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FRACTURE CONSOLIDATION IN BURNED PATIENTS

N. P. IVANOVA, N. V. PETROV

Skeletal fractures appear to be a major pathological event in combined injuries and are found in 40 % patients exposed to thermal and mechanical injuries according to our evidence. Opinions differ as to fracture consolidation in burned patients and its specific features. Some authors (A. N. Berkutov, 1956; I. L. Krupko, 1966; I. E. Revzin, 1967, 1969) assume that the reparative process of osseous tissue is impaired in burned patients, others (D. B. Bekov, 1960; A. K. Smirnov, 1976) believe that the consolidation of small fragments occurs in normal convalescent period provided proper treatments is applied.

Our aim was to find out if there was any common negative impact of the thermal injury on the fragment consolidation and if a burn at the site of fracture slows down its union.

We have analyzed the treatment of fractures of long tubular bones in 76 burned patients — 52 men and 24 women, aged 15 up to 65. As to the localization of the fracture the cases can be divided as follows: humerus — 13, bones of the forearm — 15, femur — 16, crural bones — 32 persons.

We have evaluated the degree of thermal injuries according to Frank's index. Very extensive burns (Frank's index over 60) were found in 24 cases, major (from 30 up to 60) in 32 and minor burns (less than 30) in 20 patients.

In accordance with the main aim of the research the patients were divided into two groups: 1. burn and fracture in different anatomical areas (24), 2. burn and fracture in the same localization (52).

We considered useful to include into the first group 20 more burned patients with fractures, who did not need any special surgical treatment and were healing satisfactorily under normal conditions. This group included fractures of the os coxae and ribs in 15 patients, isolated fractures of the fibula without fragment displacement in 5 cases.

In total, we followed 96 burned patients with fractures in various localizations.

The patients of the first group were treated using different methods: plaster bandage — 12, skeletal traction — 3, surgical intervention — 9 cases.

Plaster bandage was applied to the fractured upper extremity (without displacement or after reposition) regardless of the type of fracture (arm in 4, forearm in 4 patients). In cases of leg lesion plaster immobilization was used in stable fractures (in 5 patients with crural bone fracture) and in only

2 cases with spiral fracture (1 with femural fracture and 1 with tibial fracture). The above method still permitted us to treat burn injuries as they were situated outside the area of plaster bandage.

We performed skeletal traction in 2 patients with unstable femoral and shin fractures and in 1 patient with fractured humerus, where closed reposition proved unsuccessful. The burns were located on the anterior surface of the trunk and on intact extremities, and did not interfere with the treatment.

Open reposition of the fragment was carried out in 5 patients: fracture of the olecranon (2 patients) and patella (1), with the fragment displacement and fracture dislocation in the area of the shoulder joint resistant to bloodless setting (2 patients).

A compression-distraction apparatus was applied in 4 patients with unstable crural fractures with major fragment displacement. The method employed enabled us to carry out reposition and reliable fixation without hindering the treatment of the extensive burns of the trunk and upper extremities.

The results seen in 24 patients of the first group and of the added group of 20 showed fragment consolidation in the convalescent period normal for this kind of fractures, no matter how serious the burn may have been. Delayed union found in 4 patients was caused by late reposition (after 2—4 weeks) and fixation of the fracture due to the severe general condition of the patients with thermal injury.

In the second group treated (suffering from burn and fracture at the same site) we faced certain difficulties arising from the burn injuries of the extremity involved. We have to emphasize that the treatment of the fractures accompanied by full-thickness burns of the forearm and especially of the shin was similar to that of open fractures because of the thin layer of surrounding vital soft tissues. Furthermore, healing in the above patients mainly depended on the extent of muscle injury and destruction and on peripheral blood circulation. When selecting the treatment procedure, we had to take the above circumstances into account.

Tab. 1. Treatment of fractures in group 2 patients

Treatment	Localization				Total
	arm	forearm	femur	shin	
Plaster	2	3	5	2	12
Skeletal traction and plaster	2	—	2	2	6
Extermal fixation apparatuses	3	8	5	18	34
Total	7	11	12	22	52

Table 1 shows that plaster bandage was applied in 12 patients with the fracture and burn in the same localization. The following cases were regarded as indications for the use of the technique: stable uncomminuted fractures of the extremities or fractures after reposition in combination with circumscribed burns. The burns were treated through a "window" in the plaster. We failed to reach an ideal position of the fragments in 5 patients with femoral fractures, whereafter the fracture was stabilized with plaster bandage, which permitted changes of dressings and treatment of burns in this and other localizations.

Traction was applied in 6 patients of group 2 with unstable fractures of the humerus, femur and crural bones. The burns affected the anterior and lateral surfaces of the extremities. The traction was continued for 1—1½ months. The wounds were progressively decreasing in size due to superficial burn healing. Fragment fixation was subsequently carried out using a "window" in the plaster bandage, which did not interfere with free autografting. As an exception (2 patients) the surgical procedure was used while fixing the fragments with skeletal traction. The patients were transferred to the operating theatre in their own beds without having to use a stretcher.

Tab. 2. Fracture consolidation in group 2 patients

Localization	Consolidation			Total
	normal	delayed	non-union	
Femur	10	2	—	12
Shin	17	3	2	22
Arm	7	—	—	7
Forearm	7	3	1	11
Total	41	8	3	52

The compression-distraction method was applied in patients of group 2 much more frequently (34). Any fracture with concomitant burn injury to the posterior surface of the extremity or with a circular burn of the extremity is taken as an indication for employing the technique. The external fixation apparatus facilitates a reliable fixation of the plaster as well as active treatment of the burn. Furthermore, the pressure of the extremity on the burned surface is eliminated. The external fixation apparatus gives the patient a chance to resume movement early. This is important with a view to preventing hypostatic complications.

Examining the results of treatment in group 2 we find that in most patients the consolidation of the fragments occurs in the normal convalescent period in cases of open fractures in the respective localization (Tab. 2).

Fragment union was delayed in some patients (8) or did not occur at all (3), i. e., the consolidation failed to progress smoothly in all patients. Among these, open fractures with badly damaged soft tissues were diagnosed in 9 patients; 2 patients were admitted to our department too late after the trauma (2 and 3½ months). In the latter 2 patients with femoral fractures and extensive burns fragment fixation proved unsatisfactory (plaster splints). Consequently, plaster bandage with "windows" over the burns was applied. Union was reached in 10 and 12 months respectively.

