or even palliative but efficient surgery, the major operations are rather avoided or strictly limited (Fig. 1).

If, on careful examination, MF or CFS seem to be the only efficient and reasonable solution, a detailed analysis of the existing surgical options is made. The planning of therapeutical strategy proceeds mostly from photographs, dental casts, and X-ray rata such as cephalometric tracings, tomograms, arteriograms as well as computerized tomography. Sometimes, masks made from thermoplastic materials or even plaster-of-Paris head figures are useful for a more precise analysis. Meticulous neuroradiological examination, including CT, is obligatory.

Developing cranial deformities can quite often be accompanied by cerebral anomalies.

In cases of hydrocephaly or congenital cerebral cystic cavities, intracranial relationships should be evaluated and, if necessary, preoperative shunt operations performed.

Detailed analysis

Surgery for post-cleft mid-face underdevelopment and for milder forms of faciostenosis is so far the most familiar and popular solution. This is because of the frequency of such disorders and the relatively simple treatment involved, consisting mostly in maxilla advancement of the Le Fort I and 1½ types (Fig. 2, 3).

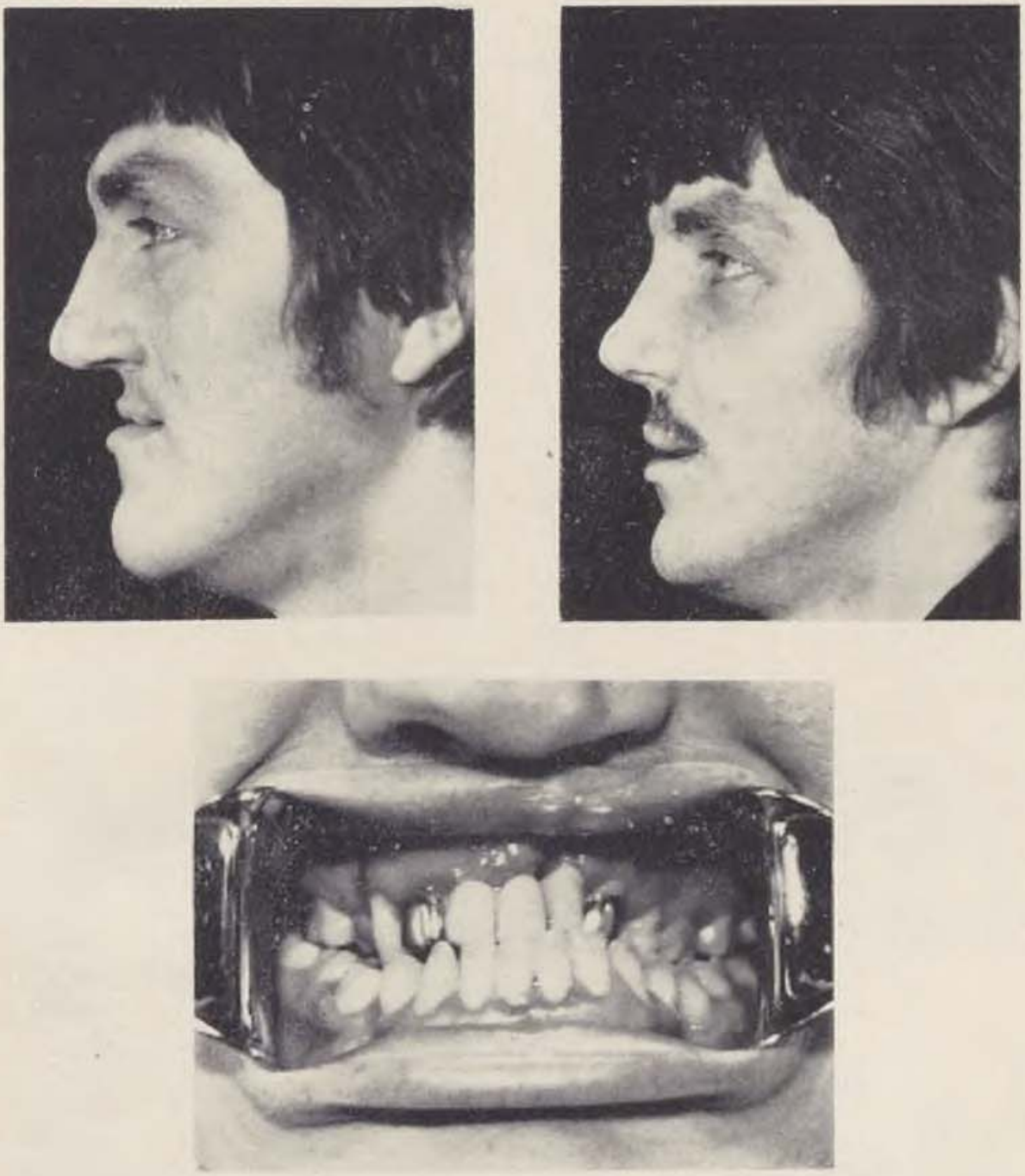

Fig. 1. Palliative treatment of unilateral post-cleft deformity. (a) Instead of maxillary osteotomy, only bone grafting was performed followed by rhinoplasty according to Blair. Despite 3rd-class occlusion (c) quite satisfactory patient's appearance was achieved (b)

The most challenging is probably the treatment of small, V-shaped maxilla in bilateral clefts demanding surgical widening and tripartite osteostomy. In such cases, apart from the familiar difficulties involved in premaxilla stabilization, there are also some problems connected with the primary or secondary closure of palatal clefts by means of local or tongue flaps (Fig. 4). So, in order

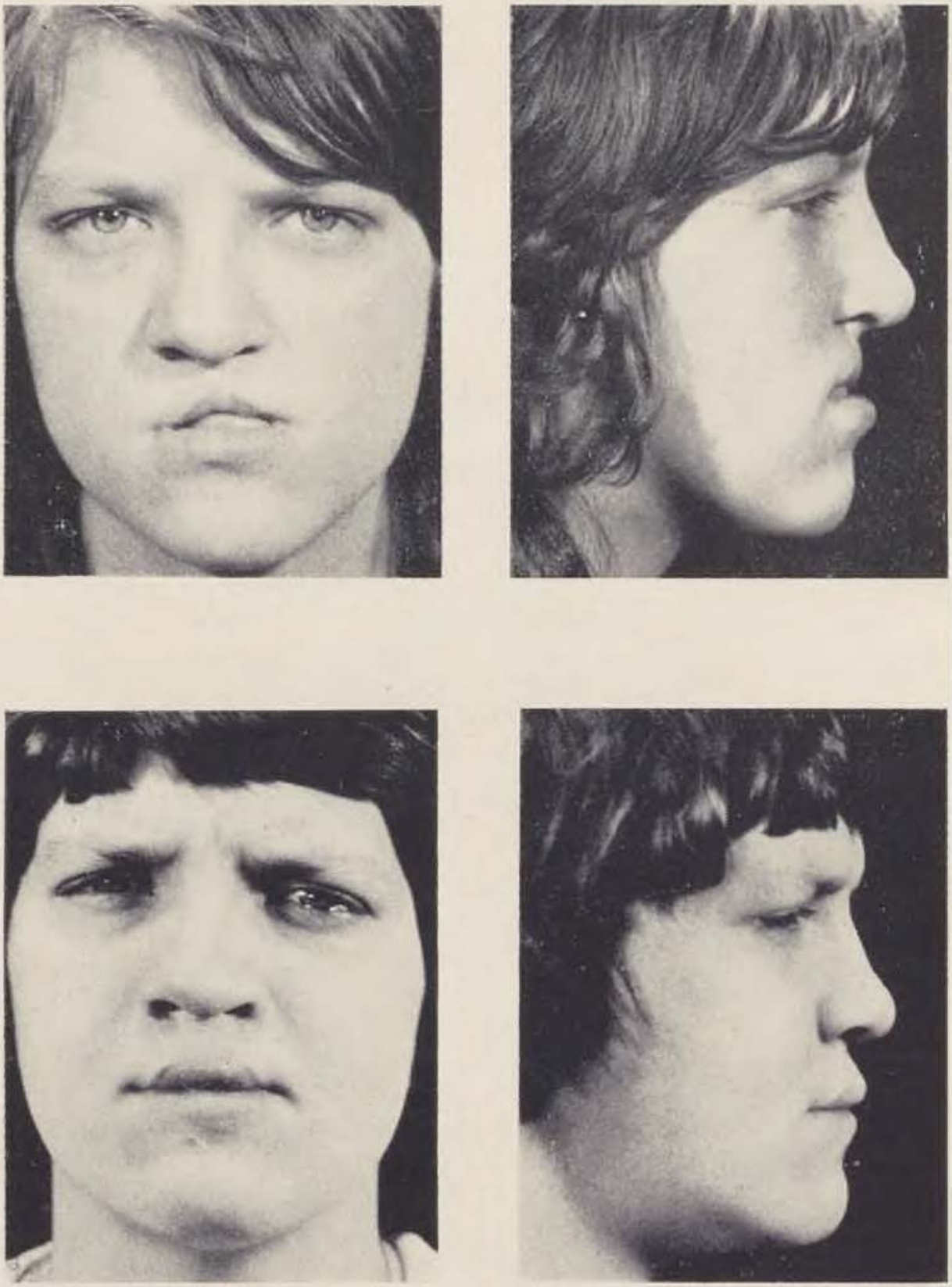

Fig. 2. Severe deformity as a result of bilateral cleft lip and palate repair (a, b). The list of operations included Le Fort I osteotomy, Abbé-plasty, pharyngopalatoplasty and tongue flap plastic surgery to fill in the hard palate defect. c, d — Result of treatment

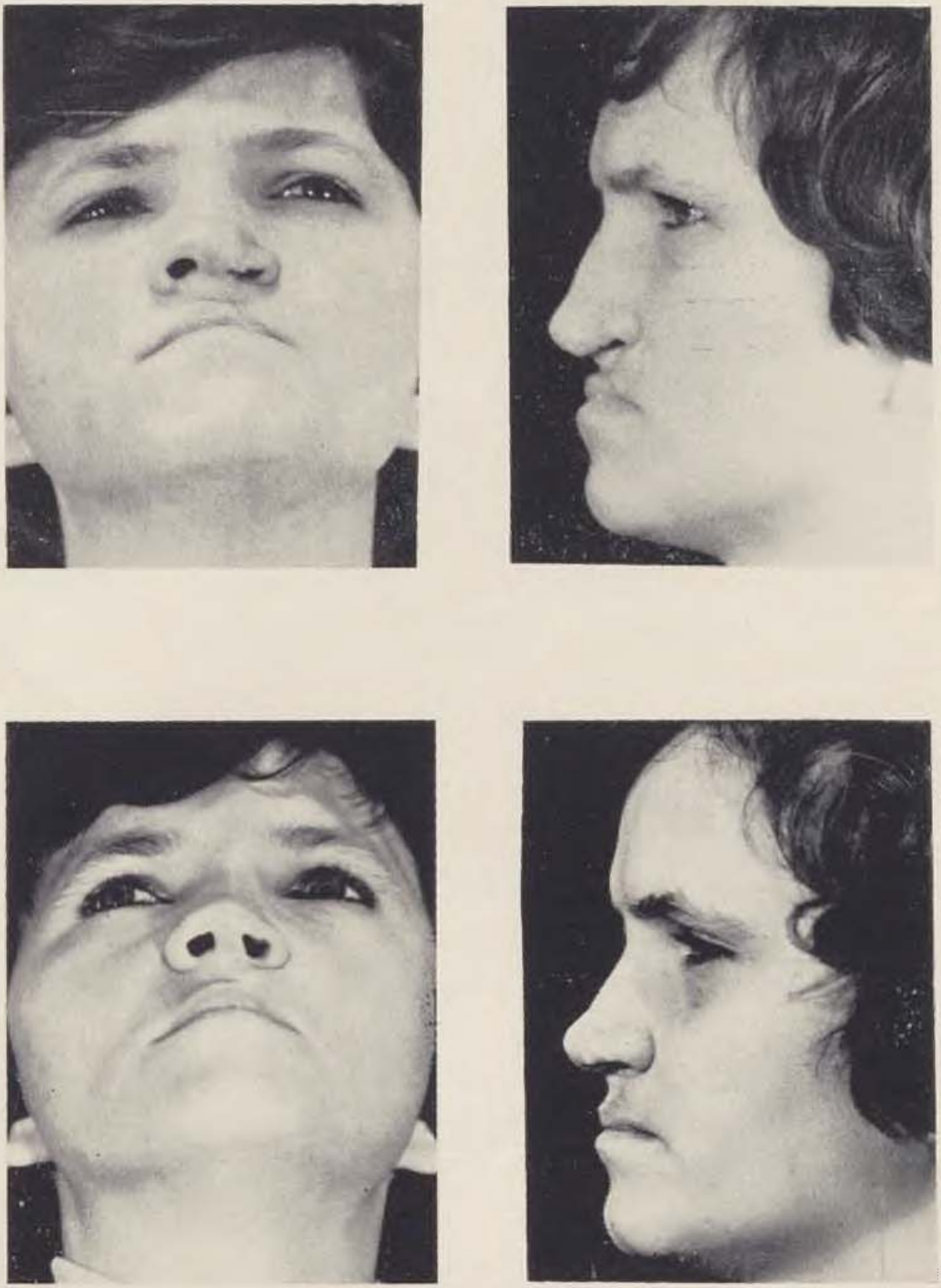

Fig. 3. a, b — Unilateral lip and nose deformity and maxillary underdevelopment before surgery. c, d — Patient's appearance after maxillary osteotomy and simultaneous nose and lip repair

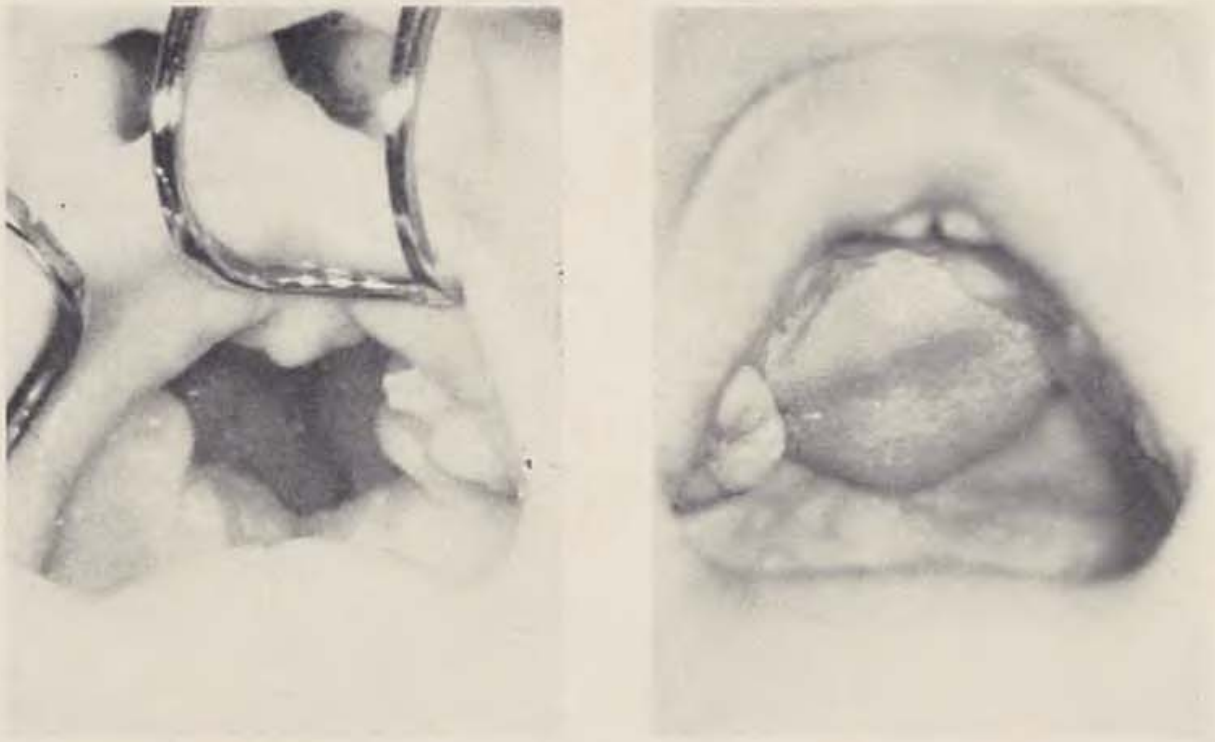

Fig. 4. Major hard palate defect before (a) and after (b) the tongue flap plastic operation

to avoid the above mentioned problems, it is probably quite reasonable to postpone the widening of the maxilla and to limit the operation to the anterior transposition and lowering of the maxilla.

