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EVALUATION OF EXPANDED POLYTETRAFLUOROETHYLENE (E-PTFE) AND AUTOGENOUS FASCIA LATA IN FRONTALIS SUSPENSION

A comparative clinical study

H.-P. ZWEEP, (1), P. H. M. SPAUWEN, (2)

INTRODUCTION

Patients suffering from congenital or acquired ptosis palpebrae superioris are mainly treated by frontalis suspension (1). Thus far the use of autogenous fascia lata gives the best cosmetic and functional results (2).

However, autogenous fascia lata has some disadvantages, such as prolonged operation time, additional wound for taking the graft, additional scar and difficulty in obtaining sufficient quantity and length in children less than 3 years of age (3, 4). Therefore other suspensory materials have been tested in the past, including allogenic fascia lata, silk and synthetic materials, such as nylon and silicone, all of them leading to inferior results as compared to autogenous fascia lata (5, 6).

However, two studies report successful application of the synthetic material expanded polytetrafluoroethylene (ePTFE) soft tissue patch* in frontalis suspension (3, 7). PTFE is a synthetic microporous polymer, comprised of nodes interconnected with multidirectional fibrils. This material is inert, induces little foreign body response, is biocompatible, non-toxic, non-carcinogenic, non--antigenitical and easy to handle. Moreover, the microporous structure of the ePTFE patch has alleged to allow the ingrowth of connective tissue to achieve strong anchorage to the patch (8).

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*Gore-Tex^{R} Soft Tissue Patch, W. L. Gore and Associates Incorporated, Flagstaff, Arizona, USA.

The present study describes the prospective results of 13 patients suffering from ptosis palpebrae superioris who underwent a frontalis suspension according to Wiener-Lexer with the use of ePTFE soft tissue patch. The results were compared with the results of the last 13 patients in the foregoing period in whom autogenous fascia lata was used.

PATIENTS AND METHODS

Patients

Nineteen ptotic upper eye lids in 13 patients were corrected with an ePTFE sling; ten patients suffered from congenital ptosis and three from an acquired ptosis (two posttraumatic, one myopathy). There were eight male and five female patients, of whom eight were under and five above the age of 15 years.

In the fascia lata group also 19 upper eye lids in 13 patients were corrected. In 11 patients their ptosis was of congenital origin; in two cases the ptosis was acquired (one posttraumatic, one myopathy). There were nine male and four female patients; seven were under and six above the age of 15 years.

Methods

All patients underwent a frontalis suspension according to Wiener-Lexer with standard sterile surgical procedures and under general anaesthesia. Incisions were made in the sulcus palpebrae superioris and just above the eyebrow and from there two vertical tunnels were created subcutaneously. In the ePTFE treated patients a strip of 1 mm ePTFE soft tissue patch was stretched manually, as prescribed by the manufacturer, and inserted in a U-form shape (Fig. 1A). The ePTFE sling was fixed to the tarsus with three sutures of Gore-Tex^R suture material 6x0.

In the fascia lata group a strip of fascia lata was obtained from the upper leg and inserted in the same way as the ePTFE sling and fixed to the tarsus with three sutures of Ticron^R 5x0. Then in both groups the upper eye lid was elevated by pulling the two ends of the sling upwards, adequately correcting the ptosis. Fixation to the frontalis muscle was performed with Gore-Tex^R suture material 6x0 in the ePTFE group and with Ticron^R 5x0 in the fascia lata group. The skin was intracutaneously closed with PDS^R 5x0 (Fig. 1B). No antibiotic prophylaxis was used.

During the follow-up period the functional and cosmetic results of each patient were registered together with the satisfaction of the patient or his or her parents and each scored positive or negative.

Functional results were scored positive when eye closure was complete, the pupil was completely visible by looking straight forward and the eye lid could be elevated more by raising the eyebrows.

Cosmetic results were scored positive when symmetry was achieved with a margin of 1 mm.

Satisfaction was scored positive when the patient (above the age of

15 years) or the parents of the patients (under the age of 15 years) were satisfied with the results.

In both the ePTFE group and fascia lata group the mean follow-up period was ten months (range respectively 2—16 and 2—31 months).

The results in both groups were statistically compared by means of the Fisher Exact test. A p value of less than 0.05 was considered to be significant.

RESULTS

In both groups no complications occurred during the follow-up period, such as infection, fistulation or extrusion.

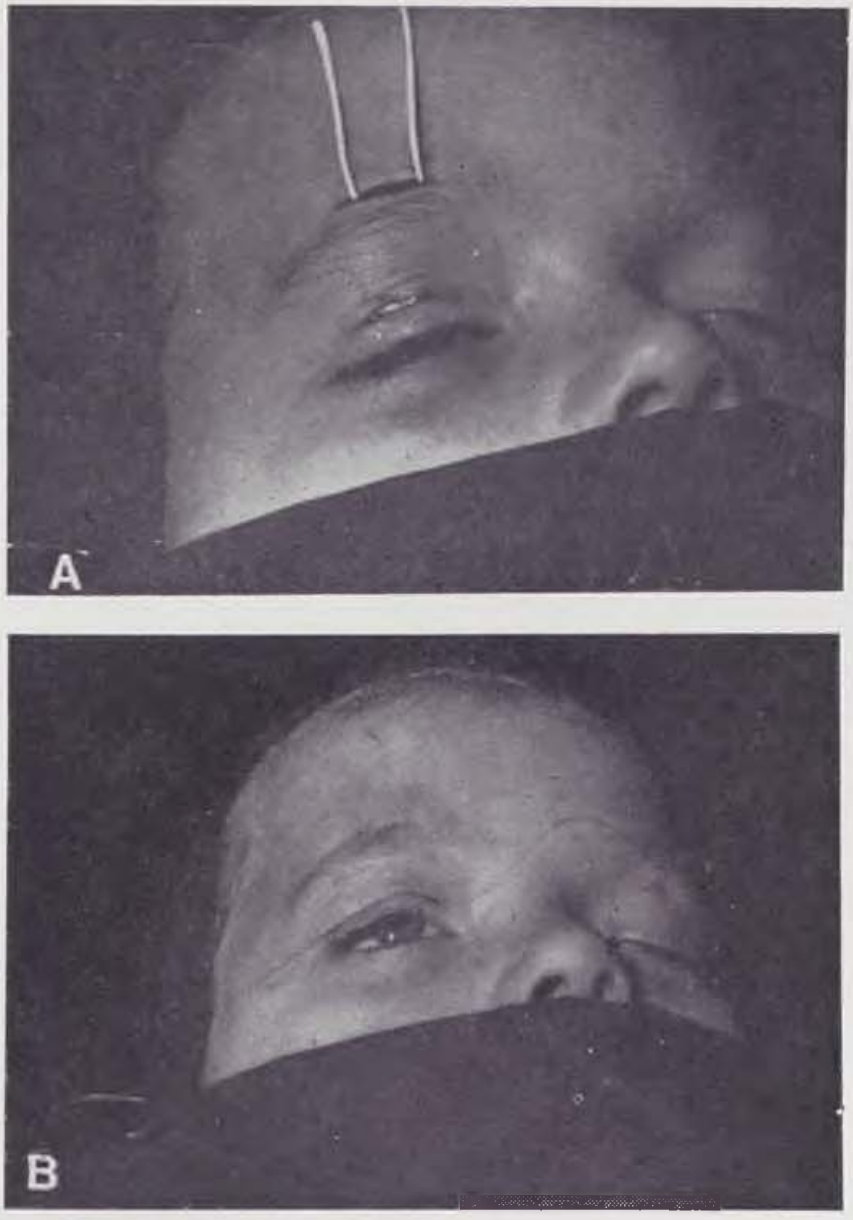

Fig. 1. A sling of ePTFE soft tissue patch after insertion in a 7 year old patient with congenital ptosis of the upper eye lid (A). Situation after closure of the skin at the end of operation (B).

Functional results

Functional results in the ePTFE group were scored positive in six of the 13 cases (46 %) and in 12 of the 13 cases (92 %) in the fascia lata group (Fig. 2). The difference in functional results between the two groups was sta-

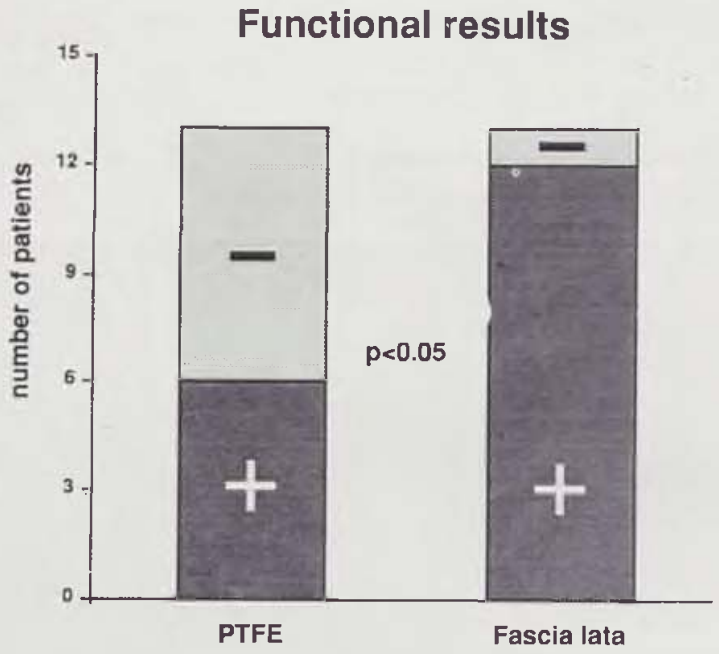

Fig. 2. Comparison of the functional results scored positive and negative in the ePTFE — and fascia lata group. The functional results in the fascia lata group were significantly better ($p < 0.05$).

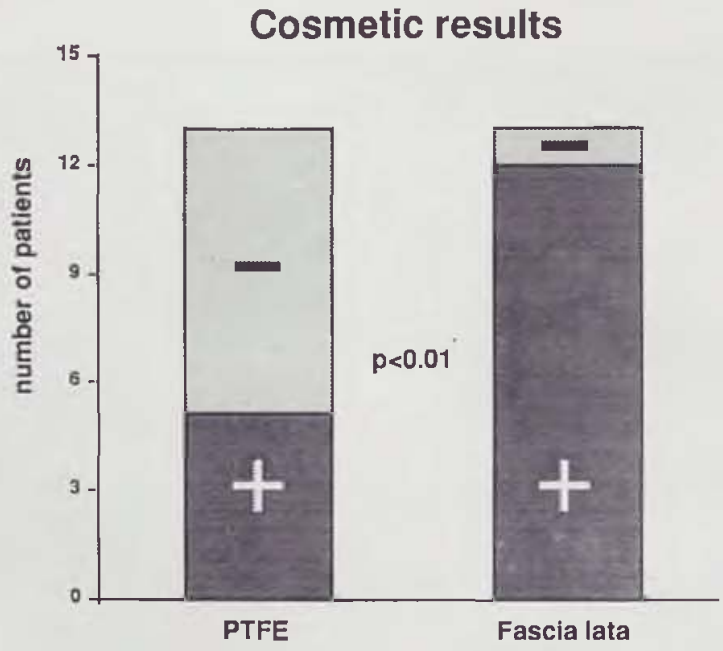

Fig. 3. Comparison of the cosmetic results scored positive and negative in the ePTFE — and fascia lata group. The cosmetic results in the fascia lata group were significantly better ($p < 0.01$).

tistically significant ($p < 0.05$). In seven patients (54 %) of the ePTFE group the functional results were scored negative. In all these cases a gradual drop of the upper eye lid occurred within a few months postoperatively, especially interfering with active elevation of the upper eye lid. In five patents of the ePTFE group the upper eye lid also partly covered the pupil. One patient in the fascia lata group had some minor problems with active elevation of the upper eye lid after 30 months.

Cosmetic results

Symmetry was achieved in five patients (38 %) in the ePTFE group and in 12 patients (92 %) in the fascia lata group (Fig. 3). The difference was statistically significant ($p < 0.01$). All cases with assymetry of the eye lids in the ePFTE group were due to an early drop of the upper eye lid, also affecting the function. One patient in the fascia lata group showed some assymetry of the upper eye lid shortly after the operation.

Satisfaction

In seven cases of the ePTFE group (54 %) and in all cases in the fascia lata group the patients or their parents were satisfied with the results (Fig. 4). The results in both groups were significantly different ($p < 0.01$).

In the ePTFE group five patients (38 %) were reoperated by shortening of the ePTFE sling between seven and 15 months after the operation. These patients had a gradual recurrence of their ptosis, leading to partial coverage

Fig. 4. Comparison of the results, concerning satisfaction, scored positive and negative in the ePTFE — and fascia lata group. Patients in the fascia lata group were significantly more satisfied ($p<0.01$) with the result.

of the pupil and a decreased ability to elevate the upper eye lid when raising the eye brows.

Histological analysis of an explanted piece of ePTFE patch after 15 months of implantation showed fibrocollagenous tissue with multinuclear giant cells at the patch — tissue interface. Ingrowth was not evidently visible (Fig. 5).

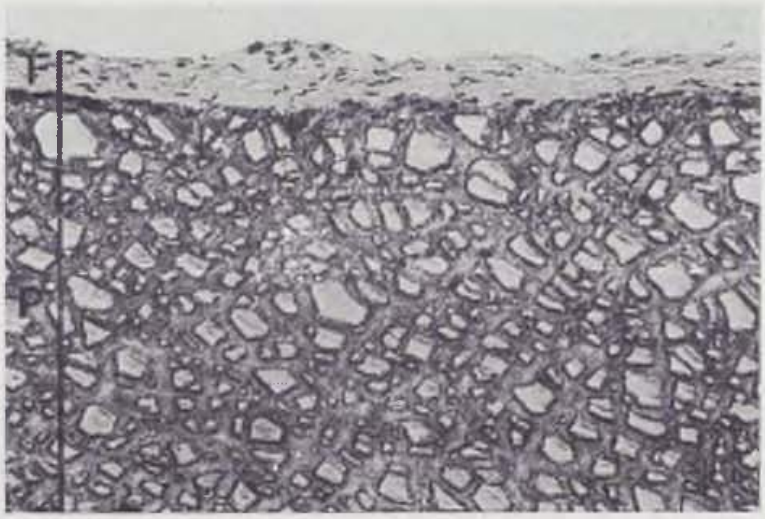

Fig. 5. Light micrograph of a piece of ePTFE patch that was explanted after 15 months of implantation because of recurrence of the ptosis. Note that the patch (P) is surrounded by fibrocollagenous tissue (F). Tissue ingrowth is not clearly evident. Stained with haematoxylin-eosin; original magnification x64.

DISCUSSION

The present study demonstrated that ePTFE soft tissue patch, when used as a sling in frontalis suspension according to Wiener-Lexer, gives inferior functional and cosmetic results as compared to autogenous fascia lata. Moreover, the patients in the ePTFE group are less satisfied with the results. Five patients (38 %) in the ePTFE group were reoperated within 15 months due to a drop of the upper eye lid, whereas no patients were reoperated in the fascia lata group.

Our results with the ePTFE patch contradict the results of two other studies in which ePTFE was used as a frontalis sling (3, 7). In these studies with follow-up periods of three to 12 months good functional and cosmetic results were observed.

In our study, histological analysis of an explanted piece of ePTFE patch after 15 months of implantation showed fibrocollagenous tissue at the patch--tissue interface with the presence of multinuclear giant cells. Ingrowth was not clearly evident. This finding indicates that fixation of the ePTFE sling was only guarantied by the sutures, which appeared not to be sufficient, probably resulting in more or less loosening i.e. detachment of the sling and subsequently a drop of the upper eye lid.

There may be two explanations for the lack of tissue ingrowth into the patch. First, the internodal space of the ePTFE patch (fibril length 10—20 μm) is too small to allow good ingrowth of fibrocollagenous tissue. This idea is supported by the histological results of a study in which ePTFE patches were used for the repair of large abdominal wall defects: no tissue ingrowth was observed (9). In another study it was demonstrated that even ePTFE with a fibril length of 30μm permitted only minor tissue ingrowth (10).