An analysis of the clinical course and treatment in cases of impaired union revealed severe soft tissue destruction to be the major cause of the delay. The fragments failed to unite in 3 burned patients with open fractures of the crural bones and forearm with concomitant contusion of soft tissues, and the process was delayed in 6 others regardless of immobilization carried out at the time of applying the compression-distraction apparatus. The cause of non-union was found in broken blood supply to the wounded part of the extremity. To improve the situation we restored the skin cover using dermatoplasty (tube flap — 5, Italian plastic operation — 4 cases). Union was achieved in all the above cases. Our data corroborate literary reports on massive soft tissue destruction as leading to the development of pseudoarthrosis (I. F. Balatashvili, 1985; T. P. Vinogradova, G. I. Lavrisheva, 1974; A. V. Kaplan, O. N. Markova, 1975, and others). Our research showed that pedicled tube flap plastic operation considerably improved peripheral blood circulation with the development of arterial and venous collaterals (A. A. Belyayeva et al., 1985).

As an example, we present a case report on patient Sh., 26 years old, who had a car accident on October 1, 1979, and who sustained a fracture

Fig. 1 Right lower extremity of patient Sh. on admission

of the right femur (middle third) together with trunk burns (3rd degree AB) and thermal injuries of the right lower extremity (altogether about 25 % of the body surface, out of that 15 % full-thickness burns). He was referred to our Institute 2½ months after the accident. We found a circular granulation wound on the right shin and on the posterior inner surface of the right femur (Fig. 1). The femoral fracture was detected by X-ray and so was the displace-

Fig. 2 X-ray of the right femur of the same patient at admission

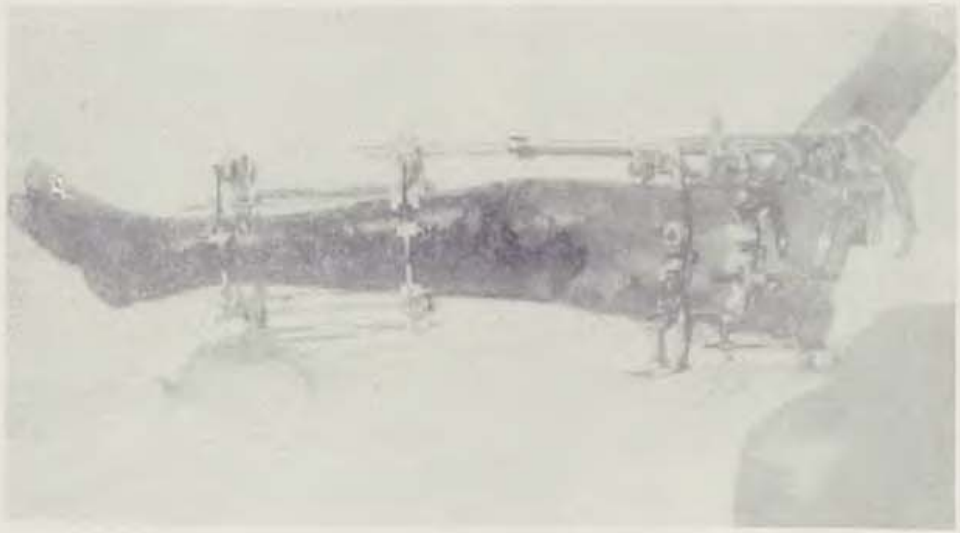

Fig. 3 Right lower extremity of the same patient after Ilizarov apparatus application and after free autoplasty

ment of fragments with a periosteal callus already formed (Fig. 2). We applied the Ilizarov apparatus to correct the displacement and to fix the fragments 10 days after his admission when his general condition had improved. We also performed free skin grafting to cover the granulation wounds, and applied split-thickness autografts. To eliminate the pressure of the body on the burned surface, we applied the Ilizarov apparatus also on the right shin (Fig. 3). Gradual reposition of the fragments with the apparatus still in position was performed in 3 weeks for stable fixation of the fracture. Free autografts were applied twice (January 10 and February 13, 1980) whereupon