In the majority of cases, to nose and lip repair is performed during the second stage, though sometimes, in unilateral clefts, simultaneous corection may be found feasible, too. As yet, however, the results of the above operations are not quite acceptable since, as a rule, more refinement is called for later on.

Surgical operations for hemifacial microsomia are rather awkward and difficult undertakings because of the asymmetry and involvement of both facial and cranial anatomical structures. In children, bone graft modelling, soft tissue augmentation and other disguising procedures constitute probably the most reasonable approach. In our own practice, the same attitude is adopted for the management of mild deformities. In adult patients, the only effective solution is simultaneous osteotomy of the maxilla and mandible with bone graft modelling according to Obwegeser and Munro (7).

Apart from the occlusion and contour correction, there are usually quite a few difficulties in dealing with auricular deformity and displacement. In our opinion, the best results are achieved with Kislov's method provided the whole cartilaginous framework is detached from the normal or remaining auricular meatus, and moved upward. Needless to say, such dissection requires great care to avoid any circulatory disturbances (Fig. 5). In the less severe deformities, the Reichert method should probably prove effective, too (9).

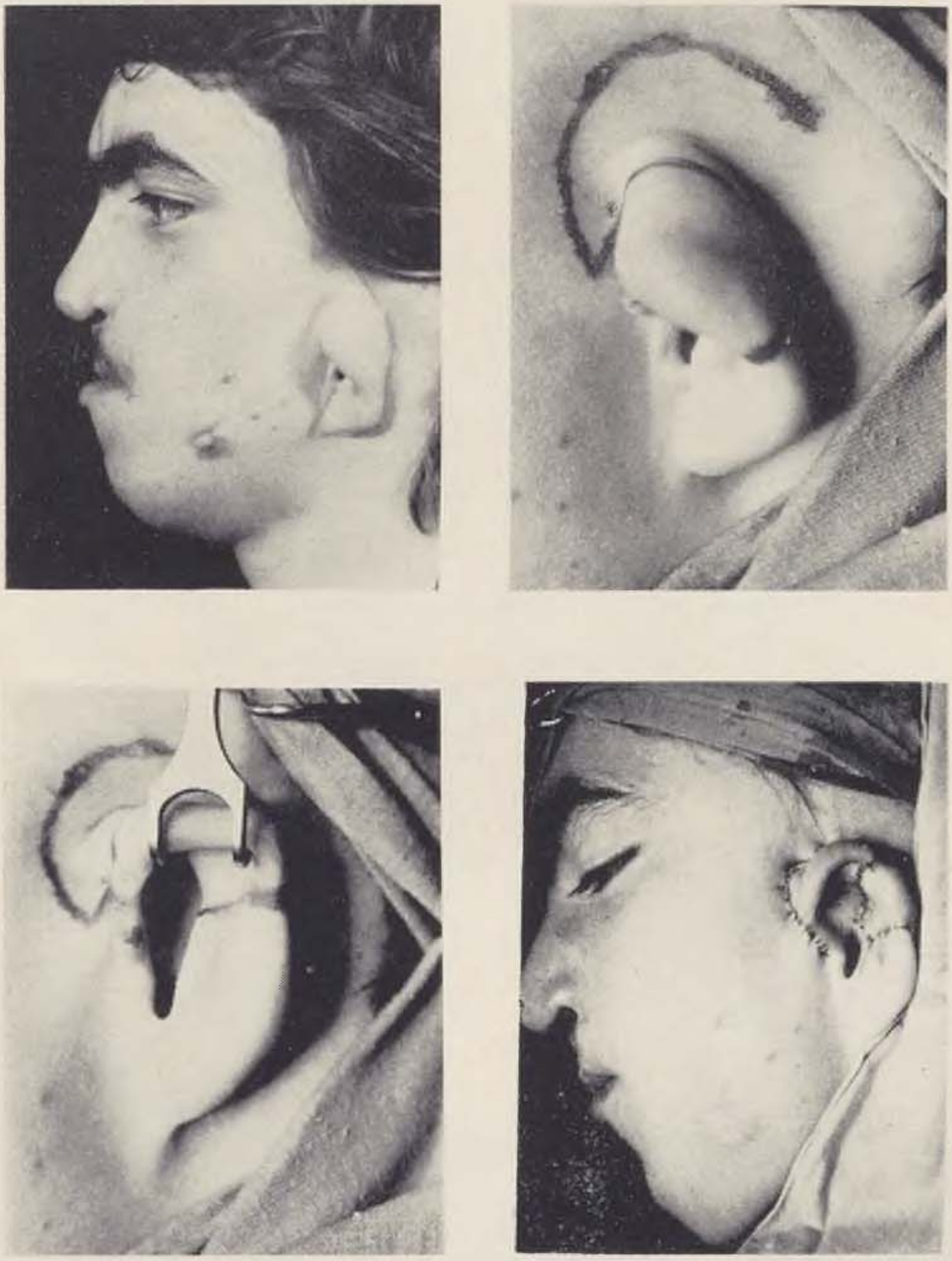

Fig. 5. a — Hemifacial microsomia. During the first stage, the maxilla and mandible were osteotomized simultaneously. Iliac spongy bone grafts were used for facial symmetry correction. The second step consisted in auricle modelling and replacement according to Kislov's method. b, c, d — Intraoperative presentation of the auricle correction

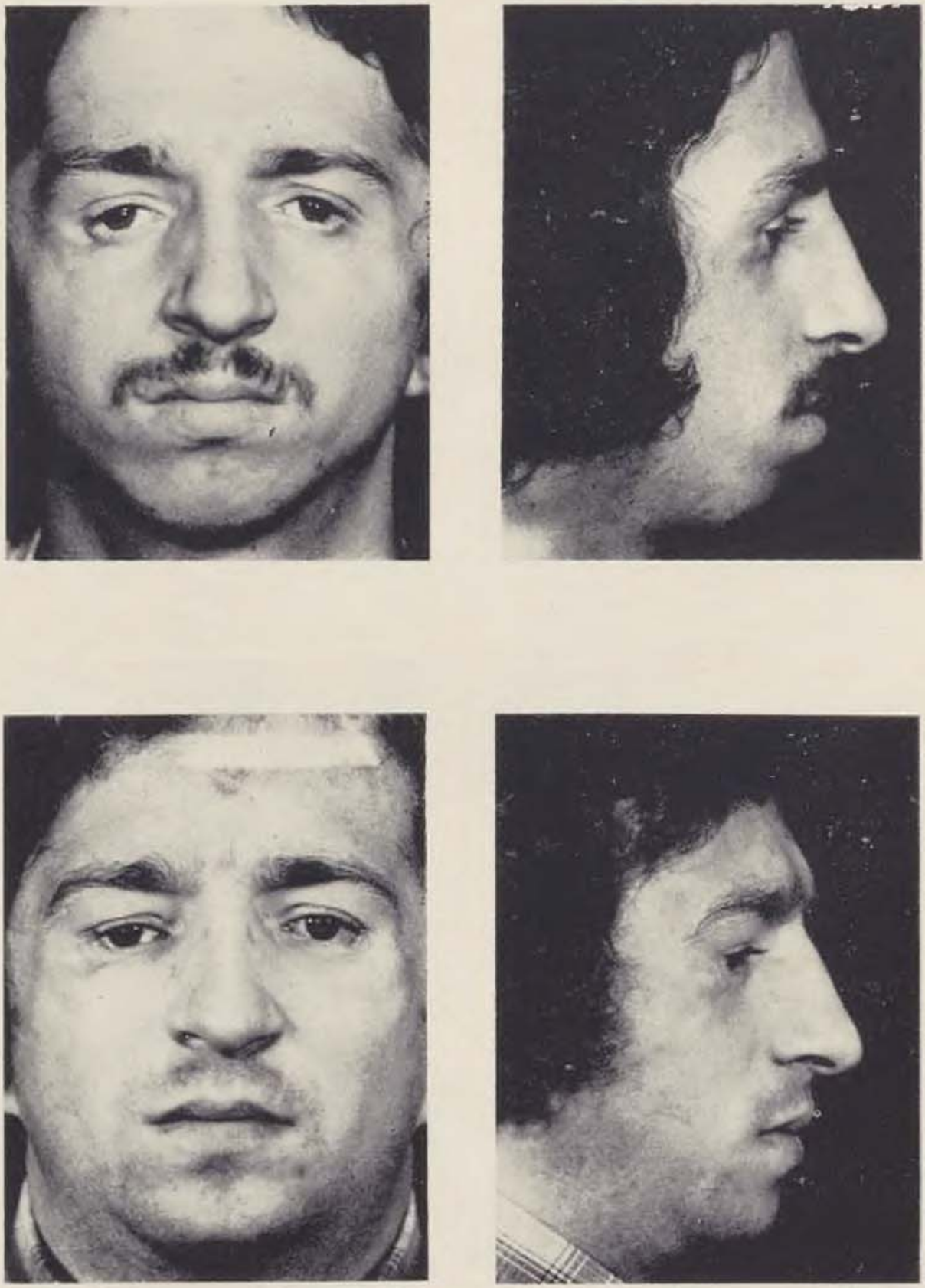

Fig. 6. The Treacher-Collins syndrome before (a, b) and after (c, d) bone graft shaping and antimongoloid slant repair

The management of the Treacher-Collins syndrome demands the correction of numerous deformities such as coloboma and antimongoloid slant repair with the simultaneous reconstruction of the zygomatic and orbital bones. If we add the need for chin augmentation, it seems evident that maxillofacial

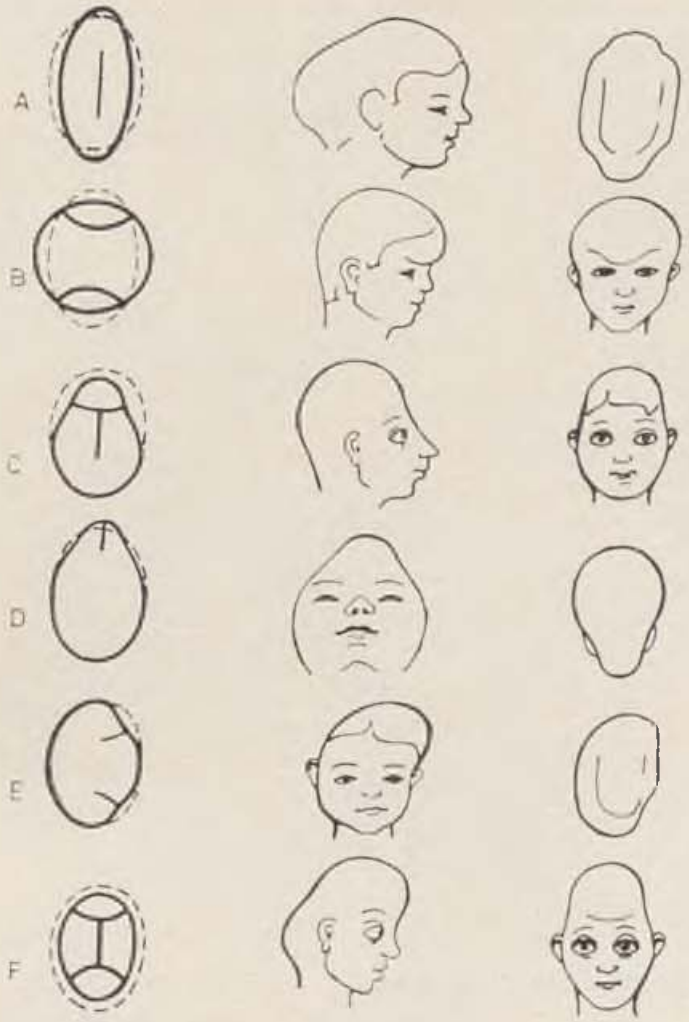

Fig. 7. Schematic representation of craniostenoses. A — Dolichocephaly, B — Brachycephaly, C — Oxycephaly, D — Trigonocephaly, E — Plagiocephaly, F — Turricephaly

dysostosis is a large consumer of bone tissue which is difficult to obtain in children. The replacement of autogenous transplants by a large amount of allogenic bone grafts would produce some problems, too, due, e. g., to infection and excessive resorption. For that reason and also because of the possible growth impairment we usually postpone such treatment until the child has reached his or her teens or even adulthood (Fig. 6).

Craniosynostosis which is due to the premature closure of one or more cranial sutures appear to be primarily caused by the reduced growth potential of the cranial base and by the abnormal attachment to the cranial base of the dura mater (8).