In addition, the ePTFE material itself also prevents tissue ingrowth due to its hydrophobic character. In vitro—and in vivo studies on cell-polymer interactions have shown that hydrophobic materials, such as PTFE, disfavour cell adhesion, spreading and growth (11). This inhibiting effect of hydrophobic material on tissue growth has also been observed in PTFE vascular prostheses, which have poor healing characteristics (8, 12).

In conclusion, our study demonstrated that ePTFE soft tissue patch, when used as a frontalis sling in the treatment of ptosis palpebrae superioris, gives inferior results as compared to autogenous fascia lata. Poor anchorage of the ePTFE patch to the surrounding tissue at the patch-tissue interface might have been responsible for the recurrence of the ptosis. Therefore we believe that ePTFE should not be the material of first choice in frontalis suspension.

SUMMARY

Ptosis palpebrae superioris is mainly treated by frontalis suspension with autogenous fascia lata. In this study we evaluated the potential of an expanded polytetrafluoroethylene (ePTFE) soft tissue patch to function as a frontalis sling in 13 patients with ptosis palpebrae superioris.

Functional and cosmetic results and the satisfaction of the patients were scored positive or negative and statistically compared with 13 patients in whom fascia lata was used. The mean follow-up was ten months.

Although no complications occurred in either group the patients in the ePTFE group were less satisfied ($p < 0.01$) and showed inferior functional ($p < 0.05$) and cosmetic results ($p < 0.01$) as compared to the fascia lata group.

Histological analysis of an explanted piece of ePTFE revealed that tissue ingrowth into the patch was lacking, which might have led to poor anchorage and subsequently a recurrence of the ptosis.

We believe that ePTFE is not the material of first choice in frontalis suspension.

RÉSUMÉ

Evaluation de polytétrafluoréthylène (e-PTFE) expandé par rapport à fascia lata autogène en suspension frontale (étude clinique comparative)

Zweep, H. P., Spauwen, P. H. M.

Ptosis palpebrae superioris est traitée habituellement par suspension frontale de fascia lata autogène. Dans cette étude nous avons évalué les facultés fonctionnelles du

lobe en polytétrafluoréthylène expandé du tissu mou en qualité de suspention frontale chaz 13 patients avec ptosis palpebrae superioris. Les résultats fonctionnels, cosmétiques et la satisfaction des patients étaient appréciés soit affirmativement. soit négativement par rapport à 13 malades, chez lesquels on a utilisé fascia lata. La période minimale d'observation était 10 mois. Bien qu'aucun groupe n'ai présenté de complications, le groupe des patients avec l'ePTFE était moins satisfait ($p < 0.01$) et ses facultiés fonctionnelles étaient plus basses ($p < 0,05$), ainsi que les résultats cosmétiques ($p < 0,01$) par rapport au groupe avec fascia lata. L'analyse histologique d'un morceau d'ePFTE excisé a prouvé qui l'incrustation das le tissu était insuffisante, ce qui pouvait mener a un mauvais ancrage avec, à la suite, une rechute de ptosis.

Nous en concluons que l'ePTFE ne sera pas au premier lieu comme matériel de choix pour la suspention frontale.

ZUSAMMENFASSUNG

Auswertung des expandierten Polytetrafluoräthylens (e-PTFE) im Vergleich mit autogener Fascia lata bei Frontalis Suspension im frontalen Gehänge (klinische Vergleichsstudie)

Zweep H. P,, Spauwen P. H. M.

Die Ptosis palpebrae superioris wird hauptsächlich durch frontale Suspension unter Anwendung autogener Fascialata behandelt. In der vorliegenden Studie haben wir die Fähigkeit der Funktion eines expandierten Polytetrafluoräthylenlappens des weichen Gewebes asl Frontalgehänge bei 13 Patienten mit Ptosis palpebrae superioris bewertet. Die Funktions- und kosmetischen Ergebnisse sowie die Zufriedenheit der Patienten werden positiv oder negativ bewertet im Vergleich zu 13 Patienten, bei denen Fascia lata angewendet wurde. Die geringste Zeitdauer der Beobachtung betrug 10 Monate. Obwohl es in keiner Gruppe Komplikationen gab, war die Gruppe der Patienten mit eúPTFE weniger zufrieden ($p < 0,01$) und wies eine geringere Funktionsfähigkeit auf ($p < 0,05$) ebenso wie geringere kosmetische Ergebnisse ($p < 0,01$) im Vergleich mit der Gruppe mit Fascia lata. Die histologische Analyse des herausgenommenen Stückchens ePTFE zeigte ein unzureichendes Einwachsen ins Gewebe, was zu einer schlechten Verankerung mit darauffolgender Wederholung der Ptosis führen konnte.

Wir erachten, dass die ePTFE bei der Auswahl des Materials für eine frontale Suspension nicht an erster Stelle stehen wird.

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The authors wish to thank Mrs H. E. J. Stek for her administrative work and Mr H. R. A. Meiborg for the photography.

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LONG-TERM EXPERIENCES WITH THE TWO-STAGE PALATOPLASTY WITH REGARD TO THE DEVELOPMENT OF MAXILLARY ARCH

Fára, M., Brousilová, M., Hrivnáková, J., Tvrdek, M.

Every surgical procedure in children involving the bones may, for a certain time, slow down their growth and thus the development of the whole area involved. In the palate operation where the palatal shelves, the vomer, and possibly, further bony parts are denuded, this fact is of great significance. Thus one can consider Schweckendiek's proposal of the two-stage palate operation as theoretically very sound. He adcovates operating on the soft palate within the first months to bring its muscles into function and delaying closure of the hard palate until school age. However our experience with this procedure, in comparison with one-stage palatal closure, was not gratifying enough to justify the disadvantages of postponement of hard palate closure for several years.

The purpose of this longitudinal study was to asses the positive or negative influence of the two-stage palatoplasty performed according to the Schweckendiek technique on development of the alveolar arch. Patients in this study were compared to a control sample of patients who underwent one-stage palate repair.

Forty-six patients from a pool of 70 were regularly followed from the time of palatoplasty to adulthood. They were divided into two groups (2 and 4) and compared with two control groups (1 and 3).

Group 1. Total bilateral cleft patients operated on in one stage.
Group 2. Total bilateral cleft patients operated on in two stages.
Group 3. Total unilateral cleft patients operated on in one stage.
Group 4. Total unilateral cleft patients operated on in two stages.

Repair of the soft palate in the Schweckendiek groups was performed at the time of primary lip repair when the patient was 5 months old; repair of the hard palate was done at 6 to 7 years of age. In the control groups one-stage palate repair was performed at 3 to 4 years of age. Early results of this series indicated that one-stage closure of the palate at approximately 3 years of age was more beneficial to the patients than the two-stage closure. Currently, two-stage closure is performed only in selected cases.

Three dental impressions were taken in all patients: one was obtained before lip repair, one prior to palate repair, and one when the patients were 15 to 18 years of age.

RESULTS

Width of the cleft was evaluated from the first two dental casts. Although the cleft width in the control groups stayed constant or was slightly increased. the width of the cleft was significantly reduced in the Schweckendiek groups.

Regarding the growth dynamics of the palate it is evident that the type of operation has no influence on the growth rate of the palate. Similar results were found when the growth dynamics of the alveolar segments were studied.

Regarding the changes in width of the alveolar defect was stated, that although the type of operation had no influence on the width of the defect in the bilateral cleft group, the two-stage procedure resulted in a larger alveolar defect in the unilateral cleft group.

Fig. 1. Intraoral situation after primary suture of soft palate in a bilateral cleft at the time of the second stage at the age of seven years.

Evaluation of the alveolar arch at the final stage shows that the type of operation had no significant influence with the exception of narrowing in the area of the canines in patients operated on in two stages.

Because the sex representation was not comparable in all groups of patients, the dental casts obtained after the patients were 15 years of age were evaluated separately for males and females. No significant differences were found.

DISCUSSION

Wolfram Schweckendiek must be credited for the popularization of the two-stage palatoplasty. However, acceptance of this method presently is not unanimous. This is due in part to the controversial results of longitudinal evaluation of the growth and development of the maxilla and speech. There also are social reasons that make acceptance of this method difficult.

Results obtained are in agreement with those in the literature. That is, the Schweckendiek two-stage palate repair contributes to reduction of the cleft width during the period between both operations. On the other hand, there is no evidence that this technique contributes to normal growth of the maxillary complex.

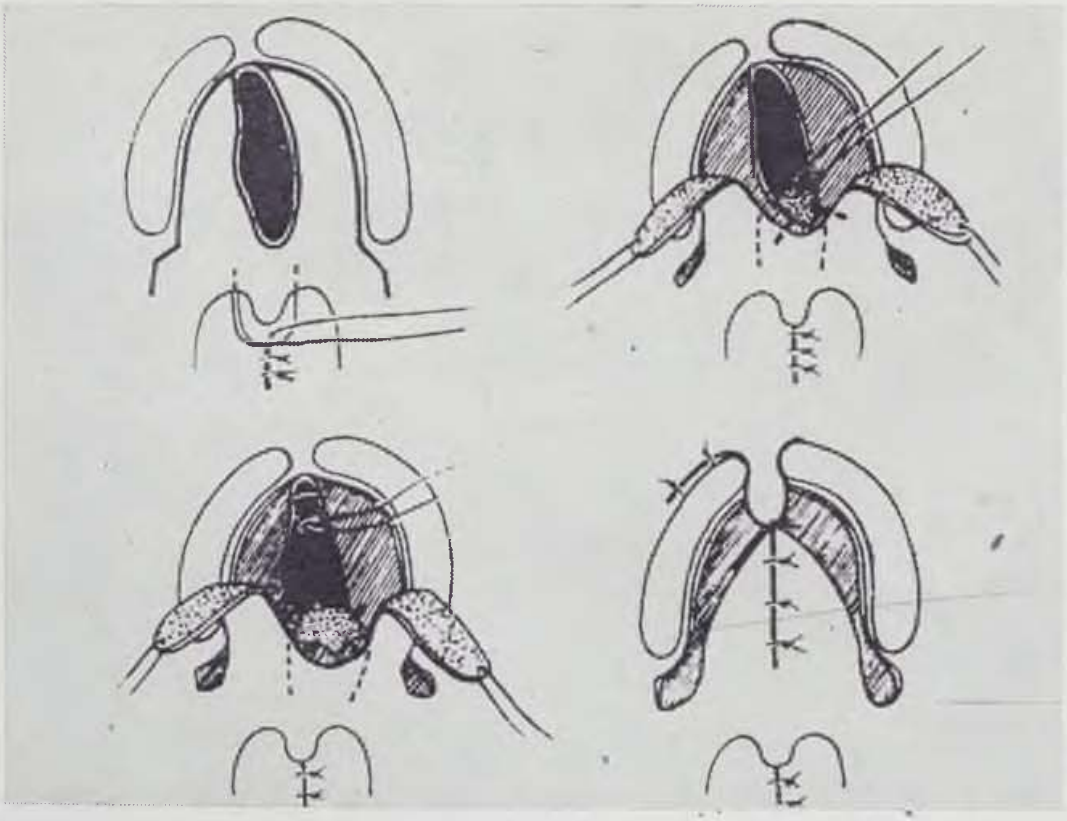

Fig. 2. The procedure used for suture of the hard palate done together with retro position of the palate and the upper based pharyngeal flap.

From the orthodontic point of view, both types of palate repair, one-stage and two-stage procedures, basically create the same conditions for final configuration of the dentoalveolar arch of the cleft maxilla. The Schweckendiek repair in patients with complete bilateral clefts contributes to narrowing of the transverse dimensions of the maxilla between the canines. In children with complete unilateral clefts, the repair extends the alveolar defect. This results in the same width of the alveolar defect at adulthood as prior to surgery. Following one-stage palatoplasty, the width of the alveolar defect is reduced during growth and development.

Slower reduction of the width of the alveolar defect may be observed even before the second stage of repair. At that time, the defect width was reduced to 24,1 % of its original size in the control samples, whereas reduction was 51,9 % in the Schweckendiek samples. Changes in cleft width were assessed during the same period of time. Whereas cleft width increased in the control groups by 25,8 %, the cleft in the Schweckendiek groups was reduced by 25 % owing to the influence of the repaired soft palate.

Patients were treated with the same orthodontic routine, so it appears that the Schweckendiek repair does reduce the cleft width following the one-stage palatoplasty, although there is limited reduction of the alveolar defect. Orthodontic appliances that support the normal relations between the maxilla and mandible and correct the configuration of the maxillary dentoalveolar arch act also as a support for levers represented by both parts of the maxilla.

The traction that acts on the distal ends of these levers following simultaneous repair of the lip and soft palate causes an extension of the alveolar defect on their proximal ends. The premaxilla that is fixed to the segment on the normal side is shifted by these forces on its cleft side proximally. This mechanism does not exist in bilateral clefts, in which the premaxilla is not fixed to any segment.

SUMMARY

From our data on 46 patients operated on by one surgeon in 1961 and 1962 who were regularly examined up to adulthood, it may be concluded that the growth results of the two-stage palatoplasty, when the second stage is done before the patient is 7 years of age, are almost identical to the results of one-stage palate repair performed at the age of 3 to 4 years. However, a greater orthodontic effort is needed to achieve a properly aligned dentoalveolar arch with the two-stage palatoplasty.

Key word: Two-stage palatoplasty.

RÉSUMÉ

Expérience à long terme avec palatoplastie à deux étapes du point de vue du développement de l'arc de maxillaire supérieure

Fára M., Brousilová M., Hrivnáková J., Tvrdek M.

S'appuyant aux donnés que nous avons acquis d'un groupe de 46 patients, opérés tous par le même chirurgien aux années 1961 et 1962 et qui étaient régulièrement suivis

jusqu'à l'âge adulte, on peut conclure que les résultats de croissance, après une palatoplastie à deux étapes, où la 2ème étape était effectuée avant l'âge de 7 ans du malade, sont presque identiques aux résultats de la réparation du palais à une étape, effectuée à l'âge de 3 à 4 ans. Toutefois, pour obtenir une équilibre convenable de l'arc dento-alvéolaire, la palatoplastie à deux étape nécessite plus d'efforts orthodontiques.

ZUSAMMENFASSUNG

Langjährige Erfahrungen mit siner zweistufigen Palatoplastik vom Gesichtspunkt der Entwicklung des obigen Kieferbogens

Fára M., Brousilová M., Hrivnáková J., Tvrdek M.

Aus unseren Angaben über 46 Patienten, die alle von einem einzigen Chirurgen in den Jahren 1961 und 1962 operiert und dann regelmässigbis zur Zeit der Reife beobachtet wurden, kann man folgern, dass die Wachstumsergebnisse nach zweistufiger Palat plastik, wenn die zweite Stufe vor dem siebenten Lebensalter des Patienten aus geführt wurde, fast identisch sind mit den Ergebnissen einer einstufigen Korrektur des Gaumens, die im Alter von drei bis vier Jahren vorgenommen wurde. Jedoch zur Erzielung eines gehörigen Ausgleiches des Dentoalveolarbogens ist bei der zweistufigen Palatoplastik eine grössere ortodontische Bemühung notwendig.