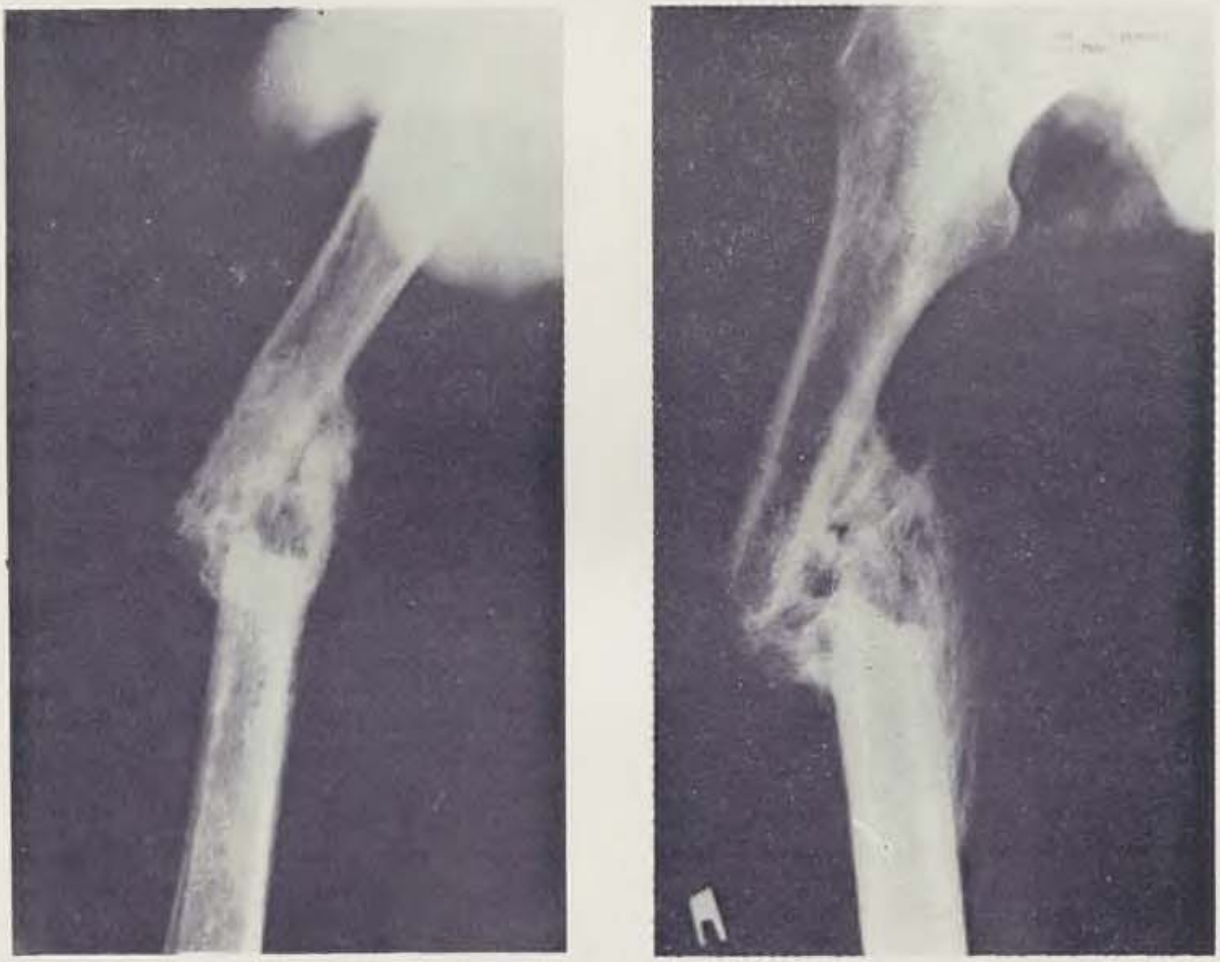

Fig. 4 X-ray of united femur fracture 8½ months after injury in the same patient

the wounds healed completely. The apparatus was removed after 3 months, though immobilization of the femoral fracture was continued using a shortened plaster bandage. Union was achieved 5 months after reposition (Fig. 4). Examined 3 years later, the patient reported no complaints. The skin cover was clean and no wounds were visible (Fig. 5). He can now walk unaided with full use of his right leg. Only movement in his right knee joint remains limited: extension is full, flexion up to angle of 100 degrees.

Fig. 5 Patient Sh.'s extremities 3 years after injury

CONCLUSION

1. Bone fractures constitute a major pathological condition in combined injuries, and are seen in 40 % of all patients with thermal and mechanical injuries.

2. Burn injuries do not affect the consolidation processes.

3. Delayed union was caused in some patients by late reposition of the fragments and by inadequate fixation.

4. Fracture non-union was caused by severe soft tissue damage at the site of the fracture, by mechanical injury and by impaired blood supply to the part of the extremity involved.

SUMMARY

The process of bone fragment union was studied in 96 burned patients. Healing was found unaffected by the burn injury. In the authors' view delayed consolidation and fragment union was due to inadequate peripheral blood circulation in the fracture area, to severe soft tissue damage in the extremity involved (9 patients) and to delayed reposition and fixation of the

fragments (6 cases). Restoration of the skin cover using pedicled flap dermatoplasty was found essential for normalizing the consolidation process as it greatly improved regional blood circulation in the fracture area.

Key words: Fractures, burns, external fixation, skingrafting, impaired peripheral blood circulation, bone fragment consolidation.

RESUME

Au problème de consolidation des fractures chez les brûlés

Ivanova, V. P., Petroff, N. V.

Nous avons traité les problèmes de consolidation des fragments osseux chez 96 brûlés. S'appuyant aux donnés cliniques et radiographiques, on a conclu que les brûlures n'exercent pas d'influence défavorable sur la consolidation des fractures. Selon notre opinion, le retard de consolidation ou une réparation nulle des fragments osseux sont causés par des troubles de circulation sanguine périphèrique dans les sites de fracture qui résultent de graves endommagements des tissus mous de l'extrémité atteinte (9 malades). L'autre facteur défavorable, c'est un traitement non adéquat, consistant en reposition et fixation attardées des fragments osseux (6).

Le proces normal de consolidation osseuse est conditionné d'une façon importante par l'exécution d'une plastie cutanée, effectuée par un greffon pédiculé, ce qui améliore considérablement la circulation sanguine régionale au foyer de fracture.

ZUSAMMENFASSUNG

Zum Problem der Heilung von Brüchen bei Verbrennungen

Ivanova, N. P., Petrov, N. V.

Wir haben uns mit dem Problem der Heilung von Knochenbrüchen bei 96 Patienten mit Verbrennungen befasst. Auf Grund der klinischen und roentgenologischen Angaben sind wir zu dem Schluss gekommen, dass Verbrennungen keinen ungünstigen Einfluss auf das Zuwachsen von Knochenbrüchen haben. Nach der Ansicht der Autoren ist die Ursache einer verlangsamten Heilung und Nichtzuwachsens der Knochenbrüche die Störung des peripheren Blutumlaufs an der Stelle des Bruches, was wiederum die Folge der schweren Beschädigung des weichen Gewebes des betroffenen Glieds ist (bei 9 Patienten) sowie einer unrichtigen Behandlung der Patienten (6), die vor allem auf einer verspäteten Reposition und Fixierung der Knochenbrüche beruht.

Eine wichtige Bedingung der Normalisierung des Verlaufs des Heilungsprozesses ist die Plastik der Haut mittels Zapfentransplantats, was den regionalen Blutumlauf an der Stelle des Bruchs erheblich verbessert.

SUMARIO

La cura de las fracturas en pacientes quemados

Ivanova, N. P., Petrov, N. V.

El papel discute los problemas concernientes a la cura de los fragmentos óseos en 96 enfermos quemados. Los datos clínicos y radiológicos llegan a la conclusión que las quemaduras no tienen influencia adversa sobre la unión de huesos. Según la opinión de los autores la curación retardada y el retardo en la unión de los fragmentos óseos son causados por el defecto en la circulación de la sangre periférica

en el sitio de la fractura, lo que es debido al daño severo de los tejidos blandos de la extremidad afectada (9 pacientes) y al tratamiento incorrecto de los enfermos consistiente, en el primer lugar, en la reposición y la fijación retardadas de los fragmentos óseos (6). Un gran enfásis se pone sobre la dermatoplastía efectuada con el pedículo del colgajo, porque ésta mejora considerablemente la circulación de la sangre regional en la zona de fractura.

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SURGICAL TREATMENT OF PATIENTS WITH UPPER MICROGNATHIA OR RETROGNATHIA

V. M. BEZRUKOV, V. I. GUN'KO, S. G. ANANYAN

The treatment of patients with skeletal forms of deformities of the jaws is among the most difficult tasks of the plastic surgeon. Numerous clinical observations testify to considerable advantages of surgical treatment as compared with orthodontic treatment in removing aesthetic and functional disturbances in patients of this group (V. M. Bezrukov, 1981; Kh. A. Kalamkarov et al., 1981; Moore, 1985).