Growth inhibition at right angles to those sutures which are prematurely synostosed, and compensatory overexpansion of the cranium at the sites of the open sutures result in various cranial deformities known as plagiocephaly, trigonocephaly, scaphocephaly, acrobrachycephaly and clover-leaf skull (Fig. 7). In multiple suture involvement (e. g. in Apert's and Crouzon's syndromes) there is no regular pattern of calvarial deformity (Fig. 8). It depends both on the site of craniostenosis and on the expansion produced by the tremendous growth

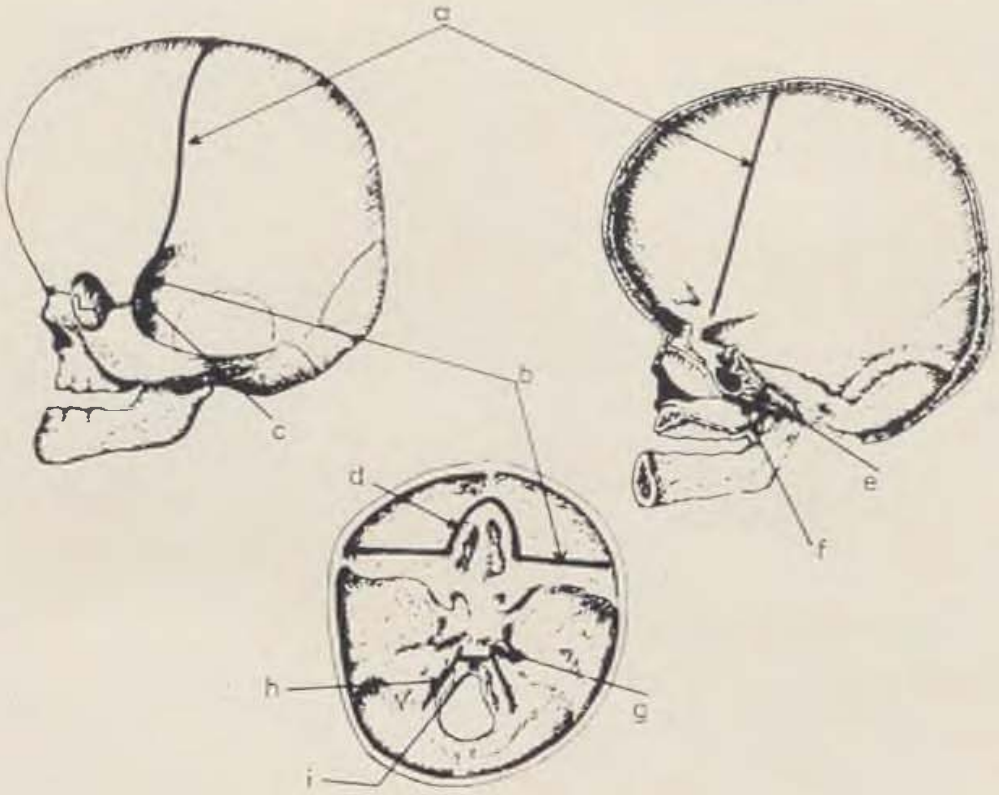

Fig. 8. Schematic representation of cranial shape and suture involvement in Apert's syndrome. a — coronal, b — frontosphenoidal, c — sphenozygomatic, d — frontoethmoidal, e — sphenooccipital, f — vomerosphenoidal, g — sphenopetrosal, h — petrooccipital, i — sphenooccipital

of the brain (from 335 g at birth to 660 g at 6 months!). Quite often, especially in oxycephaly, the compensatory cranial bone growths is inadequate to the growing brain, and an increased intracranial pressure develops with all the negative consequences. Apart from the cranial disorders, the majority of the patients with synostosis show signs of facial deformities such as maxillary hypoplasia and shortening of the orbits, which can pose many additional problems such as severe exophthalmos.

Early cranioectomy with cranial modelling and enlargement, if possible, provide the best results if performed during the neonatal period. By making use of the growing force of the rapidly developing young brain, the surgical

suture release is highly beneficial because it may prevent gross craniofacial deformities, increased intracranial pressure and severe ocular problems including optic nerve atrophy.

Surgery for scaphocephaly and other single suture involvement consists in the simple opening of the synostotic sutures. In bilateral coronal and multiple suture stenosis, this procedure is ineffective because of the simultaneous involvement of cranial base sutures. Consequently, to achieve their release,

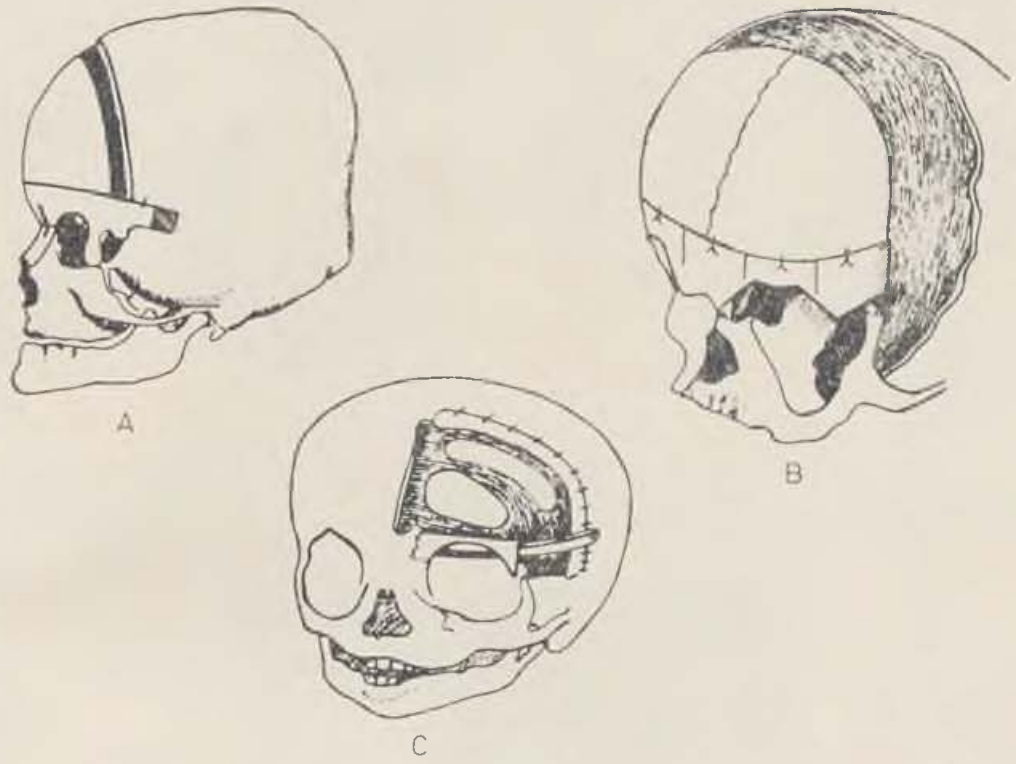

Fig. 9. Frontal bone and lateral canthal advancement according to Tessier (a), Marchac (b), and Hoffman and Mohr (c)

frontal bone or at least lateral canthal advancement should be performed (1, 2, 5) — (Fig. 9). The rather grotesque facial appearance resulting from the important frontal bone advancement tends to disappear quite quickly so that a few months after the operation the children look quite normal (Fig. 10).

The above described operation is, on the whole, uncomplicated and relatively easy provided good anaesthesia and precise monitoring are ensured. Unfortunately, in our own practice the majority of patients are referred to us too late, i. e. not until treatment has become considerably more difficult and less effective. The main reasons for this are probably ignorance of present-day options, fear of intracranial operation, and late diagnosis.

Reconstructive surgery for craniofacial dysostosis includes both cranial vault shaping and — which is probably more difficult — mid-face retrusion management (3, 4, 6). An essential procedure consists in Le Fort III advance-

Fig. 10. a, b — Early result of frontal bone advancement for the treatment of brachy cephaly. c — Child's appearance 3 months later

ment osteotomy through a subcranial route, which is quite often combined with the intracranial approach (Fig. 11). The tripartite and Le Fort II osteotomies are rather less useful and less often indicated. Theoretically as well as judging from the results of preoperative planning, the simultaneous advancement of the frontal bone and advancement — lowering of the maxilla makes for an optimal procedure in spite of some clinical shortcomings seen in practice. To begin with, this is a very extensive and, to some degree, dangerous operation

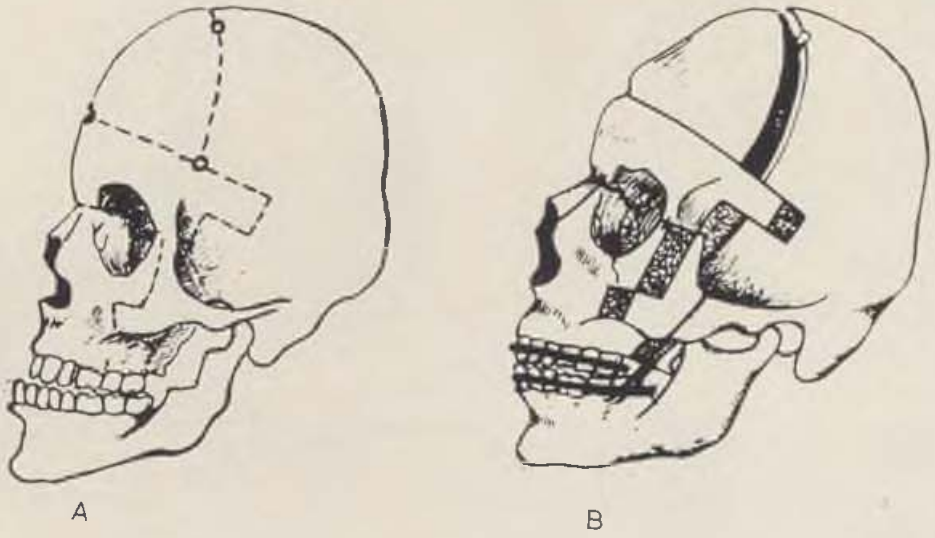

Fig. 11. Sketch of simultaneous cranial moulding and Le Fort III osteostomy — after Tessier

where very large communications between the cranial and oro-nasal cavities are impossible to avoid. Secondly, the essential advancement of the frontal bone will produce a dead space in the anterior cranial fossa which can lead to infection and/or transposed bone resorption. In some cases, therefore, especially in adult patients, bone graft shaping and other disguising procedures are rather advocated in the frontal region.

Another and probably the most relevant objection is to the radical correction of craniofacial dysostosis (such as Apert's and Crouzon's syndromes) in children because an early surgery on the jaws is known to impair mid-face development. However much one adheres to the theory that an early release of restrained tissue should result in normal growth (2), there are some technical problems such as, e. g., difficulties with intermaxillary fixation or adequate bone supply.

To conclude, if there are no vital or severe functional indications (vision!), mid-face advancement had better be delayed for as long as possible, in our view. Unfortunately, no palliative procedures are effective in such cases (Fig. 12).

Fig. 12. a, b — Severe craniosynostosis with multiple suture involvement after relieving operations elsewhere. Both cranial vault moulding with frontal bone advancement and Le Fort III osteostomy were planned. During the operation, as a result of severe bleeding and cardiac problems, maxillary osteotomy was postponed and the collected bone grafts were used for the inferior rim and lateral orbital wall shaping and enlargement. Despite using large amounts of bone grafts, only moderate correction of the exophthalmos was achieved (c)

Fig. 13. a — Minor form of hypertelorism before surgery. b — Result of eyebrow transposition and rhinoplasty

As already mentioned before, craniosynostosis, severe facial clefts, hydrocephaly and tumours may be connected with various orbital anomalies as regards their volume, shape and placement. The most common deformity strictly related to CFS is probably that of hypertelorism due to the two sides of the face failing to undergo medial rotation with the concomitant abnormality of the base of the skull. Surgical correction of hypertelorism by bringing the two orbits closer together is facilitated by the optic foramina themselves being in a more or less normal position. Consequently, osteotomy, following the stripping of all the orbital periosteum up to within 10 mm of the posterior pole of the orbit, does not interfere with the optic and oculomotor nerves.

The therapeutical method depends on the severity of the malformation. In patients with telecanthus and mild forms of hypertelorism (intercanthal distance from 30 to 38 mm) various disguising operations such as rhinoplasty or medial orbital wall osteotomy are called for (Fig. 13). The more sophisticated approach consists in infrabasal three-wall osteotomy though, admittedly, this is connected with the risk of uncontrolled meningeal laceration.

Regardless of its complexity, the intracranial approach is essential to ensure the safety and efficacy of the corrective operation. The subperiosteal dissection completed, the frontal bone is raised and the dura of the anterior fossa is exposed with or without the preservation of the fila olfactoria. The central or the two paramedial blocks of the floor of the anterior fossa, the frontal bone, the ethmoids and nasal bones are then removed. Osteotomy then

follows to separate the whole of the bony orbit from the skull and facial bones while preserving intact the bony cone around the optic foramen and superior orbital fissure. The bony orbits are now brought towards the midline partly by direct medial displacement and partly by true rotation. Bone grafts are inserted into all the fissures, and bilateral canthopexy is carried out to fix the medial canthal ligaments, followed by bone graft placement to support the nasal bridge line (Fig. 14).

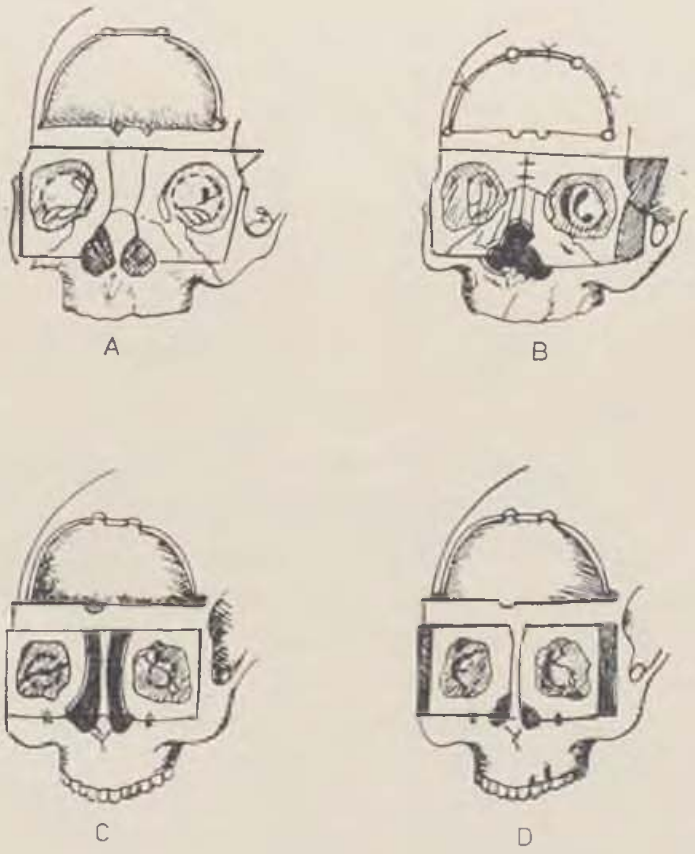

Fig. 14. Schematic representation of hypertelorism repair by intracranial route according to Tessier's (a, b) and Converse's (c, d) methods

There is still no definitive formula as to the proper timing of surgery for hypertelorism. According to all the theoretical presumptions, an early elimination of the divergent squint should be favoured in order to achieve binocular vision but the clincal evidence is rather inconclusive (6). It seems that not many data are available as to the possible danger of mid-face underdevelopment as a result of partial resection of the nasal septum if Tessier's method is used (Fig. 13 A, B). Would Converse's paramedian operation (Fig. 13 C, D) be the more obvious choice in children? It does seem to be a more justified option though not without shortcomings either.