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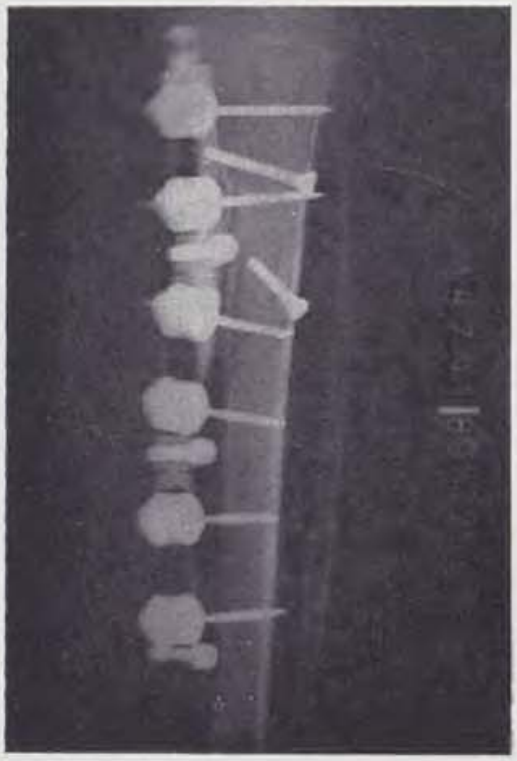
AN EXTENSIVE DEFECT ON THE TIBIA COVERED BY A FREE CROSS FLAP USING M. LATISSIMUS DORSI

M. TVRDEK, J. KLETENSKÝ, Z. PROS, J. STEHLÍK

Transfer of a free latissimus dorsi flap to a post-traumatic defect on the tibia is a method commonly employed to manage such conditions. The vascular pedicle of the flap is anastomosed to recipient vessels in the near or more distant surroundings by means of vascular grafts, if necessary. In the case we report in this article, another approach had to be adopted in view of the vascular supply to the limb.

An eleven-year-old girl, hit by a truck in a traffic accident, sustained comminuted fracture of the left tibia with severe dilaceration of the soft tissues of the tibia. Adaptation osteosynthesis of the fracture with screws was undertaken, and devitalized soft tissues were removed on the day of injury. Thrombus formation in the proximal segment of the popliteal artery, observed on day 2 after the injury, was followed by revision of the artery, thrombectomy and fracture stabilization using an external fixator. The severe contusion of tibial soft tissues involving also main vascular branches resulted in necrosis of the skin cover, part of muscles and the bone. After demarcation and removal of necrotic lesions, the skin defects were repeatedly covered by dermoepidermal skin flaps. The only problem to be managed was an infected defect on the anterior side of the middle third of the tibia, with necrotic tibial stumps protruding into it. It was in this condition that the patient was admitted to our department. Having partially disinfected the defect with antibiotic aerosols and compresses, operative management was attempted. The vascular supply to the limb provided, from the level of the distal femur, by collateral vascular circulation only, rendered free flap transfer involving anastomosis of vessels of the flap pedicle to those around the defect impossible. As a result, the posterior tibial artery and vein on the right tibia were selected as the recipient vessels.

As the first step, an external fixator devised by Ilizarev was swapped for a Poldi 7 external fixator, necrotic segments of the tibial stumps were removed, and axial alignment was performed. Next, the recipient vessels in the central



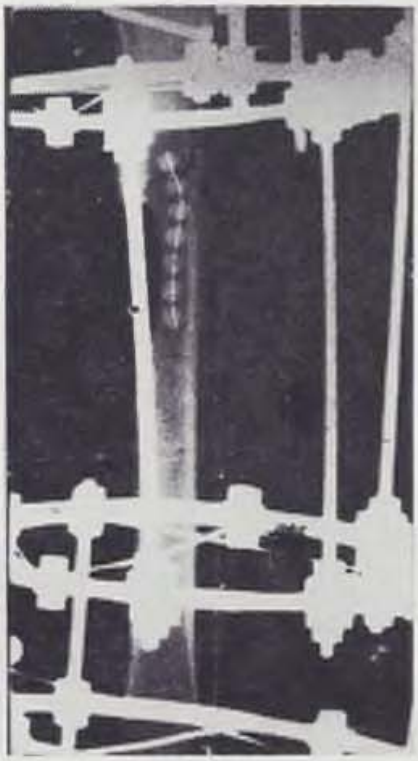


Fig. 1. X-ray of the limb 10 days after injury. — Fig. 2. X-ray after soft tissue and bone necrectomy.

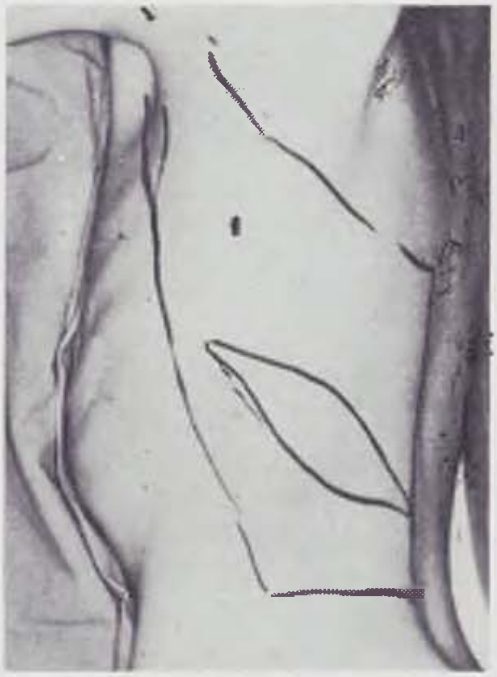
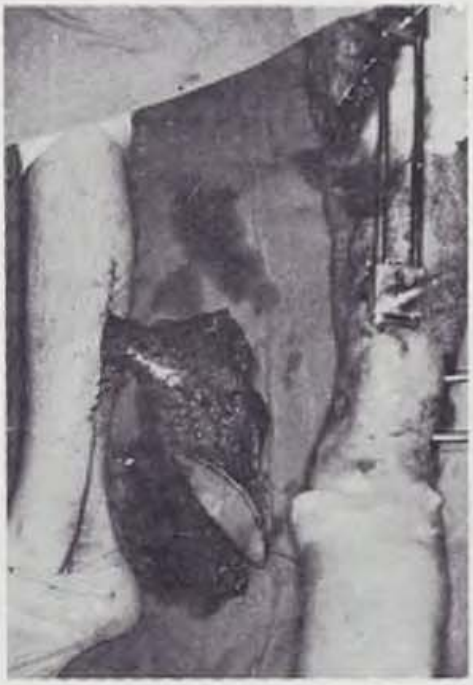


Fig. 3. Status before the operative procedure described. — Fig. 4. Drawing of the flap obtained from m. latissimus dorsi.



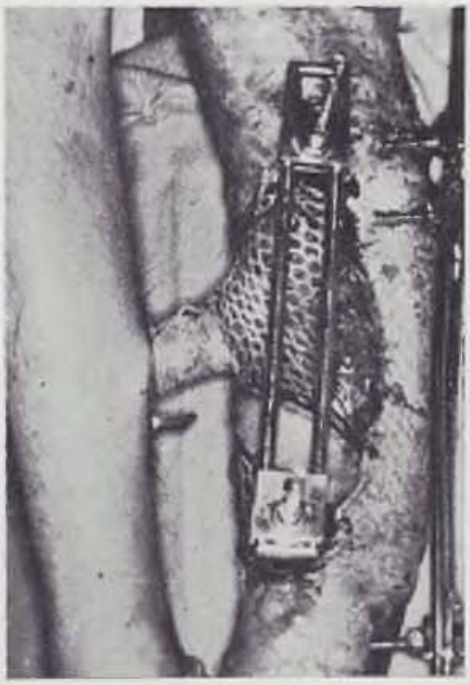
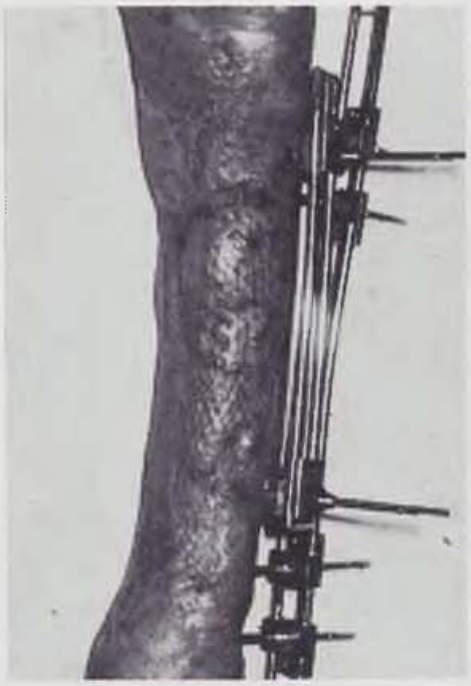


Fig. 5. Free flap after anastomosing vessels of the pedicle to recipient vessels, with a marker on the distal part. — Fig. 6. Status at the end of surgery, freely-transfer muscle covered with a mesh dermoepidermal skin graft. The bypassing segment of the flap covered by a xenograft.



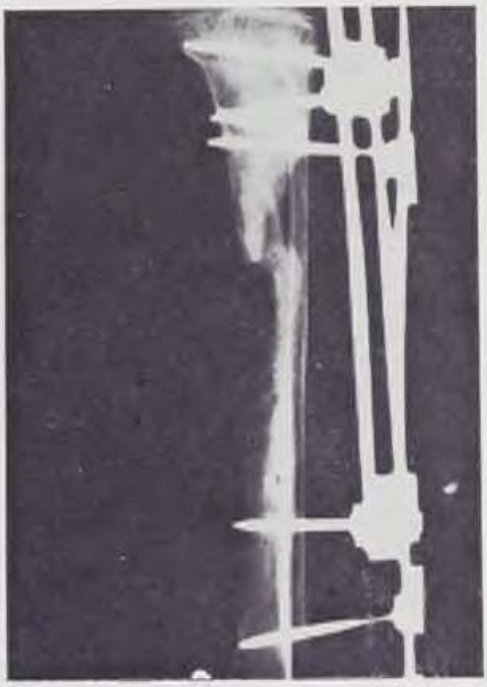


Fig. 7. Status after healing. — Fig. 8. X-ray after healing of soft tissues prior to spongioplasty.

part of the right tibia, the posterior tibial artery and its concomitant vein, were exposed. At the same time, another operative team removed left m. latissimus dorsi with a small skin island serving as a marker. Vessels of the flap pedicle were anastomosed to the recipient artery and vein end-to-side and end-to-end, respectively. To avoid traction in the vascular pedicle, part of the muscle above the flap's vascular pedicle was fixed by suture to calf muscles. The scarred, low-quality skin cover the size of the muscle flap, on the anterior side of the left tibia around the bone defect, was excised and the muscle flap as a cross flap was unfolded into the defect and fixed with suture. The bypassing part of the muscle connecting both limbs was tubulized around the vascular pedicle of the flap and covered with a xenograft. The part of the muscle spanning the bone and the skin defect was covered with a mesh dermoepidermal skin graft.

After four weeks, the flap was disconnected, vessels of the flap pedicle were ligated and the bypassing segment of the muscle was excised. The transferred muscle was bleeding spontaneously. A week later, the remaining skin defects were covered with dermoepidermal skin grafts.

Six weeks after healing of soft tissues, the patient was admitted to the department of orthopedics to undergo spongioplasty.

CONCLUSION

The above technique of free flap transfer in the form of a cross flap made it possible to cover a defect with a muscle flap of a size unavailable if using a muscular or musculocutaneous cross flap from the calf muscles of the contralateral leg.

SUMMARY

Using a clinical case, the authors demonstrate the technique of covering an extensive tibial defect unmanageable, due to blood supply to the limb and extent of the defect, by conventional methods. The required amount of tissue was provided by a flap obtained from m. latissimus dorst transferred to the site of defect as a free cross flap.

RÉSUMÉ

Recouvrement de vaste défaut de jambe par cross flap libre du latissimus dorsi

Tvrdek, M., Kletenský, J., Pros, Z., Stehlík, J.

Sur un cas clinique, les auteurs montrent le procédé du recouvrement d'un vaste défaut de la jambe, ne permettant pas — vu l'alimentation vasculaire du membre — une voie d'abord par des procédés habituels. La quantité nécessaire du tissu était offerte par un lobe du latissimus dorsi, transfére en forme de cross flap libre sur le site de défaut.

ZUSAMMENFASSUNG

Deckung eines ausgedehnten Defektes des Unterschenkels durch einen losen Gross Flap aus dem m. latissimus dorsi

Tvrdek M., Kletenský J., Pros Z., Stehlík J.

Ann einem klinischen Fall zeigen die Autoren die Deckung eines ausgedehnten Defektes des Unterschenkels, der im Hinblick suf die Gefässversorgung des Gliedes und den Umfang des Defektes durch laufende Methoden nicht losbar war. Die erforderliche Gewebemenge verlich ein Lappen aus dem m. latissimus dorsi, der an die Stelle des Defektes als loser Gross Flap übertragen wurde.

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EXTRACORPOREAL TISSUE TRANSFER FOR SALVAGE REPLANTATION

A. GOVILA

With the advent of microvascular surgery, it has become still more important to decide whether an amputation should be performed, in cases of severe crush injuries, as compared to in the past, when great importance was attached to the decision about the level at which to amputate. Our initial aim, in treating such cases, is to preserve function, minimize the time required for surgical reconstruction, and maximize the chances of faster and complete rehabilitation. The reconstruction plan has, therefore to consider potential for using non-replantable parts right at the time of emergency surgery if these goals are to be achieved most effectively.

Amputation in some, and revascularization in other, may be required. There are still others who may require secondary reconstructive procedures. Occasionally, this could be accomplished, during emergency surgery, utilizing tissue from the severed parts that could have otherwise been discarded. Awareness of such possibilites is vital if optimal results are to be achieved.

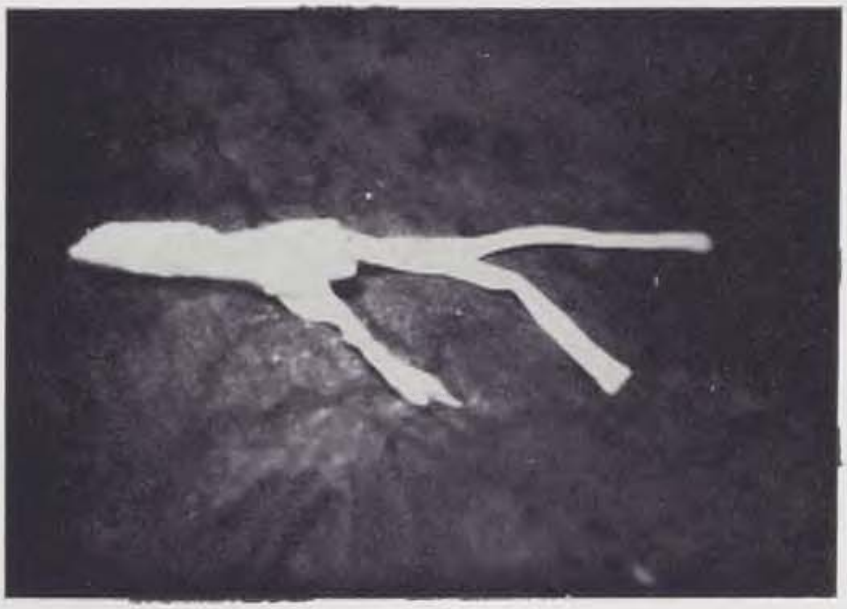
Several tissues in combination or otherwise for salvage replantation have been reported in the past, such as "Fillet of the foot" (Colin and Romita et al., 1983), musculocutaneous free flap (Colin and Romita et al., 1983), "Banked thumb and banked hand" (Colin and Romita et al., 1983), free flap from the palm of the hand (May and Gordon, 1989), free flap from mutilated multiple digits (Alpert and Buncle, 1978).

Most of these methods are based on the availability of microsurgical facility. In developing countries, initiating and sustaining, such facilities are difficult, if not formidable. To extend almost all benefits of a free tissue transfer to units without such microsurgical facilities we described "Extracorporeal tissue transfer" in the past (Govila, 1989). Using the merits of this technique, we have salvaged five severely crushed fingers in two cases and present them here.