Many effective methods of surgical treatment of patients with upper micrognathia or retrognathia are known permitting to achieve optimal results. All of them are based on the osteotomy of the upper jaw complex (UJC) in varying variants and the transfer of the osteotomized fragment in the right position placing bone transplants between the fragments and performing their fixation (V. M. Bezrukov, 1976; Obwegeser, 1969; Bell, 1985; Moore, 1985, and others). At the same time further investigation and improvement of the methods of surgical treatment of patients with the given disorder is necessary, taking into account the existing deformity, the strategy of surgical intervention and the possibilities of complications occurring in the postoperative period. The diversity of the deformities of the middle part of the face and the complexity of removing the anatomo-functional disturbances in this region represent for the surgeons a number of new problems the solving of which requires improvement of the methods of their removal.

Speaking about the delayed results of treatment of patients with upper micrognathia or retrognathia, obviously, not only anatomical but also functional results of surgical treatment (greatly determining the level of medical and social rehabilitation) should be kept in mind. Some aspects of this problem including the possible influence on the palato-glottal closure (PGC), of UJC osteotomy and its frontal shift, are not adequately dealt with in the literature. The causes of speech disturbances in the mentioned group of patients frequently observed after surgical interventions, are not sufficiently explored and adequate attention is not paid to their prevention. In our opinion, this is a special problem calling for further thorough investigation, detailed clinical and experimental studies. At the same time, the necessity of supplement-

ing the osteotomy with a number of measures preventing disturbances of speech in the patients, is discussed in a number of papers (Schuchard, 1958; Schwarz and Gruner, 1976; Jackson, 1978). For this reason, the attention of clinicians should be focussed today already not only on the achievement of stable optimum results of treatment and preclusion of relapses, but also on the prevention of disturbances of the PGC function.

From the functional point of view the existing surgical methods do not always ensure the preservation (in full extent) of the necessary movements of the soft palate. This particularly applies to cases where the surgical treatment aims at considerable shift of the osteotomized fragment of the upper jaw inevitably leading to stretching (overstretching) of the muscles of the soft palate and disturbance of the PGC function. In keeping with the above mentioned facts it is understandable why the development and further improvement of the methods of UJC osteotomy, focussed on the prevention of disturbances of the PGC function in the postoperative period, are underway in various clinical departments.

In the literature we found only sporadic papers concerned with the given problem. Starting from this point, we consider it advisable to expound the experience with the treatment of these patients in our department in which, since 1979, an improved method of UJC osteotomy has been used, by means of which disturbances of PGC function can be avoided using additional separation and shifting of muscle fibres of the soft palate.

METHODS

An incision of the mucous membrane is made above the upper vault of the oral vestibule at 0.5 cm from 7 to 7. By means of a raspatory, the anterior surface of the upper jaw is skeletonized from the margins of the piriform aperture to the suborbital openings. Using a raspatory, the muco-periosteal flaps are then separated in the form of a tunnel from the cranio-alveolar crest to the pterygoid processes of the donor bone, applying the instrument parallel with the occlusion plane. Using a drill the osteotomy of the upper jaw is performed starting from the lower border of the piriform aperture under an angle 30—60° to the orbits and then the line of osteotomy is continued horizontally avoiding the suborbital openings, up to the cranio-maxillar sutures. To ensure visual control in the osteotomy of the protuberances of the upper jaw in the region of the cranio-maxillar sutures, portions of the bone tissue sized 0.5 × 0.3 cm are cut out and "windows" are formed for the introduction of the osteotome. The line of osteotomy is then prolonged downwards along the cranio-maxillar sutures and the bone tissue is transsected by means of the osteotome through the formed "windows" in the direction of the pterygoid processes of the donor bone parallel with the occlusion plane (Fig. 1 a). Using an especially curved osteotome, the protuberances of the upper jaw are separated from the pterygoid processes of the donor bone.

At the concluding stage of UJC osteotomy the nasal septum and its lateral walls are resected by means of an osteotome at the level of the nasal base (Fig. 1 b). The osteotomized lower part of the UJC is separated from the base of the skull by shifting it downwards and forwards. Subsequently the separation of the muco-periosteal flaps in the region of the nasal base is continued under visual control up to the naso-glottal fold. Using a specially curved thin raspatory, the tissues of the soft palate are separated along its fixation to the hard palate. As a result of this procedure, the palatine aponeurosis is laid bare in all its width. In order to preserve normal position of the soft palate after the forward shift of the osteotomized UJC a trapeziform incision of the aponeurosis is performed downward to the posterior margin of the horizontal plate of the palatine bones (see Fig. 1 b), then blunt preparation and shift of the muscle fibres of the soft palate from the medial plates of the pterygoid processes of the sphenoid bone to the middle line