Speaking about the specific maxillocraniofacial disorders, it should be mentioned, however, that apart from the major malformations there are, quite

Fig. 15. a, b — Asymmetric craniostenosis and moderate hypertelorism before surgery. c — Planning of surgery, d, e — long-term result (6 years) of orbit transposition and cranial vault shaping with skull enlargement

often, numerous concomitant deformities (Fig. 15). Even disregarding those involving other parts of the body (heart, hands, etc.) there are malformations such as, for instance, hydrocephaly, absence of the nose or choanal atresia which demand preliminary or many additional but nevertheless very important operations if a fully satisfactory result is to be achieved (4, 10). In other words, a normal intercanthal distance or mid-face protrusion are very important and essential, indeed, though for a really pleasant appearance a well shaped nose or, for instance, properly balanced lips should not be underestimated by any means either, and their correction should be carried out with as much precision as possible.

J. H.

Fig. 15. e

SUMMARY

Proceeding from literary reports and from their own material which they started collecting in 1976, the authors discuss some problems regarding the management of maxillocraniofacial deformities. Numerous examples of treatment are also presented.

RESUME

Le traitement chirurgical des déformations maxillo-cranio-faciales

Kobus, K., Wroński, J., Wytyczak, M., Stepniewski, J.

Sur la base de la litérature et des études du matériel propre des auteurs, assemblé depuis 1976, on apprécie quelques problèmes du traitement des difformités maxillo-cranio-faciales. Des exemples multiples du traitement sont présentés.

ZUSAMMENFASSUNG

Die chirurgische Behandlung maxillokraniofazialer Deformationen

Kobus, K., Wroński, J., Wytyczak, M., Stepniewski, J.

Auf Grund von Literatur sowie eigenem Material der Autoren, das seit 1976 gesammelt wurde, werden einige Probleme der Behandlung maxillokraniofazialer Deformationen beurteilt und zahlreiche Beispiele einer Behandlung vorgelegt.

RESÚMEN

Tratamiento quirúrgico de las deformaciones máxilo-craneo-faciales

Kobus, K., Wroński, J., Wytyczak, M., Stepniewski, J.

En base a la literatura y el material reunido desde 1976 por los mismos autores, se estudian algunos problemas del tratamiento de las deformaciones máxilo-craneo -faciales. Se presentan numerosos ejemplos del tratamiento aplicado.

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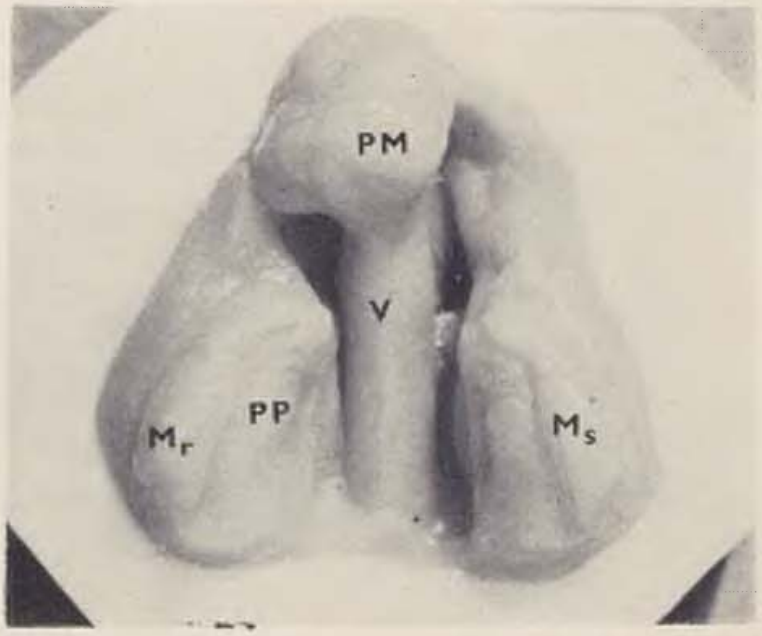
UPPER ALVEOLAR ARCH DEVELOPMENT IN PATIENTS WITH TOTAL BILATERAL CLEFT LIP AND PALATE

M. PETERKA

INTRODUCTION

Total bilateral cleft lip and palate (bil CLP) is the severest form of classical facial clefts affecting simultaneously the upper lip, maxilla and the whole palate. This type of cleft results from the non-union of hypoplastic maxillary and median nasal processes on both sides of the face. Moreover, there is an associated non-union of the palate plates. The result of this anomalous developmental process, which in human begins already well before the 40th day of embryonic development, is the permanent existence of three independent parts of the maxilla (premaxilla, right and left maxilla). Due to growth centrifugal forces, all the three segments of the maxilla remain separated from each other throughout the rest of the prenatal period (Fig. 1). That is why



1. Palate of neonate with bilateral cleft lip and palate. PM — premaxilla, M_r — right maxilla, M_s — left maxilla, V — vomer, PP — palate processes

in patients with bil CLP we regularly find, immediately after birth, protrusion of the premaxilla and an excessive separation of the maxillas, a situation which takes the form of enlargement of the sagittal and transverse dimensions of the maxilla (Huddart, 1970; Friede, Pruzansky, 1972; Narula, Ross, 1970).

Similar changes can be observed in the mouse embryo with experimentally induced cleft palate. The failure of the palate plate to unite causes a major broadening of the maxilla in the course of subsequent prenatal development (Peterka, Dostál, 1977).

Table 1. Maxilla dimensions in group of boys with total bilateral cleft compared with the control values (Brno collection)

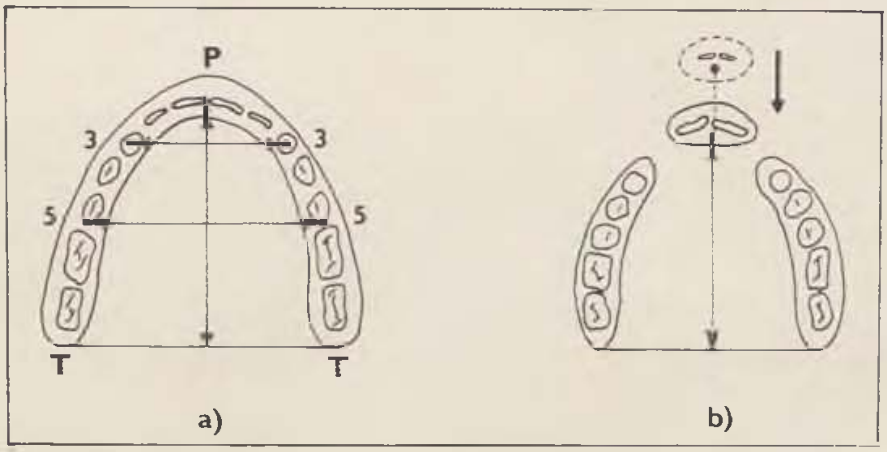
	Age	3—3			5—5			P—T		
		N	$\bar{x}$	s	N	$\bar{x}$	s	N	$\bar{x}$	s
Control	3							23	33,3	1,6
	5	14	30,9	1,2	14	42,2	2,8	14	35,1	1,5
	7	17	33,0	1,7	17	43,8	1,3	17	39,5	1,8
	8	13	33,4	1,8	13	44,5	1,9	12	40,2	1,9
	10	12	34,8	2,4	12	44,2	2,3	12	41,7	2,5
	12	32	35,4	1,8	32	45,5	2,3	32	45,3	2,2
	15	28	37,1	1,9	28	46,7	2,1	27	49,0	2,5
	19	8	36,9	1,4	8	46,6	2,1	8	52,8	3,0
CLP bil	1							24	36,2	3,8
	3	16	29,8	4,1	10	46,0	4,6	15	37,1	3,8
	4	16	29,8	3,0	15	45,5	4,0	15	37,2	3,9
	5	14	27,9	2,8	13	43,3	3,1	13	37,7	3,1
	6	10	28,1	4,8	10	43,3	5,6	11	38,2	3,3
	8	16	29,9	5,4	14	44,3	6,2	17	39,9	3,8
	9	11	29,4	4,5	9	43,6	3,6	10	38,8	3,6
	10	15	27,9	7,1	11	44,9	6,0	16	42,8	3,7
	12	16	27,6	5,0	16	43,6	5,7	16	44,1	3,5
	15	17	28,4	6,0	18	44,1	7,2	16	45,0	4,3
	17							9	46,9	4,7

Age = years. N = number of cases. $\bar{x}$ = mean. s = standard deviation

Any assessment of the width and length of the upper alveolar arch in man should take into account the existence of gaps between the non-united segments of the maxilla, a situation which may change markedly as a result of orthodontic and surgical treatment. The resultant size of the maxilla in cases of bil CLP is, therefore, determined not only by the growth potentials of each of the maxillary segments but also by the size of the gaps between them. The purpose of the present study is to monitor changes in the size of the upper alveolar arch in patients with bil CLP following surgical and orthodontic therapy, and to compare them with controls.

MATERIAL AND METHODS

The control group is made up of 147 Brno boys aged 3 to 19 years. The selection was extremely strict as the group consists solely of individuals with no apparent orthodontic defect, with the complete age-matched number of teeth, and with normal enunciation. The bilateral-CLP group is made up of 29 boys, patients of the department of plastic surgery in Brno. During the the-

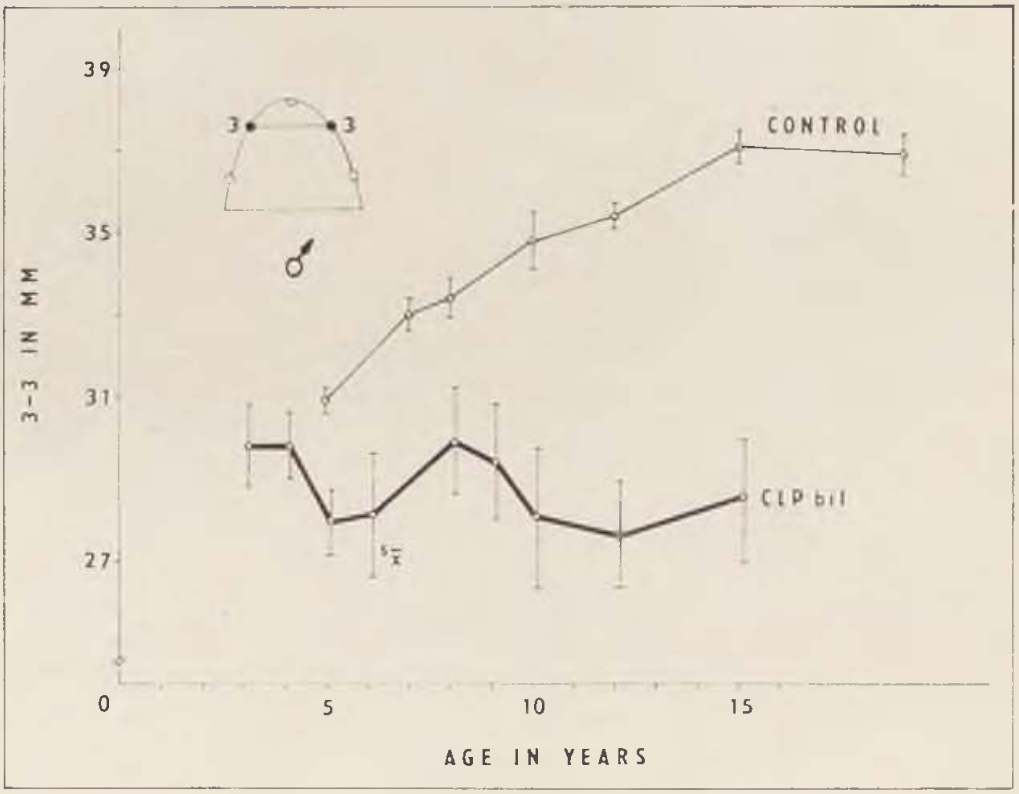


2. a) Diagram of upper alveolar and dental arch with marking of anthropometric points and distances selected for measurement
b) Diagram of upper alveolar arch in a patient with bil CLP where the P-T distance is influenced by the position of the protruding premaxilla. Dotted line — position of premaxilla immediately after birth, solid line — premaxillary position in a subsequent period of development in a patient with labial suture.

rapeutical period, each had an average of seven impression of the maxilla taken at annual intervals for 1 to 17 years. The precise number of cases in each year under study can be seen in Table 1. The plastic material Elastic was used for making plaster-of-Paris models of the maxilla both for the control group and for patients with bil CLP. Patients with bil CLP had two standard operations performed on them: one, labial suture, during the first year of life, the other, suture of the palate, at the age of 3 and a half years. All patients, from the age of 5 years on, received orthodontic treatment using removable orthodontic appliances.

The anthropometric points and distances planned for measurement were chosen so as to permit a simple method of characterization of the upper alveolar arch growth in two basic directions — transverse and sagittal — for as long a period of time as possible. The transverse-direction growth changes were assessed using two width parameters. One is the distance between the tips of deciduous and permanent canines which we designate 3-3, the other is measured between the centres of the posterior edges of the crowns of the 2nd deciduous molars and, following the shedding of the milk molars, between the second premolars (point of contact with the first permanent molar), which we designate 5-5. The sagittal dimension is measured from the centre of the

papilla incisiva to the connecting line between the two maxillary tubera, and designated P-T (Fig. 2). The distances were measured with dividers on a plaster-of-Paris model, read on an equal scale, and rounded to whole millimetres. The precision of measurement was adequate in view of the considerable dispersion variance of individual values. Statistical evaluation of the differences between average values was carried out with the t-test.