CASE 1

A 20 year old skilled worker, in a factory, sustained amputation of index finger of his right dominant hand through the middle of proximal phalanx when the finger was accidentally cought between two rollers and the reflex pull of the hand to save the rest of the hand from the trauma resulted in the

Fig. 1 a. — Preoperative picture of the avulsion injury of the index finger of the right hand.



b. — Amputated finger has been surgically denuded of all its skin and fat, exposing the tendons, bones and joints.

avulsion of the flexor tendons, from the forearm and the digital vessels, from the severed digit (Fig. 1a).

When the patient was brought to us, some 20 hours after the trauma, the digit was non-replantable. However, the patient insisted that this finger was important for his work in the factory and must be salvaged. Therefore, in this isolated digital amputation, a salvage attempt was made. We decided to skeletonise the finger, by removing all the skin, fat and loose areolar tissue and preserving the bones including the distal and proximal interphal angeal joints,

Fig. 1 c. — Extracorporeal radial forearm island flap on the retrograde flow has been raised and used to cover the skeletonised finger to provide vascularity.

d. — Post operative picture, when the patient is back to his job in the factory.

flexor and extensor tendons and use this composite tissue as a graft to be vascularised by and extracorporeal island radial forearm flap wrapped around it.

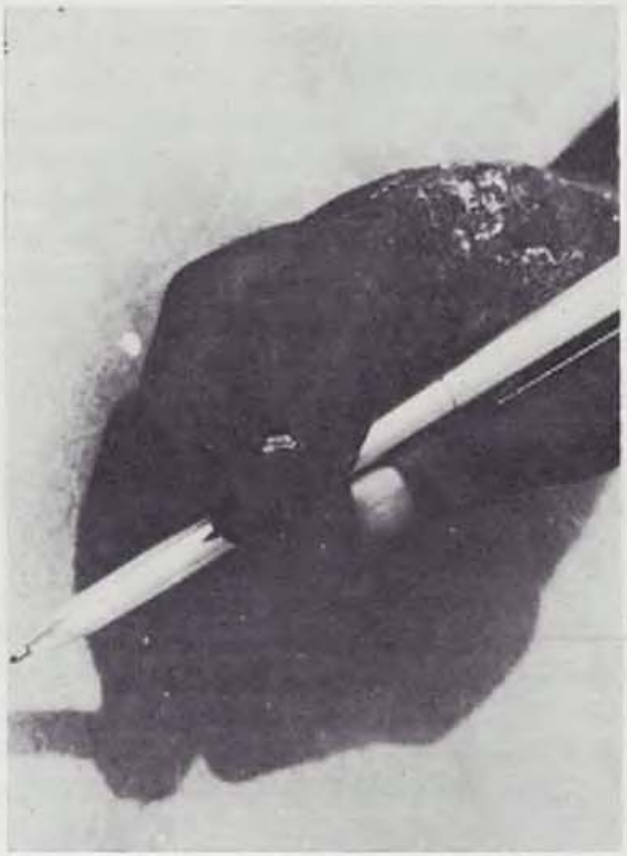


Fig. 1 e. — Post-operative tip to tip pinch and the ability to write.

f. — Post-operative grasp.

This was performed, using a 7 X 7 cm size radial forearm flap brought to the skeletonized finger, over the dorsum of the hand, and the exposed part of the vascular pedicle was skin grafted (Fig. 1b, c). The flexor tendon repair was performed using sublimis of the middle fingers as a tendon transfer and extensor repair was performed without using any tendon graft. Medial antibrachial nerve was co-opted with the common digital nerve in the palm. His post operative course was uneventful. Technicium scan performed on the tenth day revealed complete survival of all the bones. Bony union was complete in 6 weeks time. Although the proximal interphalangeal joint maintained its intrigrity the distal interphalangeal joint got disorganized during healing.

No movements recovered on this joint. PIP joint, recovered only 30 degrees of movement, but was good enough for the function since there was full range of movement on the MCP joint. The patient returned back to his work in the factory in three months time (Fig. 1d). He then had a good end to end pinch (Fig. 1e), and a wide grasp (Fig. 1f).

CASE 2

An 18 year old boy sustained crush avulsion injury of his right hand in a zinc sheet making machine. All four fingers passed between two rollers (inter roller distance was one centimeter) and were crushed beyond salvation (Fig. 2a). To salvage the fingers, the fragmented and loose bone pieces were not discarded but were assembled and immobilized, by interosseous wiring after debridement. This assembled skeleton on all four fingers was wrapped in an extracorporeal radial forearm flap measuring 14 X 20 cm to provide vascularity (Fig. 2c). The patient's post operative course was uneventful and the flap healed in three weeks time (Fig. 2d). Now the extracorporeal vessels were excised. Separation of the fingers was later undertaken in stages until three functional fingers could be created. The patient has achieved a satisfactory pinch (Fig. 2e) and a good grasp in that hand (Fig. 2f).

DISCUSSION

Salvaging tissues, from the traumatized and severed parts of the limb which cannot be replanted, has been practised with great advantage by many microvascular surgeons. The parts which are least traumatized and have an intact vascular system are used for this purpose. However, the parts without any vascular integrity could not be used in the past. Based on our earlier experience with ECTT for facial defects we have used radial forearm flap through extracorporeal circulation to vascularise the tissues which have been denuded of all circulation by sandwiching them or wrapping them in it.

The great merit of this technique lay in the fact that it does not require microsurgical facility, therefore could be easily performed by any general plastic surgeon. Additionally, there is always a risk of anastomotic faiure up to 10 percent, even in the best of the hands, leading to total disaster. It should

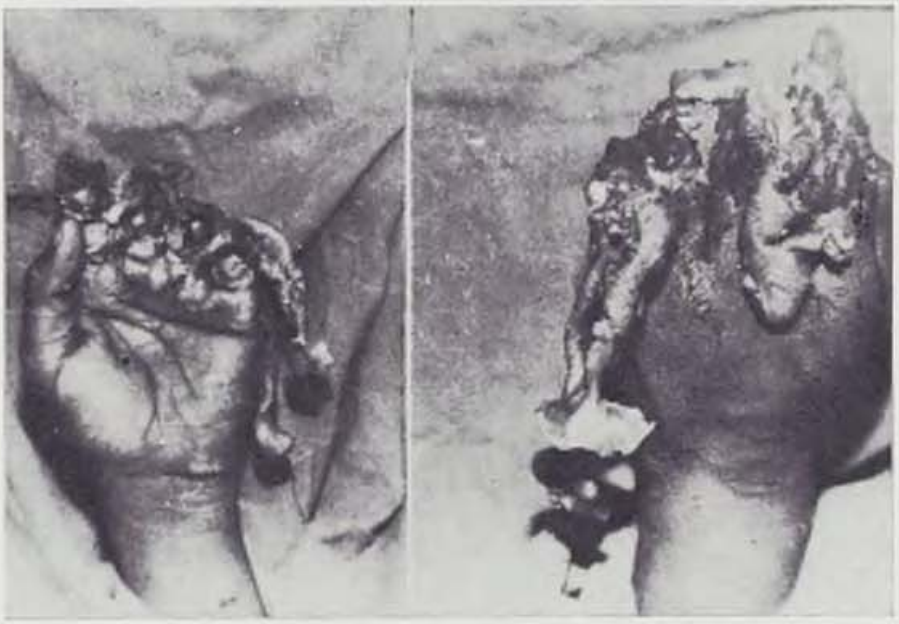


Fig. 2 a. — Preoperative picture of the crush avulsion injury of the right hand.

b. — Artist's impression of the arc of rotation of the flap and of the technique used.

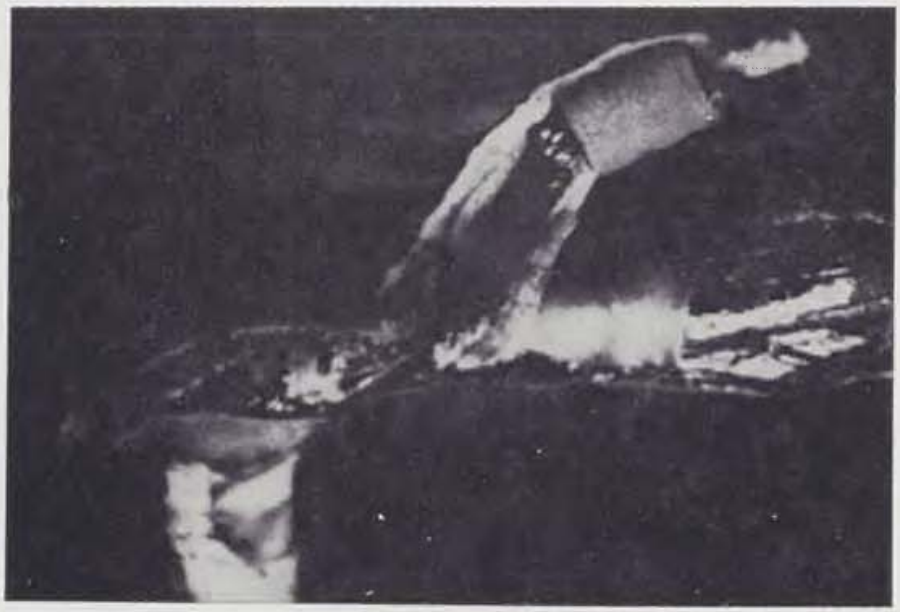


Fig. 2 c. — Radial forearm flap measuring 14 × 20 cm has been used to cover the assembled and immobilized bones.

d. — Three weeks post operative picture, just before the excision of the vascular pedicle.

be noted that the tissue, which could not be used, even by the microvascular surgeons by any method, can now be utilized by this technique. This approach has reduced the total period of hospitalization, and a fast return of function has been achieved resulting into complete rehabilitation in a short period of time.

Fig. 2 e. — Post-operative picture after seperation of surgical syndectally, showing tip to tip pinch.

f. — Post operative view showing grasp.

SUMMARY

The author reports the use of extracorporeal tissue transfer technique for salvaging severed digits of the hand which are unfit for replantation. The technique of extracorporeal tissue transfer has been reported by us earlier. In this paper its use has been extended for salvaging five non replantable digits in two cases.

RÉSUMÉ

Greffe extracorporelle de sauvetage des tissus

Govila, A.

On décrit une technique extracorporelle de la greffe pour le sauvetage des doigts de main gravement endommagés, incapables d'être réimplantés. Nous avons déjà décrit cette technique auparavant, en relation avec les défauts de la tête et du cou. Dans cette communication, on élargit son application à deux cas du sauvetage de cinq doigts, incapables de réimplantation.

ZUSAMMENFASSUNG

Extrakorporale Gewebetransplantationen zu ihrer Rettung

Govila A.

Beschrieben wird die extrakorporale Transplantationstechnik zur Rettung schwerbeschädigter Finger der Hand, die einer Replantation nicht fahig sind. Diese Technik haben wir bereits früher für Defekte des Kopfes und Halses beschrieben. In der vorliegengen Mitteilung wurde ihre Anwendung erweitert zur Rettung von fünf nicht zu replantatierenden Fingern in zwei Fällen.

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THE NECK COLLAR – A TREATMENT OF HYPERTROPHIC BURN SCARS OF THE NECK REGION

A clinical study

P. BASSE, B. ALSBJ, M. LOHMANN

INTRODUCTION

The neck region is frequently involved in burn injuries. Spontaneous healed partial thickness burns and grafted areas are characterized of hypertrophic scars and contractures of the neck. Severe contracture of the neck not only limits the range of extension and rotation of the head but also can cause severe facial deformities of the mouth and even lower eyelid. Disorders of speech and mastication may develop, and oral tear incontinence may add to the distress.

The difficulties in obtaining good cosmetic and functional results in patients with burn injuries of the neck, have lead to a variety of techniques being advocated for its correction. During this century these techniques have improved from the "primitive repair" of the contractures of the neck (Duwd C. N. 1927), to include new techniques as tissue expansion (Hagerty C. R. 1986) and advanced flap surgery (Leung P. C. 1986). The best treatment for burn scar contracture of the neck, is although, the prevention of its occurrence. This can be attempted by early excision and grafting, splinting, and pressure-garment therapy. For a century it has been known that pressure therapy on hypertrophic scars ensures a quicker fading, flattening and softening of the scars (Shoemaker J. F. 1901). Since the mid-sixties this had been the routine treatment in prevenhypertrofia in burn scars in almost all Burns Units of the world, with records of good results (Leung P. C. 1980). The use of moulded neck collars to cover the burn following secondary wound healing or grafting is reported to diminish the amount of scarring and contracture of the neck (Cronin T. D. 1973).

The Burns Unit in Copenhagen has since 1976 treated burn scars of the neck region with pressure therapy obtained by specially designed soft neck collar.

The neck collar is described and the results over a two year period (1986 to 1988) are reported and commented on.

MATERIAL AND METHODS

The neck collar (Fig. 1.)

After surgical procedure, all patients, with neck burns were kept in a supine position with their head hyperextended. 10 days post surgery a neck collar was made by the occupational therapist. It is made of moulded polyether with an adjustable Velcro-closing posteriorly. The circumference of the neck, the manubrium sterni-mandibel distance and the angulus mandibulae-clavicle distance are determining the individual standards. The aim of the neck collar is to keep the chin lifted and to ensure a proper pressure to the scar tissue.

The patient is wearing the neck collar 24 hours a day, until signs of activity of the scar is reduced. The cost of the neck collar is about 2 dollars.

Fig. 1. A 67-year old man wearing the soft neck collar. The circumference of the neck, the manubrium sternimandibel distance and the angulus mandibulae-clavicle distance are determining the individual standards.

The Jobst day-clinic

After discharge from the hospital the patients are regularly controlled in the Jobst day-clinic by a team consisting of a surgeon, a physiotherapist, a occupational therapist and a nurse.

Patients

17 patients were during the years 1987—89 controlled in the clinic. All patients had burns in the neck region and subsequently used the neck collar after the discharge.

A classification of the cosmetic results, the functional results and the final outcome according to the following criteria were performed.

Cosmetic results/score (1—4) were given due to thinning, softening, reddening and topography of the scar.

1. No effect
2. Minor effect
3. Moderate effect
4. Marked effect

Functional results/score (1—4) were classified as follows.

1. Broad contractures that needed surgical release by excision and covering by thick split skin grafts
2. Linear contractures that needed surgical release by Y-V plasties or Z-plasties
3. Minor contractures that did not need any surgical release
4. No contractures

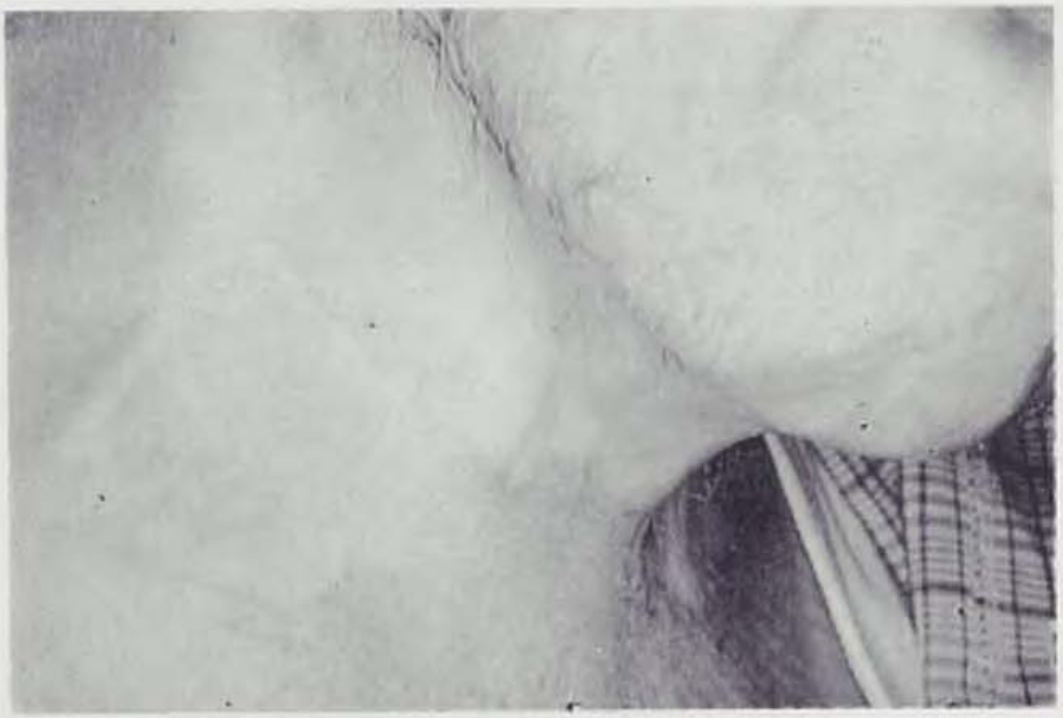

Fig. 2. The same pationt after 1 year pressure therapy. No contractares are seen.