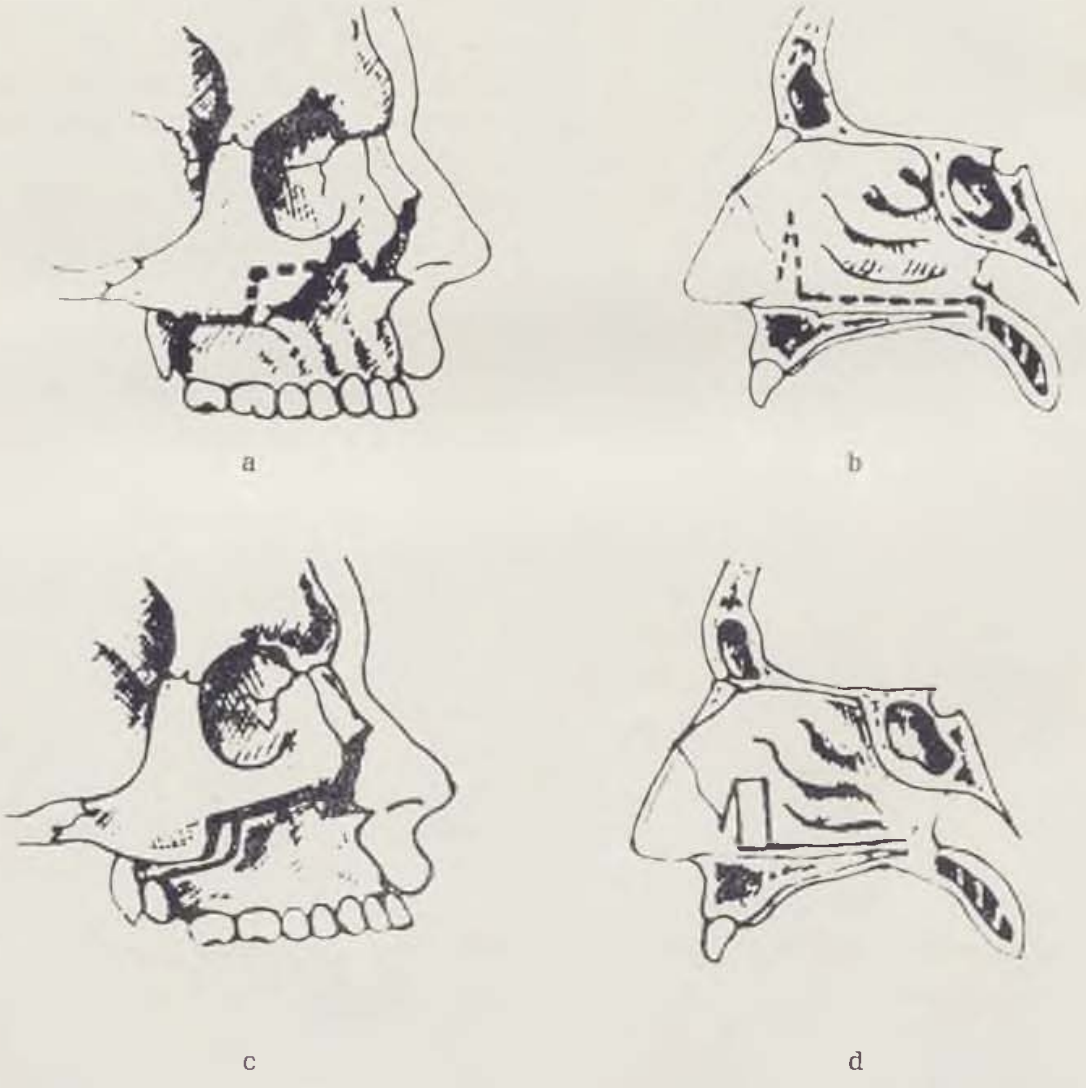

Fig. 1 Schematic presentation of the main stages (a, b, c, d) of osteotomy of the upper jaw complex. See text for explanation

of the palate are used. After lifting the mucous membrane the quadrangular cartilage of the nasal septum is dissected by means of curved scissors.

At the closing stage of the operation, the osteotomized fragment of UJC is shifted forward into correct position and fixed by fine wire sutures to margins of the piriform aperture whereas formalinized bone allotransplants

Fig. 2 Female patient S. before operation. a — en face, b — profile, c — bite

from tubular bones are placed behind the protuberances of the upper jaws in the form of small bars (Fig. 1 c and d). The muco-periosteal flaps are returned to the original position and the wound is closed with catgut sutures. Tampons are applied to the nasal passages for two days to prevent bleeding from the opeartion wound.

RESULTS, DISCUSSION

For illustration, we present the following clinical observations.

Female patient S., 18 (Fig. 2), was admitted to our department with complaints of an aesthetic shortcoming, biting and chewing difficulties and nasal breathing. According to the patient's history the disorder was congenital.

Fig. 2 d — lateral teleroentgenogram

Orthodontic treatment was carried out for a period of five years and permitted correction of the shape of the dental arch in the upper jaw and the position of individual teeth. Diagnosis: "Upper micrognathia". Osteotomy of the UJC was carried out using the above mentioned method with the shift of the osteotomized fragment 0,8 cm forward and with simultaneous separation and transfer of muscle fibres of the soft palate.

The postoperative period was without complications. The nasal tampons were removed on the 3rd day and traction was applied on the 5th day. Intermaxillar fixation was removed on the 25th day after operation. A fully satisfactory aesthetic and functional result was obtained after two years (Fig.

3). The outlines of the face were restored, occlusion orthognathic, the ability of opening the mouth to full extent. Nasal breathing, the functions of biting off and chewing food were considerably improved. The results of treatment were confirmed by the results of functional methods of examination: teleroentgenography using contrast markers, rhinopneumometry and endoscopy. Evaluation of speech by the logopedists did not reveal any signs of nasalism or disturbance of articulation.

Fig. 3 The same patient after operation (a, b)

The above mentioned method was used in 227 patients (93 men and 134 women) with various types of upper micrognathia and retrognathia, aged from 17 to 40 years (mean age 24.1). Upper micrognathia was found in 154, upper retrognathia in 73 patients. Before the beginning of treatment, each patient was subject to thorough clinical and laboratory examinations with the participation of a logopedist, orthodontist and, according to indications, otorhinolaryngologist and psychiatrist. Complex examinations including modern methods of objective evaluation of ENT functions (electromyography, teleroentgenography, endoscopy) were carried out in all patients. The speech of the patients was evaluated by expert logopedists using the auditive methods.

An analysis of early and delayed results showed that good aesthetic, anatomical and functional results were achieved in all the 227 operated patients with the above mentioned condition. Delayed results of treatment were fol-

lowed up in 136 patients (59.9 %) in periods from 1 year to 8 years. We have succeeded not only to remove the existing deformity but also to prevent speech disturbances in all the patients operated on. According to the results of teleroentgenography, the parameters characterizing the functional state of ENT did not differ from those before the operation. On the basis of the obtained results it can be concluded that the preservation of the normal situation of the soft palate which is envisaged by the elaborated method

Fig. 3 c, d

of UJC osteotomy enables us to prevent disturbances of speech in the post-operative period.

When generalizing the results of the treatment performed it should be pointed out that in UJC osteotomy in patients with upper micrognathia or retrognathia it is advisable to carry out additional transfer of the muscle fibres of the soft palate.

SUMMARY

Experiences with the treatment of patients with upper micrognathia or retrognathia in the Department of Reconstructive Surgery of the Head and Neck, Central Research Institute of Stomatology, Ministry of Health of the USSR, are reported. An analysis of results of treatment of 227 patients with the above mentioned disorder has shown the high effectiveness of the developed method of osteotomy of the upper jaw complex and the experience of taking additioanl measures focussed on the prevention of disturbance of the function of the palatoglottal closure.

Key words: osteotomy, upper jaw, bone graft, soft palate.

RESUME

Traitement chirurgical des malades avec micrognathie supérieure ou rétrognathie

Bezrukov, V. N., Guňko, V. I., Ananjan, S. G.

Apportée une expérience avec le traitement des malades présentant une micrognathie supérieure ou une rétrognathie, dans le Département de la chirurgie reconstructive de la tête et du cou de l'Institut central de la recherche en stomatologie du Ministère de la Santé Publique en U.R.S.S. L'analyse des résultats du traitements de 227 malades, atteints de la difformité mentionnée, a prouvé une grande efficacité de la méthode élaborée consistant en ostéotomie du complexe de maxillaire supérieur. Egalement, les mesures complémentaires prises afin de prévenir des troubles de fonction de la fermeture du complexe glossopalatin, ont été trouvées efficaces.

ZUSAMMENFASSUNG

Die chirurgische Behandlung von Patienten mit oberer Mikrognathie oder Retrognathie

Bezrukov, V. N., Guňko, V. I., Ananjan, S. G.