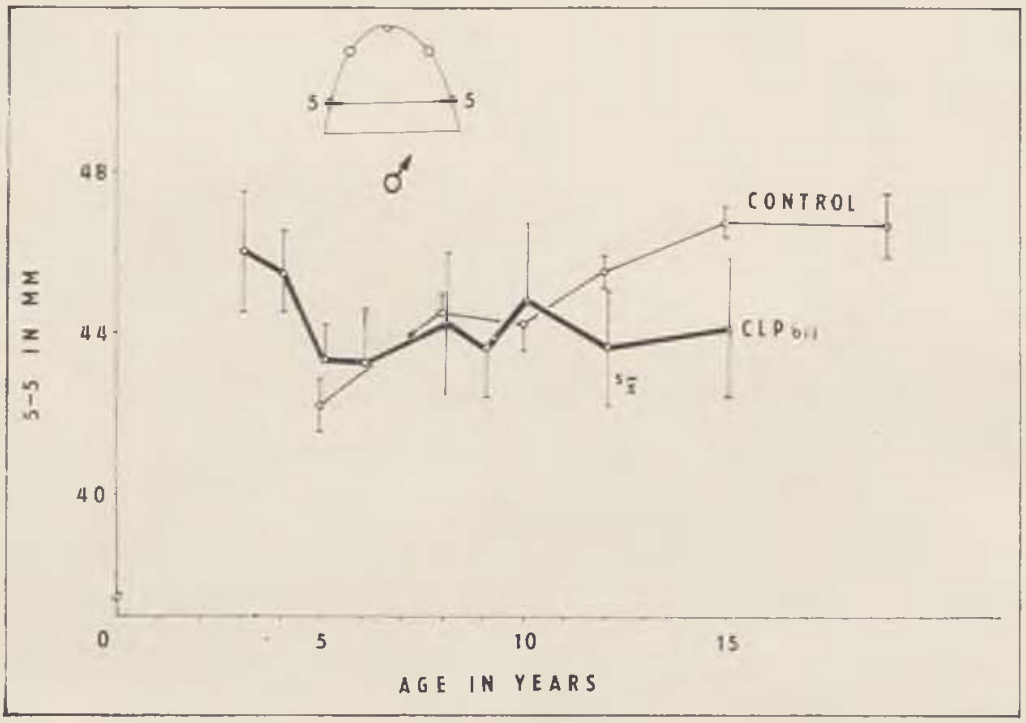
3. Average 3-3 distance values in the control group of boys and in boys with bilateral CLP
mm — millimetres, $s_{\bar{x}}$ — mean standard error

OBSERVATIONS

The 3-3 dimension characterizes the anterior maxillary poles position in the canine area. At the ages of 3 and 4, the 3-3 distance in patients with bilateral CLP is practically within norm. Following the palate operation, between the ages of 4 and 5, there is a major drop in values, and the difference from the controls becomes significant. Between the ages of 5 and 15 years, the bil CLP patients' dimension 3-3 shows no significant increase. The control values, however, do grow continuously during that period (5—15 years), thus widening the difference with regard to patients with bil CLP until, at the age of 15 years, it reaches an average of 8—9 mm (Fig. 3).

The 5-5 dimension, characteristic of the mutual position of the upper alveolar arch in the region of the 2nd deciduous molar, or the 2nd premolars, is prominently increased prior to the palate operation in patients with bil

CLP at three years. Following that operation, it will drop to the control values level to remain unchanged between the ages of 5 and 15. The growth potential of the cleft maxilla in surgical patient with bil CLP fails to become manifest in the width parameters at all. The control values, meanwhile, do increase, and from 12 years on they are above those of patients with bil CLP. The difference at 15 years is of not statistical significance (Fig. 4).



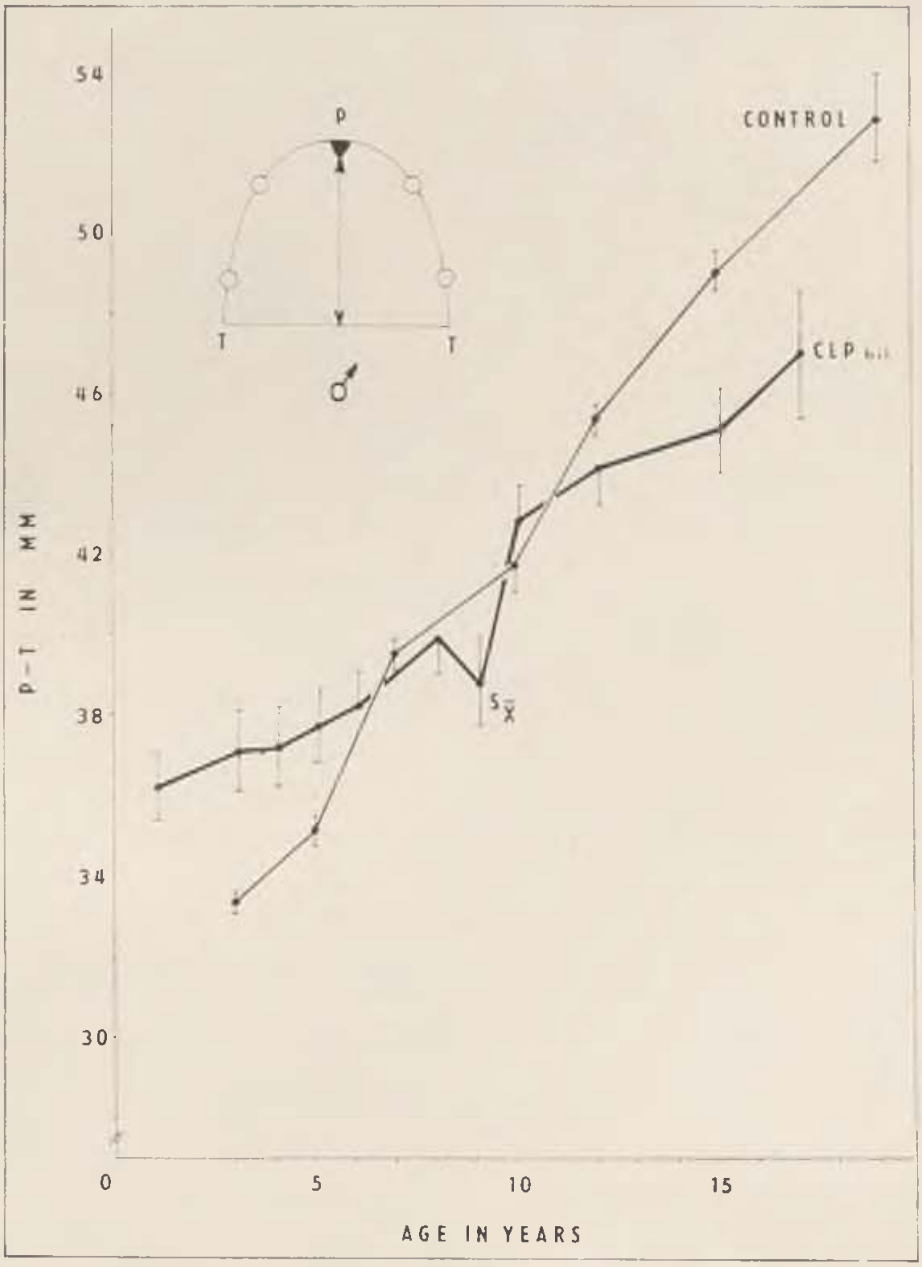
4. Average 5-5 distance values in the control group of boys and in boys with bilateral CLP
mm — millimetres, $s_{\bar{x}}$ — mean standard error

The length of the upper alveolar arch measured from the centre of the papilla incisiva behind the upper incisors up to the connecting line between the two maxillary tubera (P-T) is 3 to 4 mm greater in 3-year old patients with bil CLP than in the controls. On the other hand, the control group values keep building up at a substantially higher rate so that at the age of 6 the two curve intersect. The control groups' average annual increments are substantially higher, thus leaving the bil CLP patients eventually well below the norm. At 15 years, the average difference is 4 mm (Fig. 5).

DISCUSSION

At the age of 3 years, i. e. prior to the palate operation, the anterior maxillary poles in the region of the canines are as wide apart as in the control. Following the operation, invariably performed between the ages of 3 and 4, the 3-3 dimension becomes rapidly reduced, a sure sign of the anterior poles of the maxillary palatal part having come closer together. The pre-

maxilla which normally acts as a keystone between the maxillas, is in protrusion so that nothing can interfere with the medial movement of the maxillas. In the 5-5 area, the two maxillas are excessively remote from each other right from birth, and although they come closer together after the operation, the



5. Average P-T distance values in the controls and in boys with bilateral CLP
mm — millimetres, $s_{\bar{x}}$ — mean standard error

situation is not quite so critical as in the anterior poles area. Inadequate pitch between the maxillary canines is conductive to intermaxillary-mandibular anomaly — bilateral cross bite — in relation to the lower dental arch. Correction or rather mitigation of this anomaly is possible with the aid of orthodontic

appliances. Considering, however, that all patients in the group did receive orthodontic treatment there is very little hope of improvement or complete elimination of the cross bite. Attention should be focussed mainly on the canine region, and the orthodontic appliances should be designed so as to permit their active elements being placed as much to the front as possible. This applies mainly to the positioning of the orthodontic screw. Apart from orthodontic treatment, improvement in the finale shape of the upper dental arch can be achieved in making the definitive dental prosthesis after the patient has come of age. Dental replacement has a dual purpose: 1. to replace the missing permanent teeth, usually the second incisors, and 2. to improve the orthodontic anomaly involving the two jaws.

As for the premaxilla, its excessive protrusion obviously does not last longer than until the age of seven. As from then, the P-T dimension coincides with that in the controls. No surgical or orthodontic means were used in our patients to correct the position of the premaxilla so that its spontaneously improved position can only be put down to the continuous dynamic pressure of the surgically united lip. This is a favourable discovery since surgical operations on the intermaxilla carry a measure of risk of its loss with adverse aesthetic consequences for the patient's facial profile (Fára, Hrivňáková, 1965).

The P-T parameter provides the only evidence of the maxilla growing at all in patients with bil CLP. There is a distortion, however, from the non-standard position of the premaxilla, mainly at the beginning of the follow-up period. For that reason, we also measured the Prague group of patients for the length proper of the maxillary segments as such without the premaxilla (from the anterior maxillary poles to the tubera maxillae). This particular dimension cannot, of course, be measured in the controls since the premaxilla is united with the maxillae, and so we compared it with what was an approximately comparable parameter (from the connecting line between the canine tips to that of the two maxillary tubers). The maxilla in patients with bil CLP was found to grow from birth to the age of 10 years at a rate roughly equal to that in the controls. After that age, there is a sudden slow-down in maxillary growth in boys with bil CLP (Peterka, 1979). This means that the congenital hypoplasia of each of the maxillary segments is associated with premature growth arrest. This accounts for the resultant maxillary mass being relatively the least in this particular type of cleft. The presence of gaps between the segments, however, makes the deficit less prominent since it improves the inter-jaw relationships. In the end, this makes treatment for bil CLP a relatively easier affair than in the case of isolated cleft palate.

J. H.

SUMMARY

Plaster-of-Paris impressions of the maxillary palatal parts were made annually in 29 boys with bilateral cleft lip and palate to measure the width-length changes in the size of the upper alveolar and dental arches and to compare them with the controls. Immediately after birth, the upper alveolar arch width-length values in patients with bilateral cleft lip and palate are increased above

the controls. The right and left maxillae are at a distance from each other while the anterio-posterior dimension of the palate is determined by the protruding premaxilla. As a result of the dynamic pressure of the surgically reconstructed lip, its position keeps improving until at the age of 15 years the maxillary length is even smaller than in the controls. Consequently, the maxilla is hypoplastic. A palate operation between the ages of 3 and 4 years brings the two maxillae closer to the midline, rotating them to a certain degree. This results in what is known as maxillary collapse which is the most prominent in the canine region and which takes the adverse from of bilateral cross bite in relation to the lower dental arch. In spite of intensive orthodontic treatment, the complication is impossible to eliminate by the age of 15 years.

RESUME

Le développement de l'arcade alvéolaire supérieure des malades avec le bec-de-lièvre bilatéral total

Peterka, M.

Aux intervalles annuelles, nous avons mesuré des changements de valeur large-longuer de l'arcade alvéolaire supérieure et de l'arcade dentaire de 29 garçons qui souffraient du bec-de-lièvre bilatéral total. Des mesures ont été pratiquées sur des plâtreries, toujours confrontées avec celles de contrôle. Dès naissance, des valeurs large-longuer de l'arcade alvéolaire supérieure des malades souffrants de bec-de-lièvre bilatéral total sont montées au dessus des valeurs de contrôle. Le maxillaire droit a une certaine distance de celui de gauche. La dimension antéro-postérieure du palais est déterminée par un pré-maxillaire avancé. La position de celui-ci est successivement ajustée, en conséquence de pression dynamique d'une lèvre reconstruite opérativement.

Alors, à l'age de 15 ans, la longuer du maxillaire supérieure devient plus courte que celle de contrôle. Le maxillaire est alors hypoplastique. L'opération du palais, exécutée sur un malade de 3—4 ans, fait approcher les deux maxillaires à l'axe central et partiellement cause leur rotation. De cette manière, un soi-disant collapsus du maxillaire supérieur apparaît et culmine dans la région de dents canines. Il se manifeste défavorablement par la denture croisée bilatéralement par rapport à l'arcade dentaire inférieur. Malgré une thérapie orthodontique intensive, on n'arrive pas à éliminer cette complication.

ZUSAMMENFASSUNG

Die Entwicklung des oberen alveolaren Bogens bei Patienten mit beiderseitiger Gesamtspaltung

Peterka, M.

An Gipsabgüssen des Gaumenteils des oberen Kiefers, die bei 29 Knaben mit beiderseitiger Gesamtspaltung in jährlichen Intervallen hergestellt worden waren, haben wir die Breiten- und Längenveränderungen der Grösse des oberen alveolaren und Zahnbogens gemessen und mit einer Kontrollgruppe verglichen. Sofort nach der Geburt sind die Breiten- und Längenwerte des oberen alveolaren Bogens bei Patienten mit beiderseitiger Gesamtspaltung höher als die Werte der Kontrollgruppe. Der rechte und linke Oberkiefer sind voneinander getrennt, und das Ausmass des Gaumens von vorn nach hinten wird von dem nach vorn verschobenen Vorderkiefer bestimmt. Dessen Lage wird infolge des dynamischen Drucks der operativ wiederhergestellten Lippe allmählich geregelt, sodass mit 15 Jahren die Länge des oberen Kiefers sogar geringer

ist als bei der Kontrollgruppe. Demnach ist die Maxilla hypoplastisch. Eine Gaumenoperation im 3.—4. Lebensjahr nähert beide Maxillen der Mittellinie und verdreht sie teilweise. Dadurch entsteht der sogenannte Kollaps des Oberkiefers, der im Gebiet der Eckzähne am grössten ist und sich als beiderseitig sich kreuzender Zahnreihenschluss gegenüber dem unteren Zahnbogen ungünstig äussert. Trotz intensiver orthodontischer Behandlung gelingt es bis zu 15 Jahren nicht, diese Komplikation auszuschalten.

RESÚMEN

El desarrollo del paladar en pacientes con escición palatina bilateral

Peterka, M.