The "final outcome" was classified when the burn scar of the neck showed no signs of activity, normally one to two years postburn, as excellent, good, fair or bad.

The patient's sex and age were recorded. The etiology, localisation of the burn of the neck in anterior/posterior (A/P), plus possible transplantation (t), were recorded.

RESULTS AND DISCUSSION

12 male and 5 females entered this study. The etiology of the burns were in each case flame burns.

A summary of the clinical results is given in Table 1. All of the patients, except no. 7, used the neck collar as prescribed. Patient no. 7 was a male aged 20, unripe, who felt cosmetically unattractive wearing the neck collar, and in addition regularly failed to appear in the Jobst day-clinic. Patient no. 5, was a male aged 18, who had a known tendency to develop hypertrophic scars. The beneficial effects of the neck collar can of course be assessed subjectively. We found the results quite satisfactory. Almost 50 % of the patients obtained marked cosmetic improvements during therapy. 71 % of the patients underwent surgical release of linear or broad contractures during therapy, and most encouraging was that 65 % of the patients had a good or excellent final outcome. None of the patients showed severe deformations of the lower lip.

Table 1

Age	Sex	A/P	t	Cosmetic	Functional	Final outcome
7	M	A/P	t	3	2	good
45	M	A	0	4	4	excellent
45	F	A/P	t	2	1	fair
18	M	A/P	t	4	2	excellent
18	M	A	t	1	1	bad
8	M	A/P	t	2	1	fair
20	M	A/P	t	1	1	bad
34	F	A/P	t	3	4	excellent
57	F	A/P	t	2	1	fair
22	F	A/P	t	2	1	good
45	F	A	t	3	2	good
33	M	A/P	t	2	2	fair
21	M	A/P	t	3	2	good
44	M	A	t	2	3	good
36	M	A	t	3	3	good
67	M	A/P	t	3	3	excellent
20	M	A/P	t	2	1	fair

CONCLUSION

The best treatment for cosmetic and functional irregularities of burn scars of the neck, is of course, prevention of their occurrence. Four factors are after our opinion essential in obtaining satisfactory results:

— early grafting using thick split skin grafts
— maintaining the neck hyperextended until pressure therapy can be started
— accomplishing pressure therapy by a neck collar as soon as reepithelization has been reached
— surgical release of contractures during pressure therapy

Because of its clinical effectiveness, simplicity in both manufacture and application, individual standards, softness and low cost, we will recommend this neck collar or a better neck comformer in treatment of hypertrophic burn scars of the neck.

SUMMARY

Hypertrophic burn scars of the neck region are disfiguring and cause functional disturbances such as itchiness, tenderness, blistering or even contractures. Since 1970 the Burns Unit in Copenhagen has treated hypertrophic scars of the neck with a special soft neck collar as a routine.

This pressure treatment is controlled in the Jobst day-clinic by a team consisting of a surgeon, physiotherapist, occupational therapist and a nurse.

The clinical results of 17 cases are reported and commented on.

Key words: Neck collar, hypertrophic scars, neck burns, pressure therapy.

Résumé

Col cervical — traitement des cicatrices hypertrophique après brûlures dans la région cervicale

Basse, N. P., Alsbj, B., Lohmann, M.

Les cicatrices hypertrophiques, séquelles des brûlures dans la région cervicale, défigurent et provoquent des troubles fonctionnels comme démangeaisons, douleurs, ampoules et même contractures. Depuis le 1970, le Service des brûlures à Copenhague traite les cicatrices hypertrophiques cervicales couramment par un col souple spécial. Ce traitement à pression est controlé dans la Clinique journalière de Jobst par une équipe composée d'un chirurgien, d'un physiothérapeute, d'un médecin traintant et d'une infirmière. Les résultats cliniques de 17 cas sont présentés et discutés.

ZUSAMMENFASSUNG

Ein Halskragen — die Behandlung hypertrophischer Narben nach Verbrennungen in der Halsgegend

Basse, N. P., Alsbj, B., Lohmann, M.

Hypertropische Narben nach Verbrennungen in der Halsgegend verunstalten und verursachen Funktionssorungen so wie Jucken, Schmerzen, Blasen und sogar Kontrakturen. Seit 1970 behandelt die Verbrennungseinheit in Kopenhagen hypertrophische Narben am Hals laufend vermittels eines speziellen weichen Kragens. Diese Druckbehandlung wird in der Jobst'schen Tagesklinik von einer Gruppe kontrolltert, die aus einem Chirurgen, einem Physiotherapeuten, einem Arbeitsrazt und Schwestern besteht. Angeführt und kommentiert werden die klinischen Ergebnisse von 17 Fallen.

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GROWTH AND DEVELOPMENT OF THE FACE IN COMPLETE UNILATERAL CLEFT LIP AND PALATE DURING PREPUBERTAL AND PUBERTAL PERIODS

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So far, relatively few reports are dealing with facial growth and development in orofacial clefts. Because of the necessity to distinguish individual types and extent of clefts a collection of sufficiently large numbers of homogeneous series is associated with difficulties. In addition to these facts it is worth mentioning that accurate data can be obtained only on the basis of longitudional studies.

Puberty represents an important period for the development of the jaws and of dentoalveolar characteristics. It was assumed that the growth spurt occurring during this period has adverse effects on the development of certain skeletal and dental anomalies because of the deficient growth of the malformed maxilla. Therefore the present study was aimed at an assessment and comparison of the growth and development of the face during prepubertal and pubertal periods based on repeated examinations of the same patients with unilateral cleft lip and palate.

MATERIAL AND METHOD

The study was based on repeated assessments of teleroentgenograms in individuals with complete unilateral cleft lip and palate, without any other associated malformation. Into the series were assigned patients operated with the same method. Cheiloplasty was performed according to Vean or Tennison, the palate was repaired with the technique of pushback and pharyngeal flap surgery, without surgical management of the alveolar process. A further prerequisite for the inclusion into our series was an identical interval between the age at the time of the assessment of X-ray films. Because of sufficiently large numbers of patients included in our series it was decided to use an interval

of three years and to subdivide the patients into two series according to age, i.e. prepubertal and pubertal. The first series consisted of individuals examined at the age of seven and subsequently at the age of ten years, or at the age of eight and eleven years. Into the second series were assigned patients examined at the age of ten and thirteen years, or at eleven and fourteen years. Within the first age period were 16 boys and 15 girls, the second age group included 15 individuals of either sex. Each sex was assessed separately as well. The patients were assigned into individual series according to their birth date, varying only within ± 1 month. Because of the peak of growth spurt occurring in our girls between the age of 11.7 and 12.2 years, and in boys between 13.0 and 13.8 years (Pokorná and Wilhelmová, 1987), in boys the pubertal period consists of the period of accelerated growth rate only. Cheiloplasty was performed in both groups at the mean age of seven month (range 4—12 months), palatoplasty was carried out in he first series at the mean age of four years (range 3—7 years) and in the second at 5 years (range 3—8 years). For the purpose of our study a difference in age of one year at the time of palate surgery proved of no importance. All patients were previously subjected to orthodontic therapy exclusively with removable appliances.

X-ray films were obtained during centric occlusion under standard conditions with the head of the patient fixed in a cephalostat. Craniometric points

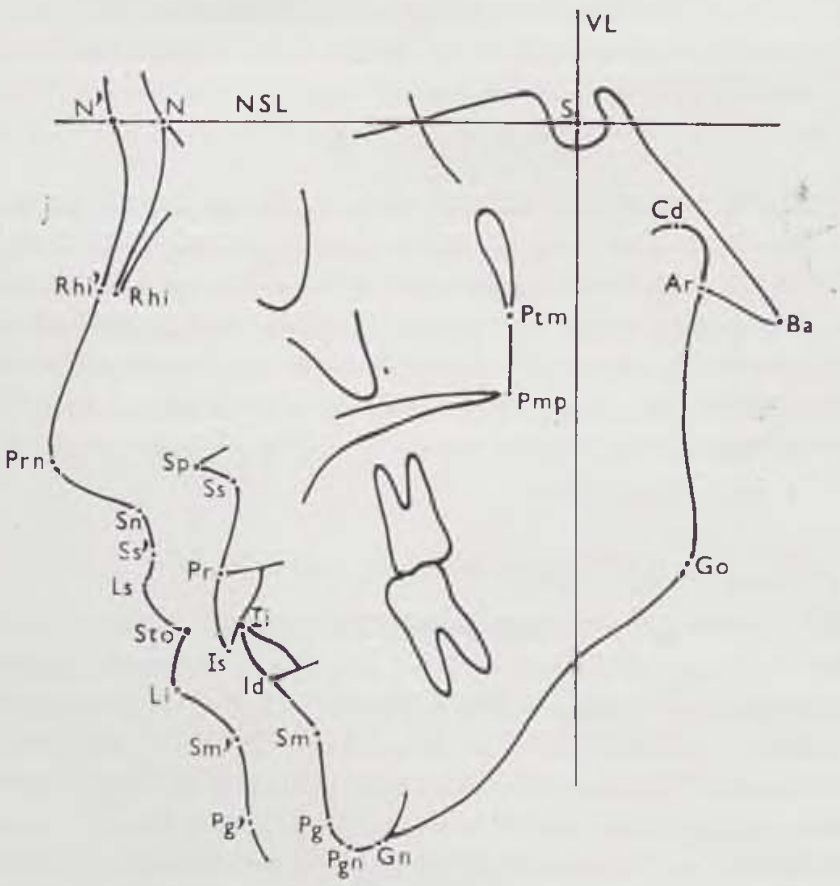

Fig. 1. Cephalometric points used in the study (definitions see Šmahel, 1984).

(Fig. 1) and reference lines (Fig. 2) used in the assessment of X-ray films were defined in more detail in our previous study (Šmahel, 1984). Besides the routinely used occlusion line OL was constructed a so-called modified occlusion line OL_m passing through the midpoint of the distance between the edges of upper and lower incisors during centric occlusion and the apex of the angle formed by the lines PL and ML. This line is related in a lesser degree to the eruption of teeth than the classic OL and thus was used for the so-called Wits appraisal (Ss + Sm) and the assessment of other projected distances (Pr + Id, Pr + Ss). The perpendicular distance of a point from the reference line was marked e.g. as Ptm-VL, the angle as N-S-Ba or as a fraction of pertinent re-

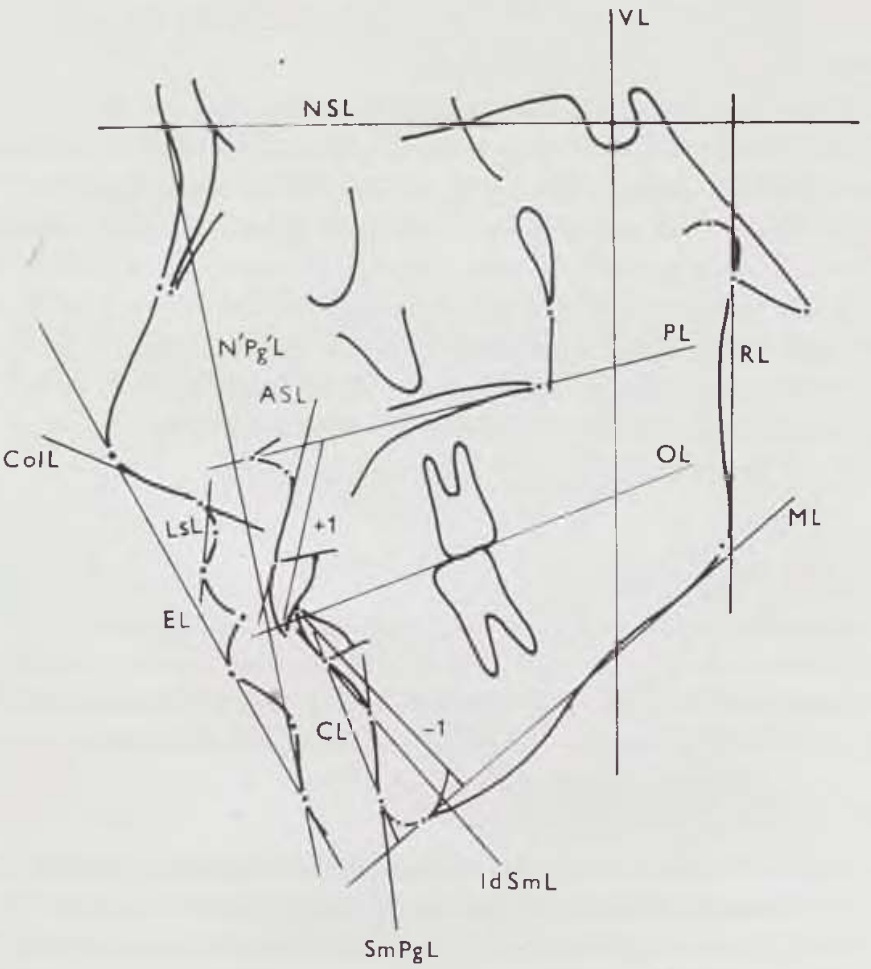

Fig. 2. Reference lines used for the assessment of X-ray films: NSL=line through N and S, VL=perpendicular to NSL through S, PL=line throuugh Sp andmost posterior point of the palatal processes, OL=line through midpoint between Is and Ii and through midpoint between the distobuccal cusp of the first upper and lower molar, ML=tangent to the mandibular body through Gn, RL=tangent to the upper alveolar process through Pr, SmPgL=line through Sm and Pg, IdSmL=line through Id and Sm, +1=axis of the upper central incisor -1=axis of the lower central incisor. N'Pg'L=line through N' and Pg', EL=line through Prn and Pg', ColL=tangent to the columella through Sn, LsL=line through Ls and midpoint between Sn and Ss', tGo=point at the intersection of ML and RL (tangenta gonion point).

ference lines (ML/NSL) and the proportional characteristics as S-Go%N-Gn (S-Go in % of N-Gn). The distances between points which were projected on the reference line were marked e.g. Ss + Sm (OLm), where the characteristic in parentheses designated the reference line on which pertinent points were perpendicularly projected. Negative mean values designate a retroposition of points on the maxilla as compared to points on the mandible. The negative value of Ls-EL showed how far the upper lip failed to attain the esthetic line EL. A maxillary overjet (Is-Ii) was measured between the edges of upper and lower incisors parallel to the occlusion plane. The prominence of the upper lip (Ls + Li) was determined by the difference between the distances Ls and Li from N'Pg'L. In the case of double contours due to the difference between the right and left side, the pertinent points were marked at the midpoint between both contours.

The data obtained by measurement were analyzed with routine statistic methods. For the comparison of the growth rate of individual dimensions, the increments recorded during both investigated periods of age were expressed in terms of percent of the initial size of the parameter (Tabl. 1). Changes in characteristics of shape, position or proportion are illustrated graphically (Fig. 3—6). They document the substantial developmental trends of craniofacial structures in complete unilateral cleft lip and palate. Intersexual differences between the age groups of ten to eleven years in both series examined, were tested with the t-test (intersexual differences were not tested in linear characteristics which reflected the larger size of boys).