Es wird die Erfahrung mit der Behandlung von Patienten mit oberer Mikrognothie oder Retrognathie an der Abteilung für rekonstruktive Chirurgie des Kopfes und des Halses im Zentralen Forschungsinstitut für Stomatologies des Ministeriums für Gesundheitswesen der UdSSR angeführt. Die Analyse der Behandlungsergebnisse von 227 Patienten mit der obangeführten Deformation erwies eine hohe Effektivität der ausgearbeiteten Methode der Osteotomie des Komplexes des Oberkiefers sowie die Zweckmässigkeit der ausgeführten ergänzenden Massnahmen, die auf eine Vorbeugung der Störungen der Funktion des Schliessens des palato-glottalen Komplexes gerichtet waren.

SUMARIO

Tratamiento quirúrgico de los pacientes con micrognatía superior o retrognatia

Bezrukov, V. N., Guňko, V. I., Ananjan, S. G.

Los autores presentan sus experiencias obtenidas del tratamiento de los pacientes con micrognatía superior o retrognatía, que fueron tratados en el Departamento de Cirugía Reparadora de Cabeza y Cuello, el Instituto Central de Estomatología, Ministerio de Salud Pública, Unión Soviética. Los resultados obtenidos en base del tratamiento de 227 enfermos con la dicha deformidad demostraron una gran eficiencia debido a la técnica ostotómica aplicada a la mandíbula superior y éstos fueron también ventajosos por loque se refiere al empleo de las medidas suplementarias dirigidas a la eliminación de los desórdenes funcionales del cierre palato-glótico.

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VERTICAL BACK FASCIOCUTANEOUS FLAP IN RECONSTRUCTION OF THE BACK

Y. MARUYAMA, M. SAWAIZUMI, S. TAKEUCHI

Coverage of posterior trunk wounds has traditionally been by skin grafting or local skin flaps, and more recently, by muscle or musculocutaneous flaps. The most useful muscles for coverage are the trapezius and latissimus dorsi at the expense of their muscular function.

Lately, the advantages of the fasciocutaneous flap have been recognized and its use has spread. The purpose of this paper is to report the usefulness of the islanded vertical back fasciocutaneous flap in the back reconstruction.

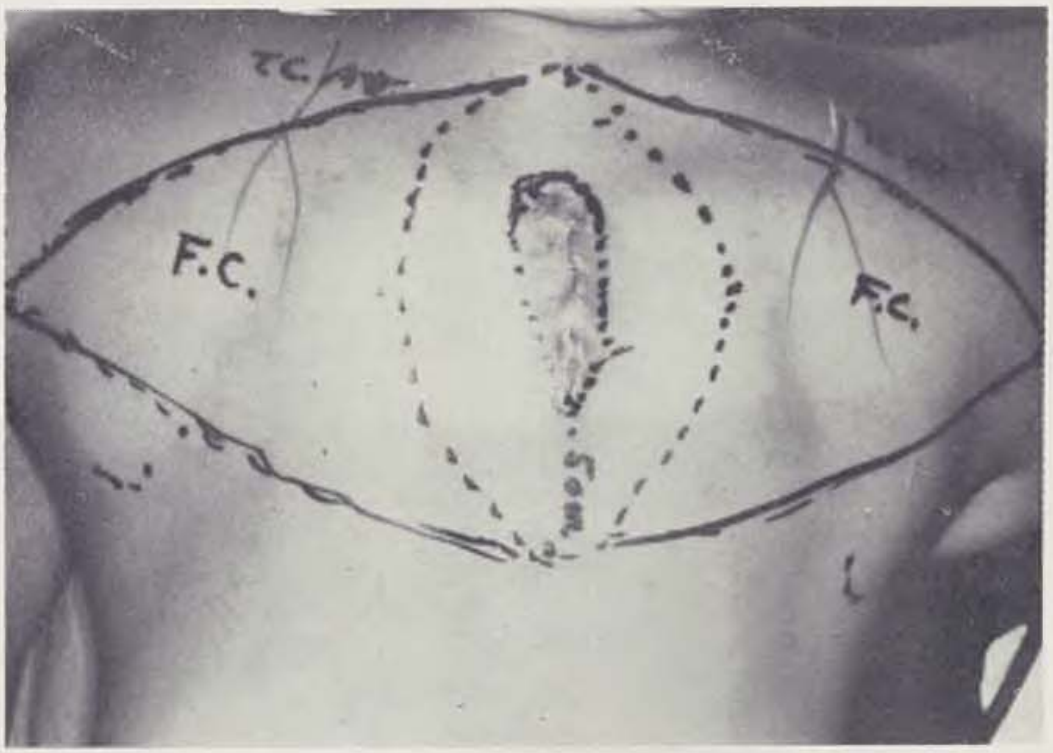

Fig. 1 Design of the area of wide resection and two vertical back fasciocutaneous island flaps based on the lateral cutaneous branch of the transverse cervical vessels