Por medio de vaciados en yeso del maxilar, hechos en intervalo de un año en 29 muchachos con escisión completa, hemos medido los cambios de la longitud y amplitud de la parte palatina y dental del maxilar, comparándolos con el control. Inmediatamente después del nacimiento el ancho y largo de la parte alveolar del maxilar en estos pacientes es mayor de lo que arrojan los tamaños del control. El maxilar derecho e izquierdo están alejados, uno del otro, la distancia entre la parte delantera y trasera del paladar está determinada por el premaxilar prognato. Suposición se va corigiendo poco a poco debido a la presión dinámica del labio reconstruido en forma operatoria, de manera que a los quince años de edad la longitud del maxilar resulta incluso menor que la de los controles. El maxilar por tanto resulta hipoplástico. La operación del paladar entre los tres y cuatro años de edad hará que se acerque los dos maxilares hacia la linea media adquiriendo una rotación parcial. Como consecuencia se produce el llamado colapso del maxilar, siendo de mayor intensidad en la zona de los caninos, manifestándose como forma desfavorable como mordida cruzada bilateral en relación con la mandíbula. A pesar de un intenso tratamiento ortodóntico no se logra eliminar esta complicación antes de los quince años de edad.

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EXPERIENCE WITH TRAPEZIUS MYOCUTANEOUS AND OSTEOMYOCUTANEOUS FLAPS

M. KENYERES

Several kinds and modifications of the trapezius myocutaneous and osteomyocutaneous flaps have already been described. These can be broken down into five subgroups:

1. Longitudinal flap. The first report about this particular variety came from McGraw et al. However, we do not regard it as a genuine myocutaneous flap since it contains muscle only in its pedicle. It receives its blood supply from the occipital and posterior auricular arteries. These vessels are often ligated while performing a radical neck dissection because they run right across the uppermost part of the operating field containing Ducuing's glands. That is why the method is seldom used in head and neck surgery. The only report about the use of this flap, apart from the original, was published by McInnis and his co-workers.

2. Lateral flap. This is the most widely used flap. The first publication on it was by Demergasso and Piazza, followed by reports by Bertotti, Panje, Gantz and Panje, and, lately, by Shapiro. These flaps are supplied from the lateral branch of the superficial or transversal cervical arteries and veins. The area designed for transplantation stretches from the point of the entry of the vessels to the acromion, and from the anterior border of the trapezius to the scapular spine.

3. Trapezius osteomyocutaneous flap. This is really a variety of the lateral flap, differing from the former in that it contains a part of the scapular spine. Panje and Cutting were the first to use it for the reconstruction of the anterior part of the floor of the mouth. The necessary bending of the bone was achieved by cutting out small triangles from the inner surface of the spine. Guillamondegui and Larson reported about a modification of the original method using the natural curvature of the acromion for mental arch replacement. Transplantation of the outermost part of the scapular spine and acromion is possible on the above mentioned pedicle as those parts of the shoulder blade are supplied from the trapezius muscle. Our department recently developed a new fashion of the osteomyocutaneous flap containing the innermost quarter of the scapular spine in conjunction with a triangular piece

of the medial border of the shoulder blade for replacing the lateral orbital wall malar bone zygomatic arch and the covering soft parts.

4. Transversal flap. This variety was first described by Kenyeres and Tucker. The blood supply comes from the transversal cervical vessels, too, but the flap axis follows the direction of the main artery and vein between the root of the neck and the medial border of the shoulder blade. The muscle and covering skin planned for transfer is about 10 cm in length, and 6 cm in width.

5. Lower trapezius flap. This variety was first described by Baek and co-workers. In the same year, Mathes and Nahai reported to have developed a similar method. There is some confusion as to where this flap is supplied from. According to the original description it receives its blood supply from the descending branch of the transversal cervical artery and accompanying veins, but these vessels do not run pass beneath the trapezius but, as a matter of fact, between the thoracic wall and the rhomboids. In our view the flap is supplied from the intra- and submuscular branches of the superficial or transversal cervical arteries. The flap can be transferred but only along with a strip of the trapezius containing the vessels. The transplant area lies between the medial border of the shoulder blade and the spine corresponding to the lower part of the muscle.

MATERIAL AND METHODS

Our own experience is with the transversal, lateral and osteomyocutaneous flaps. Our department performed ten reconstructions using those methods as primary and secondary procedures. All but one were successful. The only failure was due to serious wound infection in the region of the vascular pedicle in a severely burned patient. The salient features of the reconstruction are summarized in Table 1. Six of our patients were oncological cases where primary reconstruction of extensive resection defects was called for. The other four were facial injuries demanding secondary procedures because of major tissue loss causing aesthetic and functional impairment.

Trapezius flaps are available in combination with other plastic procedures, which is why we used them together with pectoralis and latissimus dorsi myocutaneous flaps, as well as with scalp sickle flaps.

The lifting of trapezius flaps pedicled on the transversal cervical vessels always begins with the exposure of the supplying artery and vein. In our first surgical operations, this proved a very time-consuming procedure as we endeavoured precise dissection. As we gained more experience we realized this was superfluous because of the numerous variations of the transversal cervical vein and the two main versions of arterial supply. Those findings were corroborated by the recent anatomical studies conducted by Goodwin and Rosenberg. Since all the components of the vascular pedicle lie between the superficial and deep cervical fascia, we perform the dissection as follows:

A transverse incision is made on the lateral surface of the neck through the skin platysma and fascia in the medial third of the supraclavicular triangle.

Care is needed to keep the external jugular vein unhurt in its lower part. Next comes the exposure of the posterior belly of the omohyoid muscle. We make an incision parallel with the upper edge of the muscle and mobilize the fibro-fatty tissue above the deep fascia separating it from the sternomastoid up to the anterior border of the trapezius 3 cm wide. This bundle certainly contains all the vascular components needed to supply the flap. This kind of dissection of the pedicle is far quicker; in addition, it also helps to avoid injury to the vessels.

Table 1

Type of flap	Indication		Primary reconstr,		Secondary reconstr,		Compli-cations
	Neo-plasm,	Trauma	Neo-plasm,	Trauma	Neo-plasm,	Trauma	
Longitudinal	—	—	—	—	—	—	—
Lateral	2	—	2	—	—	—	—
Osteomyocutan,	2	4	2	—	—	4	1 infection. flap loss
Transversal	2	—	2	—	—	—	—
Lower	—	—	—	—	—	—	—
Total	6	4	6			4	1
	10		10				

Mobilization of the pedicle is followed by the lifting of the flap proper. At this point comes the question of which flap is the more suitable in the given case. Obviously, the higher the defect is situated, the longer the pedicle should be. For that reason, in some case part of the flap skin can be removed leaving the subcutaneous tissue intact. In this way, part of the muscle helps to lengthen the pedicle, too. Using this manoeuvre, the longitudinal axis of the flap itself will be shorter unless a "lower flap" is dissected. In our view, the "transversal" and "lateral" flaps are equally useful for the reduction of defect not bigger than 8 by 10 cm, and not more distant than the upper temporal line or the chin. For tissue losses as high as the front, a "lower flap" can be applied. In cases where replacement of a part of the facial skeleton is also necessary, an osteomyocutaneous flap should be used. The bony component of the tissue complex is released after the dissection of the myocutaneous island from below with a vibratory saw and chisel after pushing away the infraspinous muscle with a raspatory. It is advisable to fix the soft parts to the bone by several stitches in order to prevent their shearing off.

The flap is advanced to position mostly through a subcutaneous tunnel. In high localized defects, it is advisable to make auxiliary incision through the wall of the tunnel to facilitate the pulling through of the tissue complex.

The flap is subsequently sewn onto the defect by means of interrupted suture. In our opinion, there is mostly no need to sew the muscle in a separate layer except when a cavity wall is reconstructed. In osteomyocutaneous flaps, the firm wiring of the bony part to what has remained of the facial bones is essential.

CASE REPORTS

We think it useful to illustrate our experience by reporting on some cases, in which various kinds and combinations of the trapezius flap were used.

Case 1. A male patient, aged 74, was operated on repeatedly for multiple basalioma around the ear and the left temple. On admission, an extensive scarred field was found stretching from the temple to the pre- and postauricular region containing many tumorous foci. Intraparotid propagation was also noticeable causing peripheral facial palsy. For that reason, compound resection of the skin, parotid gland, pinna, external auditory canal and the temporal fossa was performed. The resulting defect was reduced with a transversal myocutaneous flap combined with a scalp sickle-flap. The postoperative course was uneventful, and resulted in fair healing (Fig. 1).

Case 2. The patient, a 72-year old man, was admitted for a huge squamous cancer on the posterior surface of the pinna involving the postauricular skin and the cartilaginous part of the external auditory meatus. The surgery consisted of the combined resection of the pinna, periauricular skin, the mastoid cortex, the ear canal, and the superficial flap of the parotid along with a simultaneous reconstruction, using a lateral trapezius flap. The wound healed by first intention, and no anomalies in the facial movements could be observed (Fig. 2).

Case 3. A male patient, aged 59, was admitted because of radiation failure involving a T_4N_1 paralingual squamous cancer of the lefthand side. The tumour had invaded the mandibular arch, too. The skin on the neck was severely damaged by irradiation. A combined resection was performed including the neck skin, the cervical block, and the remaining two-thirds of the mandible. Subtotal glossectomy and horizontal resection of the larynx were made, too. The resulting large defect was reduced with the use of a trapezius osteomyocutaneous flap of the Guillamondegui-Larson type to reconstruct the floor of the mouth and the arch of the mandible. The external cover was made from a latissimus dorsi myocutaneous flap shaped and transferred according to our own method. After an uneventful recovery, the patient regained his ability to speak and to swallow with the aid of the bulky trapezius flap within a month (Fig. 3).

Case 4. The patient, a man of 57, suffered from a T_4N_1 leftsided paralingual squamous tumour similar in size to that in case No. 3. Previous massive irradiation also damaged the neck skin. The same kind of resection was per-

Fig. 1. a) Case 1. Delineation of the site planned for resection, and a transversal trapezius myocutaneous flap. b) Full extent of the resection. c) Defect reduced by trapezius flap with a scalp sickle flap. d) Side view of patient two months after surgery

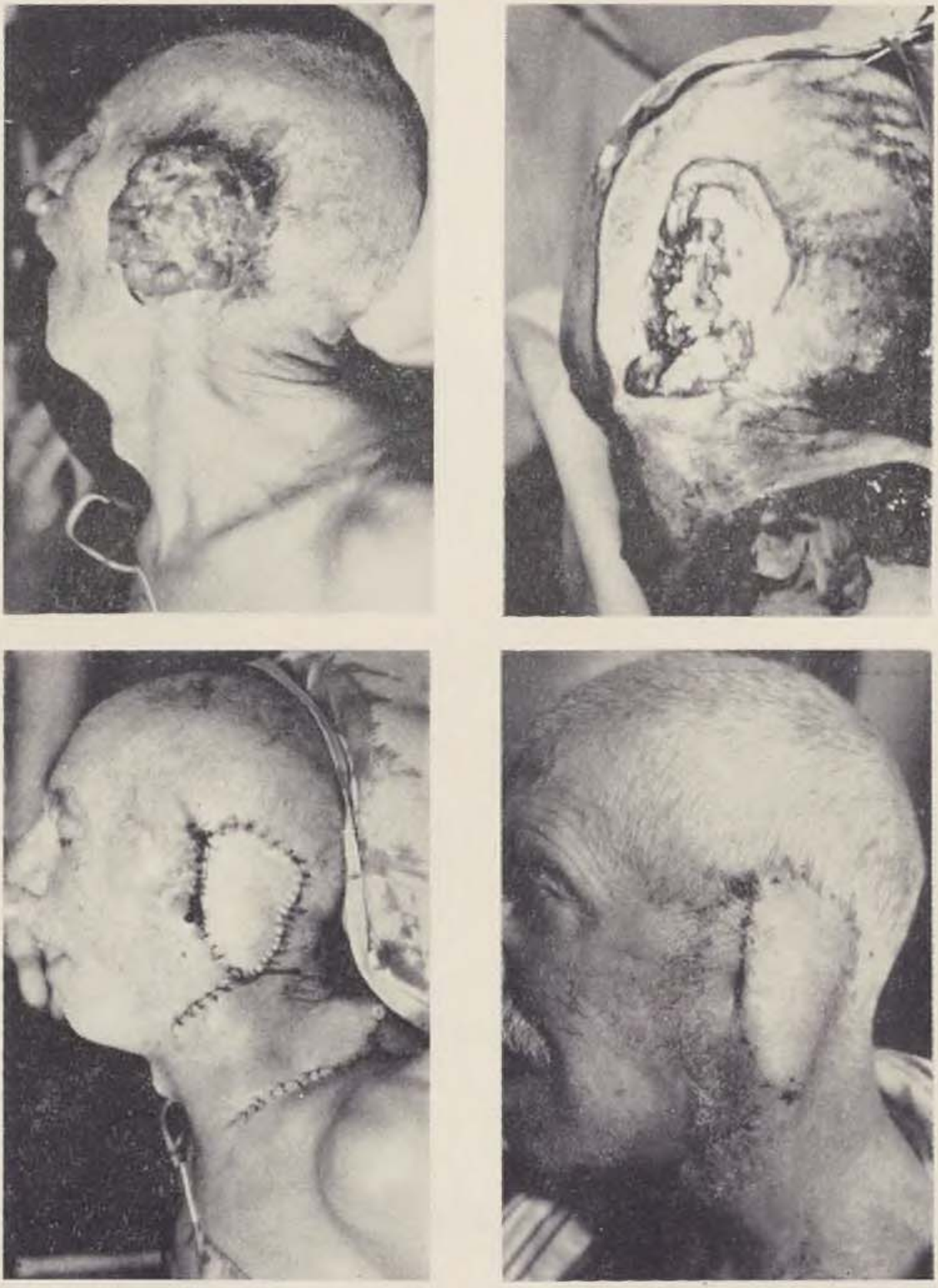

Fig. 2. a) Case 2. Huge retroauricular squamous tumour. b) Resection completed including parotidectomy and upper neck dissection. c) Tissue loss reconstructed with a lateral flap. d) Close-up of healed flap one month postoperatively. Residual external auditory canal is patent

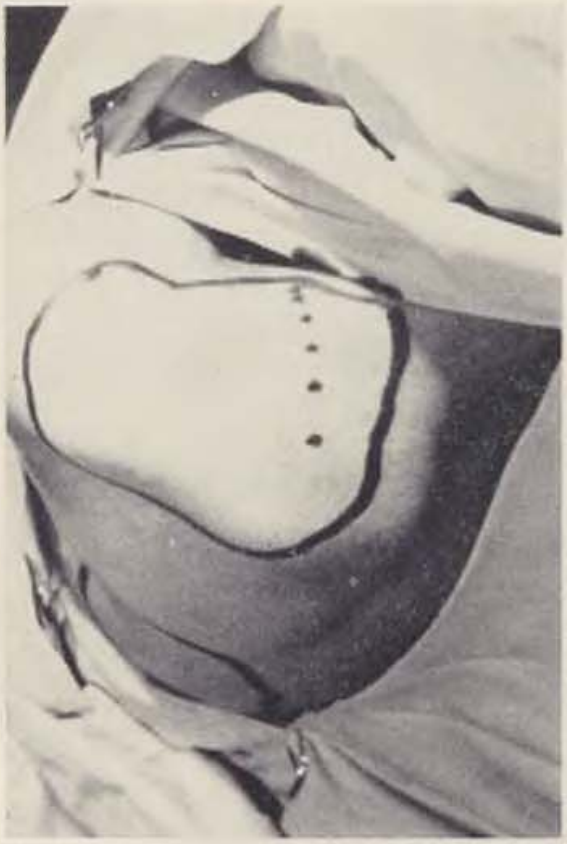

Fig. 3. a) Case 3. The combined use of trapezius osteomyocutaneous with latissimus myocutaneous flap. Delineation of flaps. b) The osteomyocutaneous flap lifted free. Scapular spine and acromion are well visible on its lower aspect. c) Subtotal mandibulo-glossectomy and resection of the soft parts of the neck completed

Fig. 3 d) Side view of patient two months after surgery. Not the excellent facial contour and the well healed latissimus flap used for external cover. e) Anterior view of the same patient. f) The bulky trapezius osteomyocutaneous flap replacing the tongue

formed as described above but the reconstructive phase was different using a pectoralis myocutaneous flap for external cover in addition to a trapezius osteomyocutaneous flap. This case was also successful with the patient being able to swallow and to speak within a month (Fig. 4).