RESULTS

Significant differences between boys and girls were recorded only in one parameter in each series (S-N-Ss, 8years, $p < 0.05$ and Ptm-VL, 11 and 14 years, $p < 0.05$). With regard to the large numbers of assessed parameters it was less than the expected 5 per cent of significant tests. Thus it was justified to conclude that the differences were accidental and for further analyses to pool both sexes.

During the two studied periods the amount of absolute increments (Tab. 1) in most facial characteristics failed to provide evidence of an enhanced growth rate during the period of puberty. It was demonstrated only by the values of maxillary depth (Ss-Pmp), or of the length of mandibular body and ramus (Pgn-Go, Cd-Go) and of nasal depth (Prn-Sn, Prn-Sp). However, the latter dimensions were affected by corrective surgery which was performed during this period of life. On the contrary a lower growth rate showed during the period of puberty the postsellar length of the cranial base (S-Ba).

The relative increments revealed during both periods in most characteristics an increase of about 5 to 7 per cent (Tabl. 1). A lower growth rate showed the length of the anterior cranial base (N-S) and the maxillary depth (Ss-Pmp), while the height of the upper lip showed no signs of growth whatsoever (Sn-Ls, Sn-Sto). On the contrary there was a higher growth rate of

nasal depth (Prn-Sn, Prn-Sp) and of the height of the mandibular symphysis (Id-Gn).

The development of cranial characteristics of shape and position during prepubertal and pubertal periods are presented on Figures 3—6. The angle of the cranial base (N-S-Ba) remained unchanged, while the so-called, orthodontic angle of the cranial base (N-S-Ar) could be reduced. There was an increase of the proclination of nasal ossicles (S-N-Rhi) and of the protrusion of the lower jaw (S-N-Id, S-N-Sm, S-N-Pg), while the protrusion of the upper jaw decreased (S-N-Ss). This resulted in an impairment of sagittal jaw relations (Ss-N-Sm)

Tab. 1. Absolute (abs) and relative (%) increments of facial dimensions in individuals with clefts

Variable	8—11 years		11—14 years	
	abs	%	abs	%
Cranial base				
N-S	1.25	1.87	1.76	2.88
S-Ba	3.72	9.38	2.86	6.85
Anterior facial heights				
N-Sp	2.85	6.42	2.72	5.66
N-Gn	6.43	6.06	5.77	5.14
Ii-Gn	2.32	6.24	2.70	6.73
Id-Gn	2.61	9.86	2.83	9.70
Sp-Pg	3.92	6.97	3.67	6.17
Posterior facial heights				
S-Go	3.98	6.18	5.67	8.24
Cd-Go	2.32	4.98	3.50	6.86
Pmp-NSL	2.84	7.60	2.80	6.87
Maxillary depth				
Ss-Pmp	0.56	1.37	2.10	4.75
Mandibular body length				
Pgn-Go	3.98	6.54	4.93	7.50
Soft profile heights				
N'-Prn	3.00	6.60	3.73	7.59
N'-Sn	3.08	6.00	3.70	6.70
N'-Sto	3.47	4.98	3.80	5.18
N'-Pg'	4.76	4.82	5.90	5.77
Nose depth				
Prn-Sn	1.04	7.73	2.07	13.53
Prn-Sp	1.78	9.26	2.70	11.70
Upper lip height				
Sn-Ls	−0.21	−1.61	0.07	0.55
Sn-Sto	0.30	1.66	−0.10	−0.51

% increments in the size of characteristics expressed in terms of percent of the initial mean value

and in a flattening of the face (N-Ss-Pg). The steadily increasing retrusion of the maxilla was in some degree compensated by the increasing protrusion of the alveolar process (ASL/PL, Fig. 5) and therefore the S-N-Pr angle (Fig. 3) did not change with age. The described changes were virtually identical during both studied periods of age, but for the retrusion o fthe maxilla which was more marked during the prepubertal period.

The inclination of the maxilla (PL/NSL) slightly decreased with age, while the slope of the occlusal plane (OL/NSL) definitely decreased (Fig.4). In the prepubertal period the mandible showed a slight trend towards posterior growth rotation which was followed in the pubertal period by the anterior growth rotation (ML/NSL, N-S-Pgn). Thus the hyperdivergency of vertical jaw relations increased during the prepubertal period and then decreased during puberty (PL/ML). The mandibular angle decreased during both periods of age (ML/RL). The reduction occurred exclusively within the upper part of the angle (Ar-tGo-N) and was produced by the increasing retroinclination of the ramus (RL/NSL, Fig. 5). The chin angle was reduced (CL/ML), while both components of the angle underwent opposite changes. The inclination of the body of the symphysis (SmPgL/ML) markedly decreased and the inclination of the alveolar process (IdSmL/ML) increased. These changes were due to the deepening of the supramental concavity.

The increasing retroinclination of the mandibular ramus (RL/NSL, Fig. 5) represented the result of orthodontic therapy aimed at a posterior displacement of the lower jaw. The anteroposterior position of the maxilla (Ptm-VL) remained unchanged. In accordance with the increasing proclination of the upper alveolar process (ASL/PL) increased also the proclination of upper incisors (+1/PL). However this process was much slower during puberty than during the prepubertal period. There was also a slight increase of the proclination of lower incisors (—1/ML). This development was reflected by changes of the interincisal angle (+1/—1) which decreased markedly during the prepubertal period and slightly during the period of puberty. A similar deterioration of sagittal jaw relations during both periods was confirmed with Wits appraisal (Ss + Sm). An impairment in the interalveolar relations (Pr + Id) was only slight. This was due to the increasing protrusion of the upper alveolar process towards the apical base (Pr + Ss). On the average, it was possible to attain in the prepubertal period a certain degree of improvement of overjet which was followed however by its deterioration during the period of puberty (Is-Ii). The relation of the posterior to the anterior facial height (S-Go%N-Gn) did not change in the prepubertal period, while in the pubertal period it was characterized by the anterior growth rotation.

The main features of the facial soft profile (Fig. 6) reflected the skeletal profile. The protrusion of the lower face increased (S-N′-Sm′, S-N′-Pg′) while the middle face protrusion decreased or remained unchanged (S-N′-Ss′). This resulted in a flatteninng of the soft profile (N′-Sn′-Pg′) and in an impairment of sagittal relations between the middle and lower face (Ss′-N′-Sm′). An increasing proclination of the upper alveolar process was accompanied by an in-

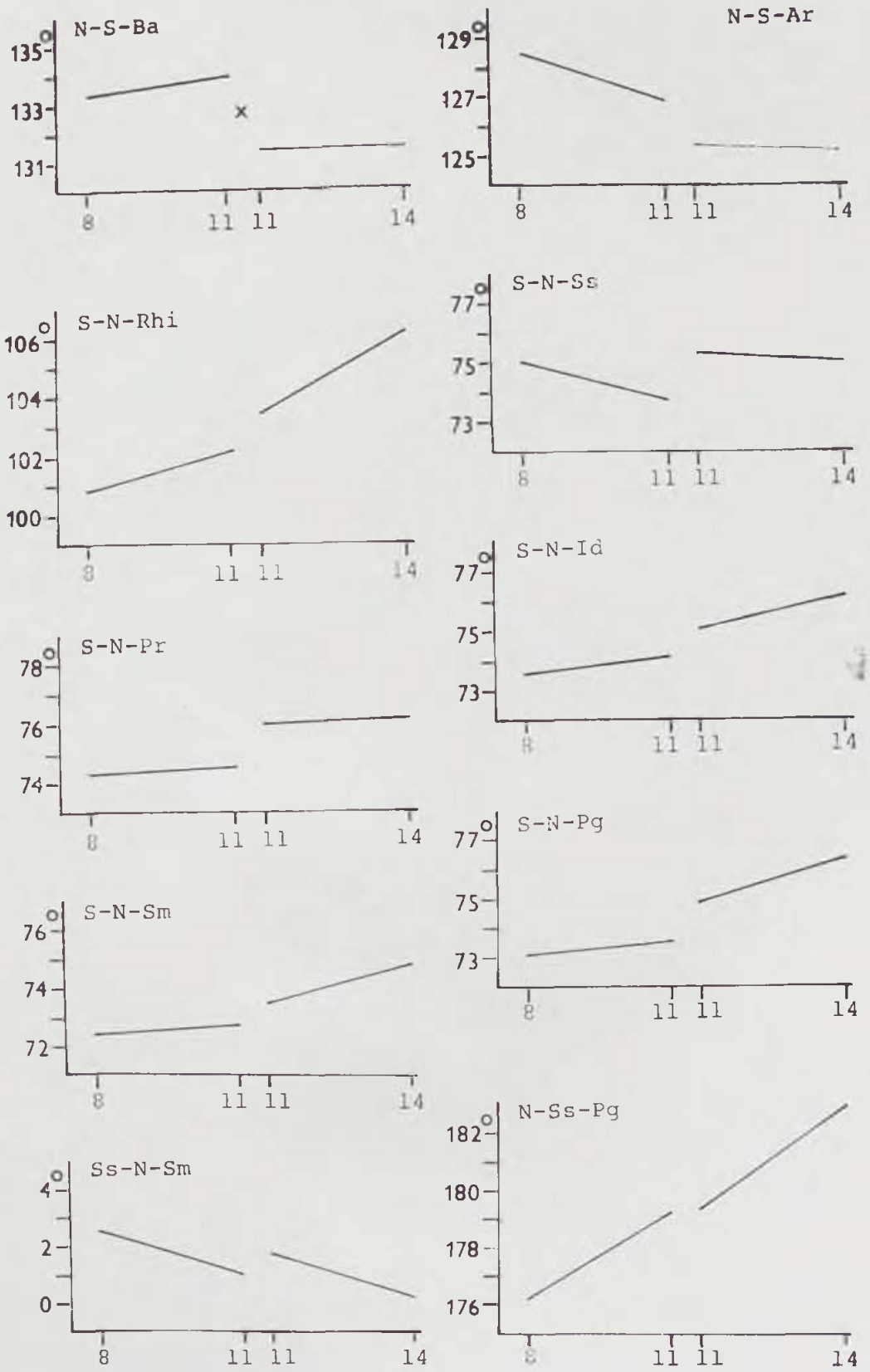

Fig. 3. Longitudinal growth curves of cra-niofacial variables during prepubertal and pubertal period in individuals with clefts (x = significant difference between both series at 11 years of age).

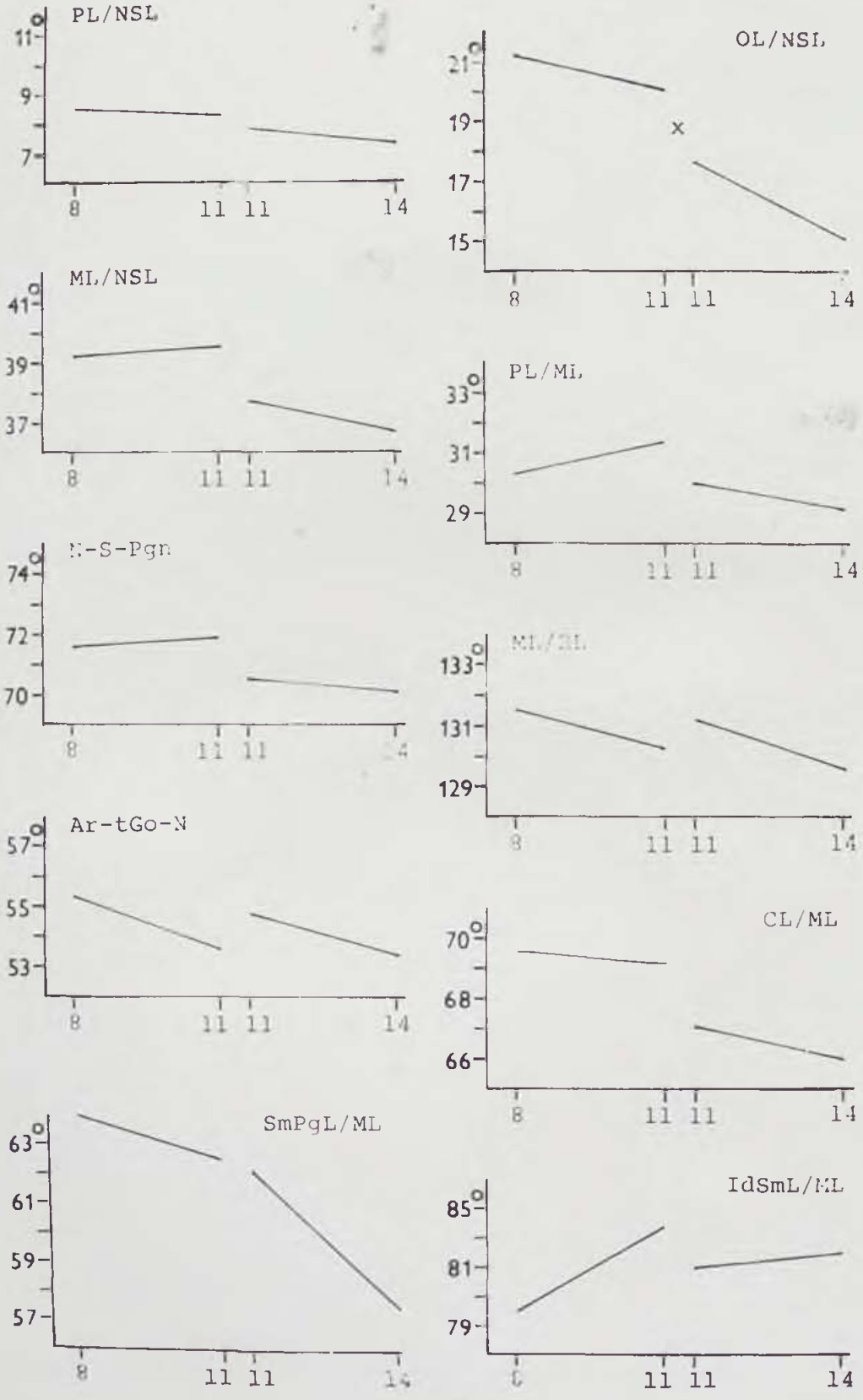

Fig. 4. Longitudinal growth curves (explanatory notes see fig. 3).