Fig. 2 Surgically created defect

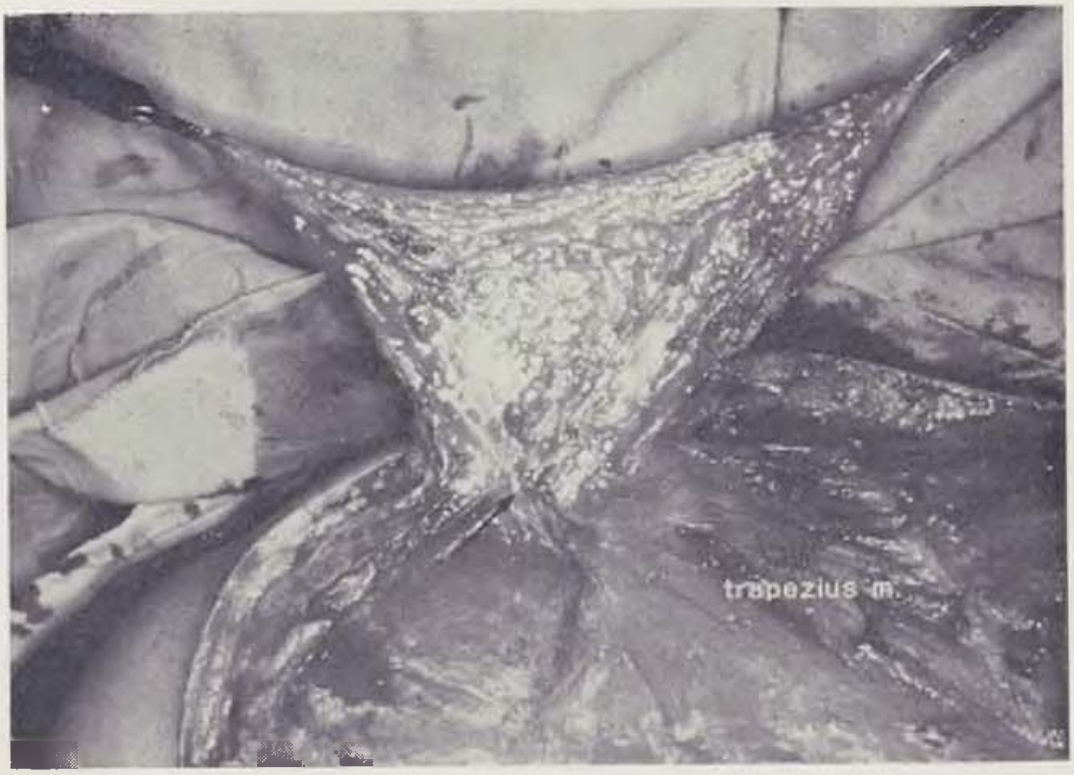

Fig. 3 Elevation of the flap. In the pedicle, lateral cutaneous branch was clearly identified (arrow)

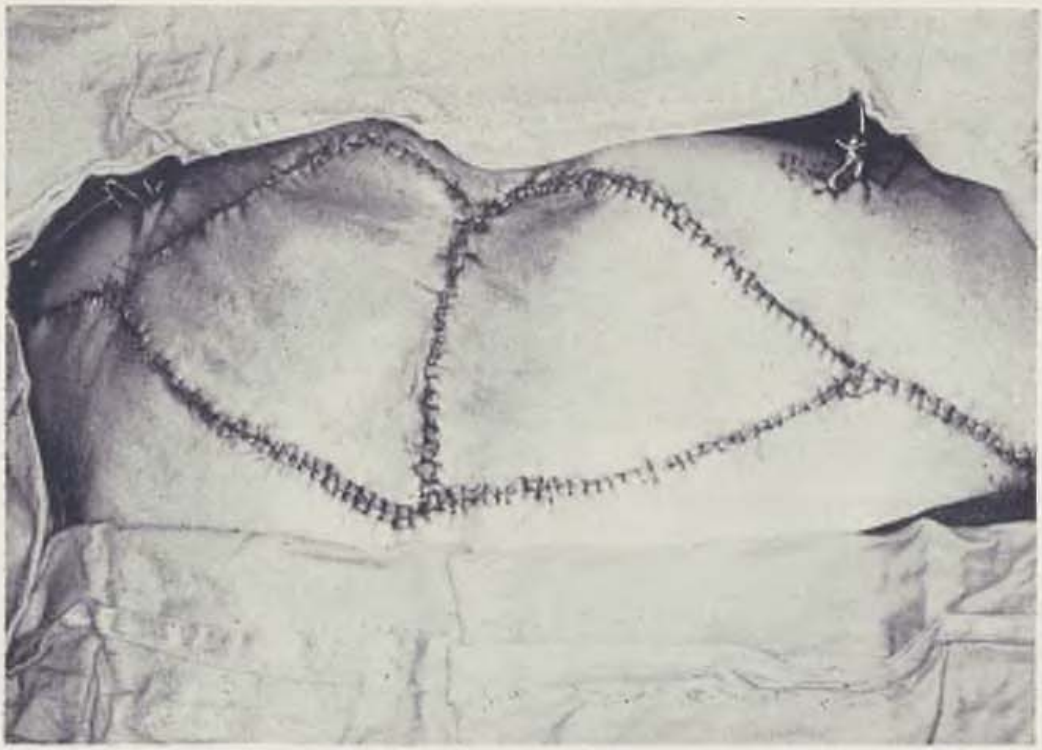

Fig. 4 Islanded bilateral fasciocutaneous flaps were transposed into the back center defect. The donor sites were closed in the V-Y fashion

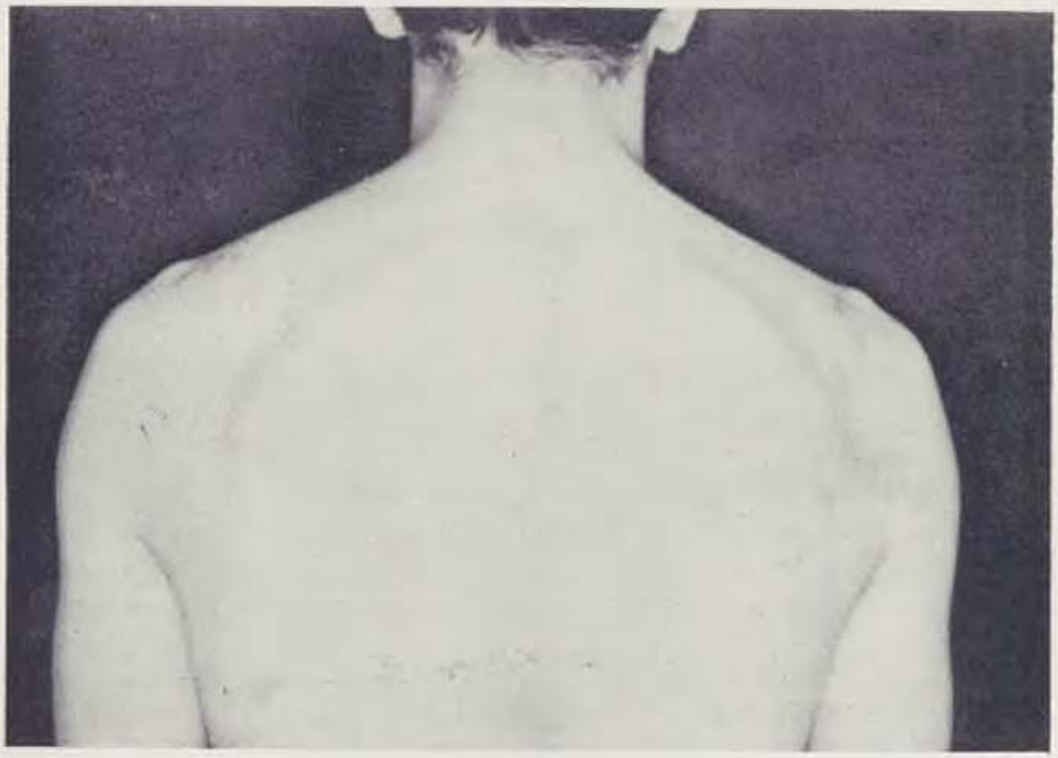

Fig. 5 Results. Coverage of the back has remained stable

CASE REPORT

A 43-year-old male had a tumour diagnosed as a lipoma on the back removed ten years previously. The tumour reappeared in the site; it was excised and diagnosed as a fibrosarcoma. A curative wide resection and reconstruction became necessary, and a wide curative resection with 5 cm cutaneous margins including a part of vertebral column was planned (Fig. 1), leaving a 10×13 cm defect on the midline of the back. To reconstruct the wide defect, two vertical back fasciocutaneous island flaps dependent on the lateral branch of the transverse cervical vessels were designed and elevated with underlying fascia (Fig. 2, 3), then transposed over the surgically created defect. The donor sites were closed primarily in the V-Y fashion (Fig. 4). The patient's postoperative course was uneventful and uncomplicated. The flaps survived perfectly and he was discharged from hospital ten days later, and he has been well with no recurrence for approximately three years and the coverage of the back has remained stable against post irradiation treatment (Fig. 5).