Case 5. This 25-year old male patient lost his chin in consequence of a gunshot. At the time of primary would care, he had a piece of the 7th rib transplanted. On admission to our department, a short scarry chin was noticeable with the vermilion border pulled downward. An osteomyocutaneous flap was used containing the acromion for chin replacement along with a lip lifting technique with Joseph's nasolabial flaps (Fig. 5).

Fig. 4. a) Case 4. Trapezius osteomyocutaneous flap combined with pectoralis myocutaneous flap. Design of the flaps. b) At the end of resection with forces holding the larynx. c) Side view of patient two months after surgery. c) Osteomyocutaneous flap providing a good mandibular contour. d) Front view of case 4

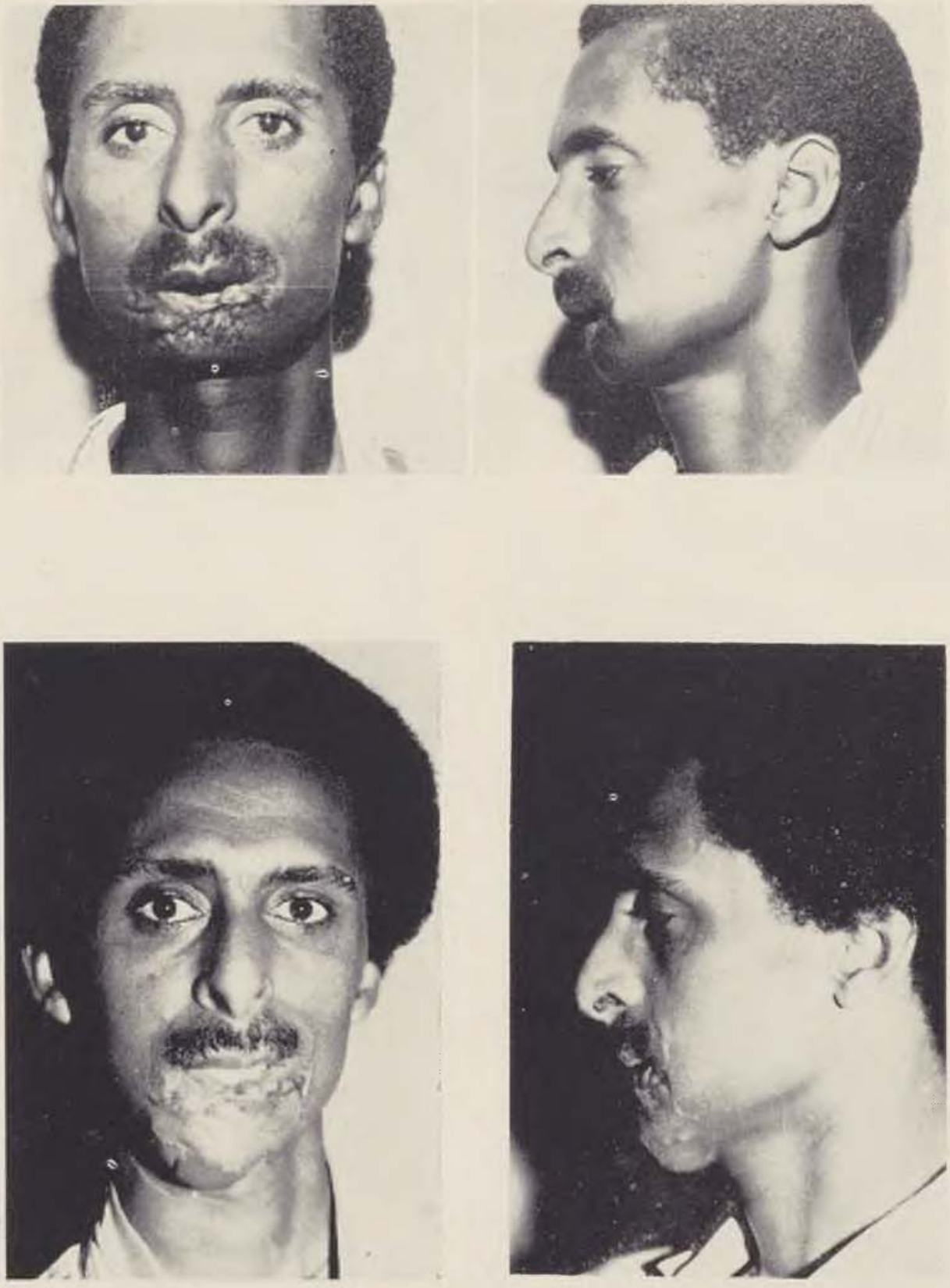

Fig. 5. a) Case 5. Patient lost his chin due to gunshot injury. Front view. b) Side view. c) Front view one month after surgery. The chin is replaced with an osteomyocutaneous flap containing the acromion, the lower lip lifted with Joseph's flaps. d) Side view of same patient one month after surgery

Fig. 6. a) Case 6. Patient lost his zygomatico-malar complex and lateral orbital wall. Side view. b) Front view. c), d), e) Two months after replacement of missing facial parts with an osteomyocutaneous flap. Upper lid lifting surgery was performed by Dr. Tury, an ophtalmologist. Patient was fitted with an eye prosthesis

Case 6. This man, aged 26, suffered a serious injury of the right-hand face caused by the blast of a shell. He lost his right bulb, the malar bone, the zygomatic arch and the surrounding soft parts. Primary wound care resulted in deep scars healed on second intention. Rehabilitative surgery consisted in the excision of the scars, and replacement of the lateral orbital wall and zygomatic arch with an osteomyocutaneous flap containing the medial border of the shoulder blade and scapular spine (Fig. 6).

Fig. 6 e)

DISCUSSION

The trapezius myocutaneous and osteomyocutaneous flaps proved to be very useful tools in head and neck reconstructive surgery. Using those methods, the surgeon has to bear in mind the following conditions to achieve the desired result:

1. The flap size should not be larger than 8 by 10 cm.

2. The most distant point of the defect planned for reduction must not exceed the chin anteriorly, or the superior temporal line vertically. For reconstruction of more distant sites, the "lower" flap is available only.

3. The muscular part of the flaps will become thinner because it is rarely possible to preserve their innervation.

4. The use of flaps pedicled on the transversal cervical vessels is contraindicated if supraclavicular metastases are present.

J. H.

SUMMARY

The author gives account of his experience with four myocutaneous and six osteomyocutaneous trapezius flaps pedicled on the transversal cervical vessels. He describes a quick and simple method for the dissection of the pedicle, and reviews the indications for and limitations of the various procedures.

RESUME

Les expériences avec un greffon dermo-musculaire ou osseux-dermo-musculaire du muscle trapèze

Kenyeres, M.

L'auteur présente ses expériences avec 4 lambeaux dermo-musculaires et avec 6 lambeaux osseo-dermo-musculaires. Il s'agit des lambeaux du muscle trapezius dont des pédicules sont formés des vaisseaux transversaux du cou. Une méthode de résection du pédicule est décrite, distinguée par sa simplicité et sa vitesse. On révise des indications et des moments limitants pour des procédés variés.

ZUSAMMENFASSUNG

Erfahrungen mit einem Haut-Muskel- und Knochen-Haut-Muskel-Transplantat m. trapezius

Kenyeres, M.

Der Autor bietet seine Erfahrungen mit 4 Haut-Muskel- und 6 Knochen-Haut-Muskel-Lappen des m. trapezius an einem Stiel aus transversalen Halsgefässen. Es wird die rasche und einfache Methode der Dissektion des Stiels beschrieben. Ferner werden die Indikationen revidiert und die limitierenden Momente der verschiedenen Methoden.

RESÚMEN

Experiencias con el trasplante dermomuscular y óseo-dermomuscular del m. trapezius

Kenyeres, M.

El autor presenta sus experiencias con cuatro trasplantes dermomusculares y seis óseo-dermomusculares del m. trapezius en el pecíolo de vasos transversales yugulares. Se describe un rápido y simple método de disección del pecíolo. Se revisan las indicaciones y limitantes de variados procedimientos.

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SURGICAL TREATMENT FOR PIGMENTED NAEVI

Y. CHERVENKOV

Regardless of the fact that a number of authors classify pigmented naevi into dangerous and non-dangerous ones depending on the presence of melanoma, we believe them to be an indication for surgical treatment not only from the oncological but also from the aesthetic points of view. Dermatological surgery as proposed and used by I. I. Kolgunenko (1974), E. Epstein (1962) and O. Diez (1962) includes electrosurgery, dermabrasion, cryodestruction and chemodestruction. In our opinion, none of those methods can ensure radical and satisfactory results as pigmented naevi are in any case indication for excision and skin plastic operation. In cases of naevi restricted to a limited area, methods of local plastic reconstruction can be used depending on the localization of the naevus. In cases where extensive excision is called for, however, the most frequent procedure is one of the naevus being replaced by a free skin graft. The excision should under all circumstances be made in a single operation with the naevus integrity preserved. We regard as incorrect multistage excisions as used by some surgeons in cases of extensive naevi.

Depending on the scope of use, we recommend the folowing classification of surgical operations for pigmented naevi:

1. circumscribed naevi permitting single-time removal and defect replacement with local tissue,

2. pigmented naevi extending over a significantly large area and not permitting the defect to be covered with local tissues after radical excision. The alternative there is the use of a free skin graft,

3. giant pigmented naevi where single-time excision with simultaneous free skin graft coverage is physiologically ruled out for its gravidity.

In the first group of pigmented naevi we can use different method of local skin plastic reconstruction with the size, shape and localization of the naevus as the crucial factors. The surgeon's decision must depend on those factors.

In the second group of pigmented naevi, the skin defect resulting from the excision is covered with a free skin graft. Depending on the patient's age, 0.2 to 0.5 mm thick dermatome transplants are the most frequent choice.

The youngest patient operated on with that method is 8 months old. Pigmented naevi encircling an extremity in a ring-like fashion present a particularly interesting problem. In such cases, excision is performed without breaking the naevus integrity by separation and removal in the form of a "sleeve".

Fig. 1, 2 — Hair-covered pigmented naevus encircling in a sleeve-like fashion the root of the right hand

Depth-wise and width-wise, the excision should go as far as intact tissue. This can be seen in the following patient: an 18 year old man, case record No. 1014/May 10, 1971, suffering from a congenital haired pigmented naevus encircling the root of the right hand (Fig. 1 and 2). Excision was performed covering the full depth and width of the naevus without breaking its integrity. The resulting defect was peeled off like a "sleeve" and immediately covered with a free skin graft (Fig. 3 and 4).

In the third group of patients we made use of our own method permitting a single-stage removal of large pigmented naevi, complete ablation and sufficient radicality, and conducive to satisfactory aesthetic and functional results without scar formation and depigmentation. The surgical treatment con-

Fig. 3, 4 — Excision performed without breaking the naevus integrity; removal of the defect and coverage with a free skin graft

sists in the single-stage removal of the giant naevus in full thickness and width, and in the subsequent coverage of the resulting skin defect with a skin allograft. 5 to 8 days later, when the patient's general condition and his paraclinical parameters have been stabilized, the allografts are replaced in one or two steps with autografts. The proposed method is illustrated by the following observations: a four-year old child, clin. rec. N. 10314/May 30, 1977.

Multiple congenital naevi pigmentosi pilosi covering the whole body, one of them involving the whole of the left arm as seen in Fig. 5. The giant naevus was surgically removed 2 cm in width and rechain down to the muscular fascia, and taken away like a sleeve with its integrity intact, (Fig. 6 and 7).

Fig. 5 — Large naevi pigmentosi pilosi all over the body

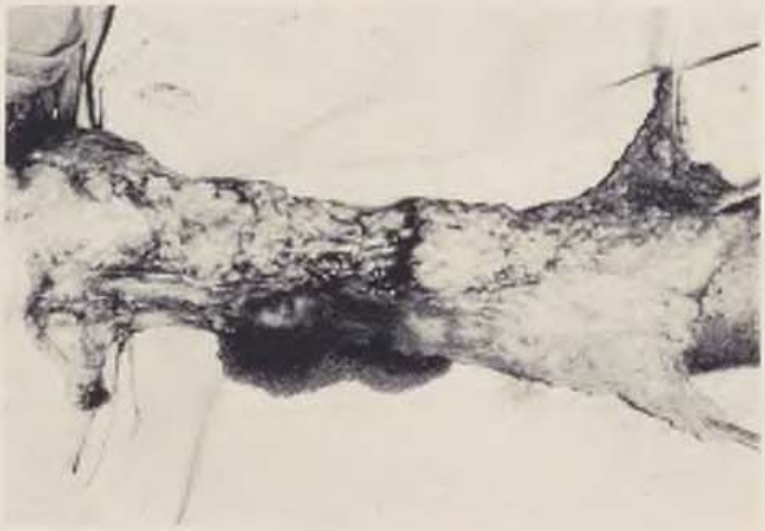

Fig. 6, 7 — Giant naevus surgically removed a peeled off like a sleeve without breaking its integrity

The resulting skin defect was immediately covered with skin allotransplants fixed with tissue cement (Fig. 8). The allotransplants healed in all over the area. Following a two-stage transfer of a free skin autograft, the condition of the upper extremity is now fully restored.