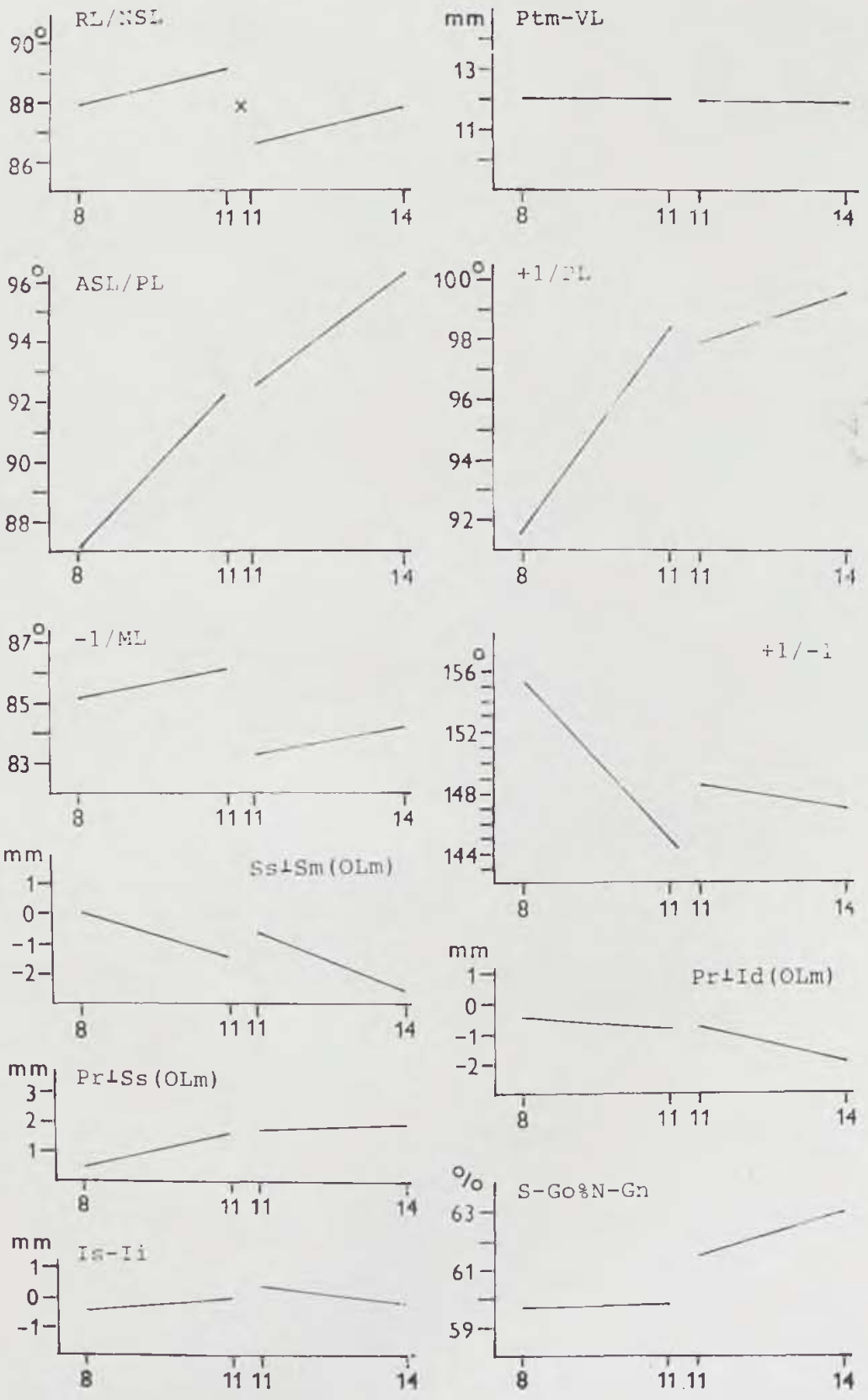

Fig. 5. Longitudinal growth curves (explanatory notes see fig. 3; ± have the same meaning as + used in the text).

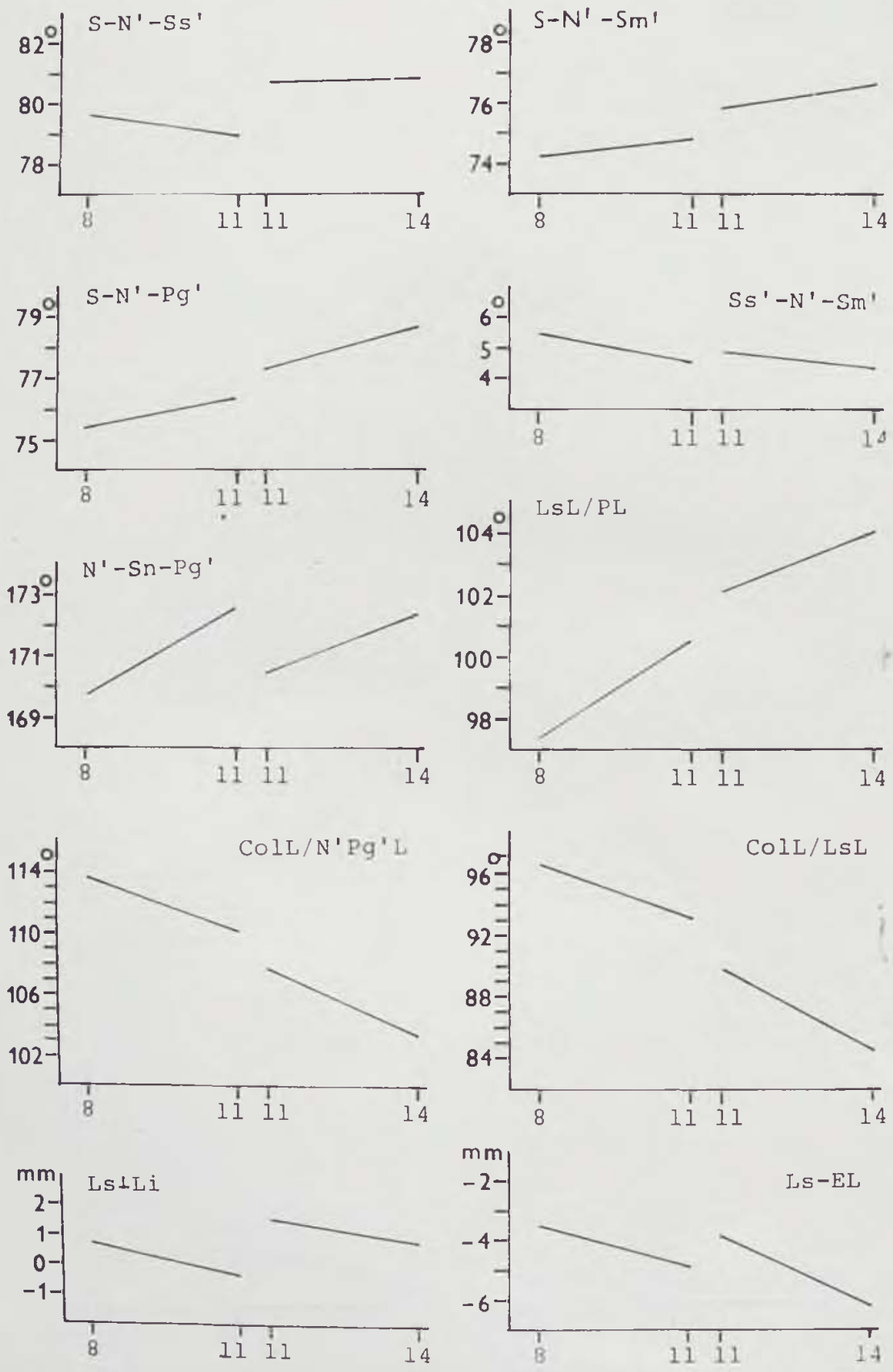

Fig. 6. Longitudinal growth curves (explanatory notes see fig. 3 and 5).

creasing proclination and protrusion of the upper lip (LsL/PL). A simultaneously decreasing slope of the collumela towards the profile (ColL/N'Pg'L) resulted in a marked reduction of the nasolabial angle (ColL/LsL). However, the prominenece of the upper lip steadily deteriorated (Ls + Li, Ls — EL). The extent of these changes was identical in both studied periods of age.

Significant differences at the level of $p < 0.05$ between the age groups of ten to eleven years of both series were recorded in three parameters: the angle of the cranial base (N-S-Ba, Fig. 3) the inclination of the mandibular ramus (RL/NSL, Fig. 5) and the inclination of the occlusal plane (OL/NSL, Fig. 4). They confirmed a certain degree of differences between both series. However, developmental changes of the above mentioned parameters were identical in both periods of time.

DISCUSSION

The results showed that the facial growth rate was not markedly enhanced during the period of puberty. Similar observations were reported on normal individuals as well (Baughan et al., 1973). Thus during puberty the deterioration of overjet was not due to a higher growth rate of the face at a time of a marked growth deficiency of the maxilla, but rather to the exhaustion of compensation and adaptation mechanisms during the preceding orthodontic treatment. This was suggested equally by the results of our recent study (Šmahel et al., in press). As compared to the prepubertal period an increased growth rate showed only the length of the mandible, the depth of the nose and the depth of the maxilla, but in clefts the growth of the latter was only very small. On the contrary a slower growth rate showed the length of the postsellar part of the cranial base with a termination of growth at the age of ten to fourteen years (Doskočil, 1961). A higher pubertal growth spurt of the mandible as compared to the growth of the cranial base was confirmed also by Lewis et al. (1985). However Bishara et al. (1981) reported that the circumpubertal growth spurt of the mandible was either low or even missing.

As compared to other facial parameters a lower growth rate showed during both periods the length of the anterior cranial base and the depth of the maxilla. The growth of the upper lip height was missing. The slight growth of the cranial base was due solely to apposition since the actual process of growth of the anterior cranial base was terminated at the age of three to four years (Doskočil, 1961). The deficient growth of maxillary depth and of upper lip height represented the sequelae of surgery (scar tension, uninterrupted ossification of the palate etc.), or it could be caused by a primary impairment of the potential growth of the maxilla. This could explain why the height the lip attained during primary reconstruction, whether long or short, persisted up to adult age and was not corrected by the process of growth (Saunders et al., 1986). A higher growth rate showed during both periods the depth of the nose leading to the increase of its prominence with age and representing a normal developmental pattern.

The above described developmental changes could also explain changes of numerous characteristics of shape and position e.g. maxillary retrusion, flattening of the face, impairment of sagittal jaw relations, increasing retrocheilia etc. Because of the marked inhibition of anterior maxillary growth at the level of the apical base the increasing proclination of the alveolar process was accompanied by a reduction of the nasolabial angle. This development was promoted by a reduction of the slope of the columella. The higher growth of mandibular length as compared to the length of the anterior cranial base contributed to the protrusion of the mandible. The inclination and occlusion of incisors and the inclination of the mandibular ramus were determined by the orthodontic therapy. The development of the face was also affected by the reduced anterior growth rotation accompanied by hyperdivergent vertical jaw relations. Thus, the mandibular angle was reduced only within its upper part due to the posterior displacement of the mandible. The described developmental changes were in agreement with the current state of our knowledge and the main parameters were consistent with the data reported by other authors (Aduss, 1971; Hayashi et al., 1976; Bishara et al., 1979; Hellquist et al., 1983).

During the prepubertal period the mandible showed a very slight trend towards posterior growth rotation, while during puberty there was an anterior rotation (ML/NSL, Fig. 4). This development reflected changes of associated characteristics (N-S-Pgn, PL/ML, Fig. 4; S-Go%N-Gn, Fig. 5). For this difference could acount the improving occlusion of incisors during the prepubertal period which contributed to the displacement of the lower jaw backwards, while the impairment of occlusion during the period of puberty promoted the anterior displacement of the mandible. However this observation could be due also to the composition of both series with a higher proportion of the posterior rotation types in the prepubertal series. This confirmed the slight flattening of the angle of the cranial base in this period (N-S-Ba, Fig. 3). The second recorded difference between the prepubertal and pubertal periods included the inclination of upper incisors (+1/PL) and related characteristics i.e. the interincisal angle, (+1/—1) and the overjet (Is-Ii, Fig. 5). During the prepubertal period, it was possible to procline markedly upper incisors and thus to improve the overjet. However further proclination of incisors was limited in the period of puberty. Thus it was not possible to compensate the continuous impairment of sagittal jaw relations and this resulted in a renewed deterioration of overjet. These changes represented the most important problem of dental development during puberty and an improvement was attained only by the use of fixed appliances. A more marked retrusive development of the maxilla in the prepubertal period than during puberty could be due to the composition and to the characteristics of the series examined.

Differences of the studied parameters between both series in the age group from ten to eleven years disclosed how far can differ two selections of probands based on the same original series because of accidental effects (composition). It is obvious that a pooling of both selected series and their assessment

based on semilongitudinal data would lead to errors. Thus, e.g. the angle of the cranial base (N-S-Ba) would decrease, and the angle S-N-Pr would increase (Fig. 3), while they remained actually unchanged. The inclination of the mandibular ramus (RL/NSL) would not change, the inclination of lower incisors (—1/ML) would even diminish, though both of them actually increased (Fig. 5). The prominence of the lip (Ls + Li) would appear unchanged while it actually deteriorated (Fig. 6). The difference in the rotation of the lower jaw (ML/NSL, N-S-Pgn) between both series would remain undetected (Fig. 4). Smaller errors would occur also during the interpretation of other characteristics. Though the pooling of both series would represent an incorrect variant of a semilongitudinal analysis of data, since both series did not include any same patient, this illustrates how an error could occur when small numbers of the same individuals would be included in both series during semilongitudinal analysis (or when composition of any semilongitudinal series changes substantially). The results confirmed the great value of longitudinal data and in some cases even the impossibility to substitute them with any other values.

SUMMARY

Roentgencephalometry was used for the assessment of the growth and development of the face during prepubertal and pubertal periods in children with complete unilateral cleft lip and palate treated with the same methods. The first series included 16 boys and 15 girls, the second series consisted of 15 boys and 15 girls examined repeatedly at the beginning and at the end of the follow-up period. There were no definite differences in the growth rate of the face between the two periods of age. Therefore, the deterioration of overjet during puberty could be due to the depletion of the compensation and adaptation mechanisms after the previous orthodontic treatment rather than to the enhanced growth rate. As compared to other facial dimensions a lower growth rate showed during both periods the length of the anterior base, the depth of the maxilla and in particular the height of the upper lip. Developmental changes of variables of shape and position proceeded similarly during both periods of age. An exception represented the rotation of the mandible and the inclination of upper incisors. During the prepubertal period the lower jaw showed a very slight posterior rotation, while during puberty an anterior growth rotation was present. A rapid improvement of the proclination of upper incisors was attained only during the prepubertal period. It was accompanied by an improvement of overjet. However, during the period of puberty there was a renewed deterioration of overjet. A marked retrusion of the maxilla developed already in the prepubertal period. During both periods occurred an identical impairment of sagittal jaw relations and of the upper lip prominence, accompanied by a flattening of the facial profile and reduction of the nasolabial angle. The prominence of the nose increased, the angle of the cranial base remained unchanged. Intersexual differences were not demonstrated in any studied characteristics.

Résumé

Croissance et développement du visage chez les fentes labiales et palatines unilatérales totales dans la période prépubertaire et pubertaire

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Par les méthodes radiocéphalométriques, on a effectué l'analyse de la croissance et du développement du visage chez les enfants âgés de 8 à 11 ans et de 11 à 14 ans, qui souffraient des fentes labiales et palatines unilatérales totales et qui étaient traités par les mêmes procédés. Le premier groupe comportait 16 garçons et 15 filles, le second 15 garçons et 15 filles. Les enfants ont été examinés à reprises, au début et à la fin de la période suivie. L'intensité de croissance du visage dans les deux périodes ne différait pas significativement. L'aggravation de l'occlusion en puberté résultait plutôt de l'épuisement des méchanismes adapto-compensatoires de l'évolution précédente que de la croisance intensive. La croissance moins progressive, en proportion à d'autres dimensions faciales, était observée — dans les deux périodes — chez la largeur de la base antérieure, le profondeur du maxillaire inférieur et surtout chez la hauteur de la lèvre supérieure. Les changements dus à l'évolution chez les caractéristiques de forme et de position avaient les mêmes attributs dans les deux périodes suivies. L'exception représentait la rotation de la mandibule et l'évolution de l'occlusion. Dans la période prépubertaire, le maxillaire inférieur montrait une postériorotation insignificante, au cours de puberté le maxillaire inférieur était en antériorotation. Nous n'avons réussi à augmenter rapidement la proclivité des incisives supérieures que dans la période prépubertaire, où nous sommes arrivé à une amélioration de l'occlusion. En puberté. l'occlusion s'est aggravée de nouveau. L'évolution retroussive du maxillaire inflérieur se manifestait déjà en période prépubertaire. Dans les deux périodes, les relations intermaxillaires sagittales s'aggravaient d'une façon identique, aussi que la proèminence de la lèvre supérieure, le profil du visage s'applatissait et l'angle nasolabial diminuait. La proéminence du nez augmentait, l'angle de la base craniale ne changeait pas Les différences intersexuelles n'étaient pas prouvées.

ZUSAMMENFASSUNG

Das Wachstum und die Entwicklung des Gesichtes bei totalen einseitigen Lippen- und Gaumenspalten in der prepubertalen und pubertalen Periode.