J. H.

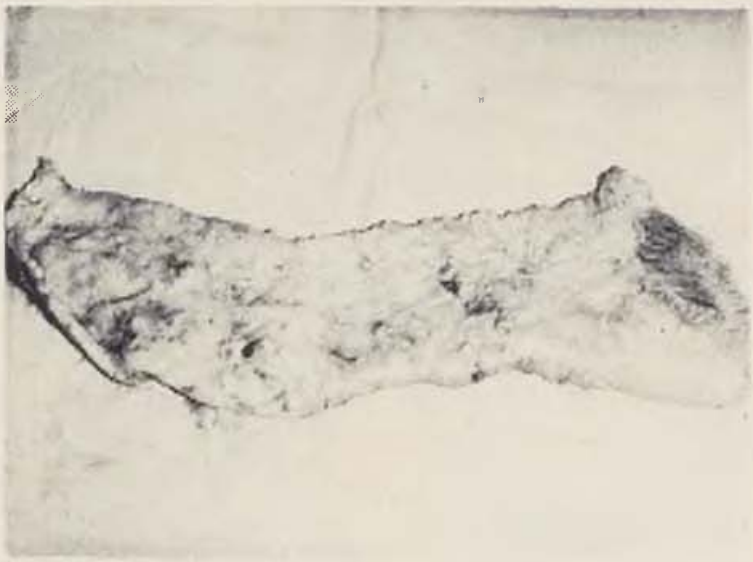

Fig. 7

Fig. 8 — Skin defect coverage with skin allografts

SUMMARY

Method of skin plastic surgery for the treatment of pigmented naevi permit radical excision and ensure satisfactory aesthetic results. The author's own method of single-step removal of giant pigmented naevi with the defect im-

mediately covered with skin allografts and with the use of skin autografts after the patient's condition has stabilized permits the ablation of very large naevi. The method also alleviated the trauma of surgical operation.

Fig. 9 — Post-operative state

RESUME

Le traitement opératoire des naevi pigmentaires

Chervenkov, J.

Au traitement des naevi pigmentaires, l'utilisation des méthodes de la plastie cutanée rend possible l'excision radicale et assure de bons résultats esthètiques.

Notre méthode consiste dans l'élimination des naevi pigmentaires géants qui est immédiatement suivie du recouvrement de la plaie par une homogreffe cutanée, en une seule étape. Les autogreffes cutanées sont utilisées après la stabilisation de l'état. La méthode permet l'élimination de vastes naevi et restreint le trauma opératoire.

ZUSAMMENFASSUNG

Operative Behandlung pigmentierter Naevi

Tscherwenkow, J.

Die Anwendung der Methode der Hautplastik bei der Behandlung pigmentierter Naevi gestattet ihre radikale Exzision und gewährleistet gute asthetische Resultate. Die von uns eingeführte Methode der Beseitigung grosser pigmentierter Naevi in einer Etappe unter sofortiger Deckung des Defekts mit einem Hautallotransplantat und unter Anwendung von Hautautotransplantaten nach der Stabilisierung des Zustands gestattet es, auch ausgedehnte Naevi abzutragen. Diese Methode vermindert das Trauma operativer Eingriffe.

RESUMEN

Tratamiento operativo de los nevos pigmentarios

Chervenkov, J.

La utilización de los métodos de plástica dermal en el tratamiento de los nevos pigmentarios posibilita implementar una excisión radical garantizando buenos resultados estéticos. Nuestro método consiste en eliminar, en una sola etapa, los gigantescos nevos pigmentarios, cubriéndose inmediatamente el defecto con un alotransplante dérmico y utilizándose autotransplantes dérmicos como estabilizadores del estado. Este método posibilita eliminar nevos de gran envergadura reduciendo al mismo tiempo el trauma producto de la intervención operativa.

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TRANSPOSITION OF FLEXOR TENDONS ON THE HAND

J. JAKUBIK

Restoration of active flexion in a triphalangeal finger or in the thumb where loss of flexion is a late result of flexor tendon injury in that region is a challenging task, indeed. A successful management of the problem places great demands on the surgeon's erudition just as much as on rehabilitation care, and on the patient's willpower and effort. In the present report I wish to make a few comments on what are fairly familiar facts.

Superficial flexor tendon transposition into an afunctional neighbouring or remote finger is a reconstruction method routinely performed at specialized surgical units. It is, in fact, a logical exploitation of the fact that active finger flexion will remain practically unaltered even if only one tendon is involved. Nature itself seems to have offered us scope for an advantageous method of reconstruction. We can also exploit our knowledge of the fact that most patients manage to adapt to the situation and gradually to control the superficial flexor albeit transposed to a new function.

The use of this method ought to be considered in any situation where tendon transplant transposition into the finger flexor region offers itself as an alternative. This is where, I believe, tendon transposition has a better chance of success. If, however, a silicon implant is planned with the intention to transplant the tendon at another time, the chances become level if, indeed, a two-phase transplantation is not the better option.

For however effective and attractive a method of reconstruction it may appear, tendon transposition is not without problems. These could be divided into two groups, one hidden in the pitfalls of the method as such, the other arising from the anatomical situation.

As regards the operation as such: by pulling the tendon out of the finger and separating from the vincula we considerably impair its nutrition. We have to mobilize it high up into the palm. It could be said then that by the nature of its blood supply it becomes more like a free transplant. This is a significant factor of great relevance for post-operative rehabilitation care. I am definitely in favour of early post-operative rehabilitation following flexor tendon surgery, even in situations like that. Rehabilitation is commenced on the very

first post-operative day since we know that adhesions may develop within 24 to 48 hours, thus definitively influencing the result for the worse. The rehabilitation nurse, however, must be thoroughly informed on the situation (we often invite her to the operating theatre during the transposition surgery to make her see which tendon she is going to train) so that she can conduct her rehabilitation effort sensitively and conscientiously and so that she may cope with any adverse situation that may arise, such as finger oedema or crepitation during exercise. This is where the amount of exercise should be reduced, where ketazon should be given locally and systematically, and where caution is called for.

In my view, unless early rehabilitation is ordered in the transposed tendon, and if, on the contrary, it is immobilized for 1 to 2 weeks, rehabilitation has a worse chance of success than in single-time tendon transplantation. The reason: the transplant is exercised by the original muscle, whereas a transposed superficialis, apart from its own adhesion, is handicapped by the retraining of its function.

The transposed tendon is unlikely to snap of it crepitates during exercise, rather it may become detached from its new insertion. Hence the importance of a thoroughly inserted cross stitch with green silon and, sometimes, a few black stitches on top of that (in a new insertion). The cross stitch should be left in position for 3 to 4 weeks though the points of insertion in a suture knotted across the fingernail ought to be protected against infection, or else the whole yellow cottonwool pad, which the suture is sometimes knotted across.

Other pitfall may sometimes hide in the transposed tendon itself if it is shifted too far to the periphery and too tight in a string-like fashion. Such tautness may jeopardize blood supply to the overlapping skin cover, if it is — as it often is, indeed — riddled with scars, of poor quality, and ischaemic. For that reason, wherever possible, the transposed tendon should be introduced into a tunnel created with a small pean forceps out of little cross incisions in the flexion creases. Unless this method is feasible, the transposed tendon should be held to the base by means of a **freely** inserted U-shaped strong catgut suture, or by means of the mattress suture acting as a kind of attachment.

If a dehiscence develops over the transported tendon or even skin necrosis, there is no longer a hope of success. Hence the caution called for in handling the skin cover during the operation.

Another point to be stressed is that in the detachement of the superficial flexor branches from their insertion we should have good access, respect their insertion nearly all along the medial phalanx, and make good use of the whole of it, and also that we should use the finest surgical means — otherwise the cross suture will soon cut through the contused tendinous tissue, and become detached in early post-operative rehabilitation.

The other group of problems arises from the anatomical situation. The transposed tendon has to be pulled through a tunnel beneath the small muscles of the hand (lumbricals) and beneath the local vessels and nerves. The artificial tunnel which the tendon subsequently passes through is a source of in-

tensive adhesions. The making of a tunnel may in itself have an adverse effect on the function of that finger which the lumbrical belongs to.

Another anatomical consideration is that the transposed tendon takes a bayonet-like course, and tends to straighten out in action. Thus a focus of permanent irritation develops at the site of flexure.

Those two circumstances become prominent particularly in transposing the index flexor tendon to the thumb.

No more details are needed here as they might seem too subjective. What should be stressed, however, is the tremendous importance of correct rehabilitation, for it takes as great a share in a successful outcome as that of correctly performed surgery itself. J. H.

SUMMARY

Transposition of a healthy finger superficial flexor tendon to a neighbouring finger with post-traumatic loss of flexion is an alternative reconstructive operation using a tendon transplant (usually autotransplant of the m. palmaris longus tendon). If a silicon temporary tendon implant is used for the transplant operation and if it is performed in two stages 3 to 6 months apart, then the chances of success are about equal for both transposition and transplantation. The former has advantages as well as disadvantages. The advantages include a relative simplicity of the operation, the gain of a therapeutic effect without any hand function interruption, and the possible attainment of satisfactory results in a short time. The pitfalls are in the danger of interference with blood supply to the tendon transposed or its rupture, the cutting through of the anchoring suture during rehabilitation, the development of excessive tautness in the tendon, etc. The author discusses some of the technical details of transposition, drawing attention to some of the moments connected with the operation.

RESUME

La transposition des tendons de fléchisseurs de la main

Jakubík, J.

L'opération reconstructive qui consiste en greffer le tendon (la plus fréquente est l'autogreffe du tendon de m. palmaris longus) au doigt manquant de flexion à cause d'un trauma, peut être alternée par une intervention qui se base sur la transposition du tendon de fléchisseur superficiel d'un doigt sain de voisinage au doigt atteint.

Si l'on réalise la greffe en deux étapes, avec 3—6 mois d'intervalle, utilisant un implant tendieux provisoire en silicone, on peut considérer des chances des deux opérations (greffe, transposition) équivalentes. C'est à dire, la transposition du tendon de fléchisseur présente nen seulement des avantages, mais aussi des inconvénients. Parmi ses avantages on peut nommer: facilité relative de réalisation, effet thérapeutique sans une moindre altération du fonctionnement de la main, bon résultat obtenu dans peu de temps. Ses inconvénients sont, au premier, danger de troubles d'alimentation sanguine au tendon transposé, possibilité de rupture du tendon transposé, suture d'ancre coupée au cours de rééducation, possibilité d'apparition de la corde tendineuse etc.

L'article fait connaître quelques détails techniques de la transposition et avertir des moments décisifs d'intervention.

ZUSAMMENFASSUNG

Die Transposition der Sehnen der Flexoren an der Hand

Jakubík, J.

Eine Transposition der Sehne des Oberflächenbeugers eines gesunden Fingers in den benachbarten Finger mit posttraumatischem Ausfall der Flektion ist eine alternative Rekonstruktionsoperation mit Hilfe eines Sehnentransplantats (am haufigsten eines Autotransplantats der Sehne des m. palmaris longus). Wenn wir bei einer solchen Transplanation ein provisorisches Silikon-Sehnenimplantat verwenden und also die doppelte Zeit mit einem Intervall von 3 bis 6 Monaten benötigen, so sind die Aussichten auf einen Erfolg sowohl bei der Transposition als auch bei der Transplantation ungefähr gleichwertig. Eine Transposition der Sehne des Flexors hat nämlich einerseits Vorteile und andererseits Nachteile. Zu den Vorteilen gehören die verhältnismässig einfache Intervention, das Erzielen des therapeutischen Effekts ohne jedwede Storung der Funktion der Hand, die Möglichkeit eines guten Ergebnisses in kürzester Zeit. Nachteile sind vor allem die Möglichkeit einer Störung der Versorgung der transponierten Sehne mit Blut, die Möglichkeit einer Ruptur der transponierten Sehne, die Möglichkeit eines Durchschneidens des Ankerstichs während der Rehabilitation, die Möglichkeit des Entstehens eines Bogens der Sehne usw.

Ferner wird auf einige technische Details der Transposition hingewiesen und auf manche Momente aufmerksam gemacht, die mit der Operation zusammenhängen.

RESÚMEN

Trasposición de los ligamentos de los flexores en la mano

Jakubík, J.

La trasposición del ligamento del flexor superficial del dedo sano al dedo vecino con la desaparición postraumática de la flexión, es la alternativa de una operación reconstructiva por medio de un trasplante del ligamento (generalmente el trasplante del ligamento m. palmaris longus). Si para este trasplante utilizamos un implante temporal ligamentoso de silicona efectuándolo dos veces con un intervalo de 3—6 meses, resulta igualmente exitosa la trasposición como la trasplantación.

La trasposición del ligamento del flexor presenta tanto ventajas como desventajas. Es una ventaja la relativa facilidad de la intervención, un efecto terapéutico exitoso sin que se afecte la función de la mano, así como la posibilidad de conseguir buenos resultados en breve tiempo. La desventaja consiste ante todo en la afectación del ligamento con el abastecimiento de sangre, la posibilidad de ruptura del ligamento traspuesto, cortaduras en la sutura de anclaje durante la rehabilitación, la posibilidad de que el ligamento presente una tensión en forma del arco, etc.

A continuación en el artículo, se señalan algunos detalles técnicos referentes a la trasposición así como algunos problemas relativos a la intervención.

Reference available at the author's.

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This interdisciplinary Conference will be a follow-up to the basic science one held in January, 1982, but will emphasize clinical science aspects of bone growth. A primary objective of the Conference again is to update and integrate our understanding of the growth of bone with new knowledge and to offer directions for future clinical research. The content will cover factors and mechanisms which influence both normal and abnormal prenatal and postnatal bone growth, both general and craniofacial, from the subcellular to the gross level. Clinical experimental approaches to bone growth will be emphasized, limited attention will be given to basic science aspects. Titles and 100 to 200 word abstracts in English are solicited from various clinical and other biological disciplines including but not limited to anthropology; oral, maxillofacial and plastic surgery; orthodontics; orthopedics; pediatrics and pedodontics.

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STOP FOR A MOMENT AND CONSIDER YOUR HEALTH

DAY AFTER DAY AND YEAR AFTER YEAR YOU ARE CONSTANTLY CHASING SOME AIM OR ANOTHER, YOU STRETCH THE MAINSPRING OF YOUR HEALTH TO THE VERY MAXIMUM. AND HOW LONG DO YOU THING YOU CAN CONTINUE TO DO SO? REMEMBER THAT YOU HAVE ONLY ONE HEALTH AND FINALLY MAKE UP YOUR MIND TO GRANT IT, AT A VERY REASONABLE PRICE, WHAT IT DESERVES: COMPLEX TREATMENT AT ONE OF THE OLDEST AND THE MOST WIDELY RECOGNIZED SPAS IN EUROPE.

CZECHOSLOVAK SPAS — OASES OF HEALTH,
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