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Roentgenzephalometrische Auswertungen des Wachstums und der Entwicklung des Gesichtes im prepubertalen und pubertalen Alter, erfolgte bei Kindern mit totalen, einseitigen Lippen- und Gaumenspalten, die mit gleichen therapeutischen Verfahren behandelt wurden. Im ersten Patientengut waren 16 Jungen und 15 Mädchen, im der zweiten Gruppe 15 Junge und 15 Madchen die Untersuchungen erfolgten zu Beginn und dann wiederholt am Ende der Behandlung. Es gab keine wesentliche Unterschiede in der Intensität des Gesichtswachstum zwischen den beiden Altersgruppen. Ungünstige Veräanderungen der Okklusion in der Pubertät wurden daher eher durch die Erschöpfung der Kompensations- und Adaptationsmechanismen während der vorherigen orthodontischen Behandlung bedingt, als durch ein intensiveres Wachstum. Im Vergleich zu den anderen Gesichtsdimensionen zeigte eine geringere Wachstumsrate in den beiden Altersperioden die Länge der vorderen Schädelbasis, die Oberkiefertiefe und vor allem die Höhe der Oberlippe. Die durch den Entwickklungsprozess bedingten Änderungen der Gestalt- und Positionsmerkmale wiesen in beiden

verfolgten Zeitperioden denselben Charakter auf. Eine Ausnahme bildete die Rotation des Unterkiefers und die Inklination der oberen Schneidezähne. In der Prepubertät bestand beim Unterkiefer eine leichte rückwertige Rotation, während der Pubertät war eine vorwärtige Rotation vorhanden. Eine rasche Erhöhung der Proklination der oberen Schneidezähne konnte nur in der Prepubertät erreicht werden, die von einer günstigen Beeinflussung der Okklusion begleitet war. Während der Pubertät kam es erneut zu einer Verschlimmerung der Okklusion-Die Entwicklung des Oberkiefers war bereits in der prepubertalen Periode durch eine starke Retrusion gekennzeichnet. In beiden Zeitperioden verschlimmerten sich in gleicher Weise auch die gegenseitigen sagittalen Beziehungen zwischen beiden Kiefern, und auch die Prominenz der Oberlippe, mit einer Verflachung des Gesichtsprofiles und Reduktion des nasolabialen Winkels. Die Prominenz der Nase vergrösserte sich, der Winkel der Schadelbasis blieb unverändert. Der Nachweis von intersexuellen Unterschieden konnte nie erbracht werden.

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ETHICAL PROBLEMS IN BURN INJURY IN THE PAST DECADE

R. KÖNIGOVÁ

The past decade has seen the emergence of ethical problems of a character rather different from those encountered previously (Königová, 1976); these ethical problems are, first, due to increasing numbers of burn disasters, a topic addressed at various international conferences; second, they increasingly arise with the constant advances in medical technology which, while maintaining vital functions on the one hand (in various critical reversals), gives rise to a complex of ethical problems associated with the decision to withdraw life-sustaining treatment.

In burn disasters, we are faced with ethical problems already at the site of the disaster in field triage. A look back into the history reveals the technique of triage was pioneered by the prominent Napoleon's surgeon baron Dominique Jean Larrey formulating the principle of sorting out patients based on the need for medical intervention: soldiers at highest risk of death were the first to be operated on. Individuals sustaining less serious injuries were provided care only after the most severe injuries had been treated. Unlike this concept (dating back to the early 19th century), present-day triage should be performed on the spot with a view to the prognosis of individual victims. In burn injury, the prognosis is established on the basis of seriousness of the injury, not only actual but, also, potential seriousness. This means the prognosis should take into account possible deterioration of the patient's status due to the six known factors of seriousness (extent, depth, localization, age, medical history, mechanism of injury).

As a result, triage is based on injury classification and is intended to determine the order in which the injured are to receive treatment. Those given primary priority include patients benefiting most from emergency care, it is therefore important to give maximum attention to victims surviving only if provided adequate care. On the contrary, the lowest priority is offered to those who will live even without emergency care and, further, to those bound to die despite treatment. Establishing prognosis in burn injury is made all the more complicated by the fact that the patients are lucid at the beginning and are able to comunicate normally even though their injury is incompatible with survival. There might be a risk that the emergency service personnel as well as surgeons with unsufficient experience would concentrate their attention only on the most serious and, consequently, hopeless cases while the other

patients would be left without timely and adequate anti-shock treatment. There would neither be time nor medicaments nor means of transport left for them. Still, shock-related processes do continue to proceed and death occurs within two or more days due to multiple organ failure. These situations require not only experience but also responsibility of the medical staff to decide who should be provided emergency care and transport and who should receive only palliative therapy of pain and fear relief.

In individual cases, it is imperative to initiate anti-shock therapy in each patient including those with an obviously fatal prognosis. This is a duty and responsibility of all physicians irrespective of their specialty, as specified in the Methodological Guidelines of the Czech Health Ministry No. 20/87.

In the past decade, there have been repeated reports from China describing survivors with extensive burns involving over 90 of the total body surface area. This makes us to exert effort in all patients, since providing complex treatment—including psychological care—may save, in particular cases, victims of apparently hopeless condition. By contrast, the so-called psychological death may occur in some patients not provided psychological care even though their prognosis regarding the physical condition may be favourable.

The so-called social death, ocurring in cases left without continual long-lasting care, is another problem.

The situation is different in mass disasters when the needs of the victims for treatment are not available regarding adequate space, medical technology (mainly in operating theatres), or qualified staff. It has been proved that physicians lacking sufficient experience and training cause more problems than they are able to solve, a fact posing extraordinary demands on those making decisions in the therapeutic strategy to be adopted. The key question in mass burn disasters is to identify those eligible for adequate therapy and those due to receive only palliative therapy, that is, to provide relief from pain and fear.

Here, it should be remembered that, unless we can treat all patients using state-of-the-art techniques, passive euthanasia is in fact performed. Such a situation may occur at the site of disaster or upon admission to a hospital. This takes us to the next stage, that is treatment in an intensive care unit. The principle stating that access to the so-called titrated therapy—including the use of technology allowing rapid correction of deviations from the normal—is the right of each individual and creates a whole complex of ethical decisions for the physician:

a) when and whether, if at all, should the therapy be started?
b) when should the therapy be discontinued?
c) what quality of life are we able to provide to the patient?

The World Medical Association has adopted a law (The Handbook of Medical Ethics, 1981, London, Brit. Med. Assoc.) making it the duty of the physician to preserve human life under all circumstances. On the contrary, physicians in many developed countries are constantly being reminded that offering care to every individual—without sorting out the patients—is a thing of the past, and the limited resources available make the physician adopt the philo-

sophy of refusing treatment in some patients. These economic considerations make us ponder over the ways of allocating or distributing sophisticated technical equipment, to whom and when?

Physicians not only in the intensive care unit for severe burn injuries but, also, in the intermediate care wards may find themselves in situations when the patient's overall condition and irreversible death in old persons make the physician decide that, in case of a cardiac arrest, cardiopulmonary resuscitation is not only inappropriate (since it would be ineffective), it can even be regarded as contraindicated. In these cases, it would bring not only long useless agony to elderly individuals and prolongation of their suffering but also, place unnecessary demands on the staff who could otherwise pay their attention to other patients, thereby, benefiting the course of their therapy, both physical and mental. On the other hand, it is important to allow the patient die a dignified death and, often, minimize the pain and sorrow of the family. Last but not least, it is necessary to consider economic aspects including the risk of nosocomial infections posing a greater threat to the other patients the longer patients with a lethal prognosis are maintained on life-sustaining systems.

In 1989, G. R. Park pointed out in the "Intensive Care World" another area of ethical and moral problems regarding clinical research in the critically ill patients. These problems are increasing as the numbers of survivors grow both due to the advances made in the pharmaceutical industry, to production of increasingly sophisticated systems and, finally, also to the numerous questions raised by those treating the critically ill.

In general, a combination of several factors may occur: a) the patients in a hallucinogenic state and, consequently, unable to give their consent to be objects of a research, b) the complex character of therapy, c) often changing hospital staff, d) alienated setting of huge sophisticated institutes (the latter two factors do not apply to our department). It is evident from the above that the potential for misuse of research in the critically ill is much greater than in any other group of patients. Protection of individuals involved in biomedical research is embodied in the Nuremberg Code amended in 1964, and in the Helsinki declaration revised in 1975 and 1983. Under the declaration, all medical studies have to be approved by an ethical committee even though it had not been clearly specified what group of experts should have the disciplinary right or power, and who should be represented in this committee. In fact, it is the integrity of the projection against unethical actions.

SUMMARY

As a result of the increasing numbers of disasters and constant advances in medical care technology allowing survival of critically ill patients by using an interdisciplinary approach to comprehensive therapy, the past decade has seen the emergence of ethical problems related to burn injury. The study discusses the issue of sorting out patients from the point of view of providing emergency care and transport as well as from the point of view of psychologic

care and palliative therapy. The quality of life and prolonged suffering of elderly individuals is another major issue as well as, last but not least, ethical and moral obstacles encountered in clinical research carried out in the critically ill where the potential of misuse is greater than in other groups of patients. The role played by ethical committees and by integrity of the research project coordinator are highlighted.

RÉSUMÉ

Problèmes éthiques des traumatismes de brûlure en dernière décennie

Königová, R.

Au cours de la dernière décennie les problèmes éthiques ont surgit dans les tranmatismes de brûlure qui sont liés au nombre montant des catastrophes et à la modernisation de la technique hospitalière que facilite, dans les conditions de l'accès interdisciplinaire au traitement complexe, la survie des patients en état critique. On discute la question du classement du point de vue de dispensation des soint immédiats et de transferts et du point de vue soins psychologiques et du traitement palliatif. Un autre problème représente la qualité de vie et la prolongation des souffrances de personnes âgées; non en dernier lieu on note les obstacles cliniques et moraux concernant la recherche clinique sur les malades en état critique, où la possibilité de l'abus est plus grande que chez d'autres groupes de patients. On souligne le rôle des comissions éthiques et l'integrité du chef d'équipe.

ZUSAMMENFASSUNG

Ethische Probleme bei einem Trauma nach Verbrennungen in der letzten Dekade

Königová, R.

In der letzten Dekade zeigten sich bei einem Trauma nach Verbrennungen ethische Probleme im Zusammenhang einerseits mit sich vermehrenden Katastrophen und andererseits mit der Modernisierung der medizinischen Technik, die es ermöglicht, dass bei einem interdisziplinarem Zutritt zur komplexen Behandlung kritische Patienten überleben. Die Frage einer Klassifizierung vom Gesichtspunkt einer unmittelbaren Fürsorge und einem Transport wird diskutiert, ebenso vom Gesichtspunkt einer psychologischen Fürsorge und paliativen Behandlung. Ein anderes Problem ist die Lebensqualität und die Verlängerung des Leidens alter Patienten, nicht in letzter Hinsicht ethische und moralische Hindernisse betreffend der klinischen Forschung bei kritisch kranken Patienten. Hervorgehoben wird die Rolle ethischer Kommissionen sowie die Bedeutung einer Intergrität der leitenden Mitarbeiter.

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THE USE OF OZONOTHERAPY IN THE NOSE CORRECTION OPERATIONS

H. KAWALSKI, J. SONDEJ, E. CIERPIOŁ-TRACZ

For many years ozone has been used in various fields of medicine. Positive results of its use have been confirmed by numerous experimental and clinical studies. Ozone has bactericidal, fungitoxic, and virucidal properties, and does not bring about an immunity of the micro-organisms (2, 3, 4, 5).

It supplies the tissues with active oxygen and forms ozonides that influence the cell metabolism accelerating enzymatic reactions, as well as increase the organism's immunity by way of an immunological improvement. Also they improve internal organs' oxygenation and induce surfactant production in the lungs (5).

Ozone has a capability to link with unsaturated fatty acids resulting in the formation of peroxides which improve the blood's ability to carry oxygen. The lipid structure of the cellular membrane of the red blood cell following ozone perfusion, becomes "slackened", the erythrocyte becomes resilient, alters its shape and may push through stenotic blood vessels which, in turn, influences the supply of nutrients into the hypoxenic regions (4, 5).

Ozonotherapy results in an increase of the 2,3-DPG concentration in erythrocytes which enables better cellular respiration and oxygen utilisation (6).

There was no bad influence observed during ozonotherapy (1).

These positive reports encouraged us to utilize ozonotherapy in nose corrective operations.

The purpose of the procedure implemented was to reduce post-operative complications—haematomas of the orbital regions and post-operative oedema via acceleration of resorption, as well as an improvement of blood perfusion of the operated region.

METHODOLOGY

Blood ozonizing with the autohaemotransfusion method consists in collecting with a vacuum pump of an assumed blood volume—approximately 10 per cent of the circulating blood volume— in a flask into which 20 ml of citrate of a 3.13 percent concentration or 20 mg of heparin is introduced. The collected blood is then ozonized with ozone of 54 Γ/cm^3 concentration, obtained with the technique of quiet electrical discharges in oxygen with 150 V voltage and 0.4 bar (40,000 N/m^2) oxygen pressure. The "BIZON H.O.T." unit—a West German device—was used for producing the ozone (1).

TABLE 1.

Post-operative complications	Duration without ozonotherapy	Duration with ozonotherapy
Post-operative oedema	6—8 days	4 days
Bloody extravasations	6—7 days	4—5 days
Correct bone union	14 days	7—9 days

We conducted the nasal correction operations with the modified Walter method. Characteristic features of this method are the following:

— processing and positioning of the alar cartilages of the nose with nylon sutures;
— reinforcement of the soft septum and the column with pieces of cartilage;
— modelling of the septum in the middle line of the body;
— lower conchotomy, if the deviated septum shuts of one of the nasal ducts;
— subperiosteal osteotomy.

Significant traumatization during the operation of the nose and the adjoining tissues results in post-operative complications.

CLINICAL MATERIAL

The duration of complication regression in 20 patients who were not administered ozonotherapy was noted:

— post-operative oedemas continued on average until 7—8 days ofter the operation;
— bloody extravasations continued on average until 6—7 days post operatively;
— correct bone union occurred within approximately 14 days.

In 25 patients ozonotherapy was employed. Ozone was administered intravenously for three days prior to the operation and for four days post-operatively. During this period general feeling of all the patients was exceptionally good. No side effects were observed. Results of ozone introduction were as follows:

— within 24 hours of the operation post-operative oedemas retracted very significantly, and completely disappeared the fourth day following the operation;
— blood extravasations disappeared completely within 4—5 days after the operation;
— good bone union within 7—9 days was obtained.

CONCLUSIONS

1. The use of ozonotherapy brings about a significant decrease of duration of post-operative complications in rhinoplasty.

2. This in turn causes an improvement of the patient's general feeling via a positive influence on his/her psyche.

3. Intravenous ozone administration is perfectly safe.

SUMMARY

Positive results of application of ozonotherapy in rhinoplasty are described. 25 patients were administered ozone intravenously for 3 days prior to operation and days post-operatively, resulting in a significant reduction in post-operative complications duration as compared with the control group consisting of 20 patients who were not administered ozonotherapy.

RÉSUMÉ

Utilisation de l'ozonothérapie dans les interventions de correction du nez

Kawalski, H., Sondej, J., Cierpiol-Tracz, E.

La desription des résultats positifs de l'ozonothérapie dans les rhinoplasties est donnée. 25 patients recevaient de l'ozone par une voie intraveineuse au cours de 3 jours préopératoires et de 4 jours postopératoires, ce qui avait pour résultat une importante réduction des complications postopératoires vis-à-vis d'un groupe de contrôle composé de 20 malades qui ne recevaient pas de l'ozonothérapie.

ZUSAMMENFASSUNG

Anwendung der Ozonotherapie bei Operationen einer Nasenkorrektur

Kawalski H., Sondej J., Cierpiol-Tracz E.

Beschrieben werden die positiven Ergebnisse einer Anwendung der Ozonotherapie in der Rhinoplastik. 25 Patienten erhielten intravenös drei Tage lang Ozon vor der Operation und vier Tage nach der Operation, was zur Folge hatte, dass die Komplikationen nach der Operation bedeutsam verkürzt wurden im Vergleich zu einer Kontrollgruppe von 20 Patienten, bei denen die Ozonotherapie nich angewendet wurde.

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