DISCUSSION

The latissimus dorsi and trapezius musculocutaneous flaps are highly useful in reconstruction of the back, but at the expense of muscular function (1, 2). They are also comparatively thicker than fasciocutaneous flaps (3).

Since Ponten (4) first described the use of the fasciocutaneous flap for the leg, the concept of this flap has continually been developed and expanded. Tolhurst (3) stated that the fasciocutaneous flap could be used randomly anywhere on the body, since the size of the blood vessels entering the flap was secondary to the number, distribution and anastomosis of the vascular system.

Cormack and Lamberty (5), however, have pointed out that the fascial plexus is not equally prevalent throughout the body, and that it is essential to know not only how it is oriented. This has been supported by Redplogle and Vasconez (6) who, through their wide experience with numerous fasciocutaneous flaps, have found that in long, narrow flaps, the vessels run in an axial direction.

For the back region, a long vertical fasciocutaneous flap supplied by the cutaneous branch of the transverse cervical vessels running axially communicating with the posterior inter-costal and numerous finer vessels was reported useful in back reconstruction, and suggested this flap could be an islanded one (7).

In the present report, islanded fasciocutaneous flaps dependent on the lateral cutaneous branches of the transverse cervical vessels were transposed onto the defect at the center of the back. This was safely executed and the results were good.

SUMMARY

A vertical back fasciocutaneous island flap based on the cutaneous branch of the transverse cervical vessels is described. This technique is useful in the management of back defects while preserving underlying trapezius muscle. In this case the defect was too large to be handled by one flap, the bilateral flaps were used. The donor site defect was closed in the V-Y advancement fashion.

RESUME

Lambeau fasciocutané vertical dans la réconstruction sur le dos

Marúyama, Y., Sawaizumi, M., Takeuchi, S.

On décrit un lambeau vertical fascio-cutané en îlot, situé au dos, avec utilisation de la branche cutanée des artères transversales cervicales. Cette méthode est utilisée dans les cas de reconstruction des défauts sur le dos, où le muscle trapèze reste conservé. Dans le cas décrit, le défaut était trop vaste pour qu'il puisse être recouvert d'un seul lambeau, alors deux lambeaux bilatéraux ont été appliqués. Pour le recouvrement de la zone de prélèvement on a choisi la méthode en V — Y.

ZUSAMMENFASSUNG

Ein vertikaler hinterer Bindehauptlappen bei der Rekonstruktion des Rückens

Maruyama, Y., Sawaizumi, M., Takeuchi, S.

Es wird ein vertikaler fascialer Inselhautlappen auf dem Rücken beschrieben, unter Verwendung des Kutanzweiges der querliegenden Halsgefässe. Diese Methode wird bei der Entfernung eines Defekts am Rücken angewendet, wobei der Trapezmuskel erhalten bleibt. In diesem Fall war der Defekt zu gross, um mit Verwendung eines Lappens beseitigt zu werden, und deshalb wurden bilaterale Lappen verwendet. Die Geberfläche wurde durch einen Vorgang in der Form von V — Y verschlossen.

SUMARIO

El colgajo fasciocutáneo vertical posterior en la reconstrucción de espaldas

Maruyama, Y., Sawaizumi, M., Takeuchi, S.

Se describe un fasciocutáneo lóbulo vertical dorsal de forma de isla empleando la rama cutánea de los vasos cervicales transversos. Esta técnica se usa para la eliminación quirúrgica del defecto dorsal con la preservación del músculo trapezoidal. En este caso el defecto fué muy extenso por eliminarlo con un lóbulo y por eso se usaban los lóbulos bilaterales. El defecto de la región donadora fué cerrado mediante el método V-Y.

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THE 2nd CONGRESS OF THE EUROPEAN BURNS ASSOCIATION

In Autumn 1987, the second Congress of the young European Burns Association, founded by our esteemed Dutch colleague R. Hermans, took place in Aachen, FRG. There is no doubt that the Congress contributed not only towards increased knowledge in the field of burns, but also towards even better understanding between the many European countries (though burns specialists throughout the world were always friends and will be, as they are faced with the same hardships). The Editors feel, that the Congress was of such importance, that it is befitting to allow — or invite — the organiser of the Congress and the new President of the European Burns Association to address our readers and contributors.

(see page 161, 181)

The Editors

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NON MICROSURGICAL TRANSFER OF DORSALIS PEDIS NEUROVASCULAR ISLAND FLAP TO DISTANT DEFECT USING NERVE SHARING TECHNIQUE

ASHOK GOVILA

INTRODUCTION

Dorsalis pedis flap being thin, reliable and neurosensory has been used as a free flap for a variety of defects, using microsurgical methods.

Sole of foot has a unique anatomical architecture to provide it and sustain it with weight bearing qualities. Reconstruction of this is a challenge as the reconstructed tissue should not only be strong and stable but also sensitive. In the past various methods such as split thickness skin grafts, full thickness skin grafts, local flaps, cross leg flaps have been used. Recently for heel defects instep region has been used as a myocutaneous unit based on Flexor Hallucis brevis, either as a multistaged (7) procedure or a single stage with a pedicle base (11) or as a myocutaneous island flap (2, 3). Fasciocutaneous island flap and free flap (7, 8) have also been used. Defects of entire heel may require distant tissues if local tissues are not enough or are not available. Dorsalis Pedis Flap when transferred to the same sole as an island flap is good enough for only two thirds of the sole, either medial or lateral or medial part of it depending upon the way it is transferred. Distant tissue of neurosensory nature without the help of microvascular anastomoses has not so far been described.

We have devised a non microsurgical technique of transferring dorsum of foot to other areas of opposite leg such as heel. In this technique the dorsalis pedis flap is raised as a neurosensory island flap keeping the vascular pedicle about 5 cm in length and transferring it to the other foot. Vascular pedicle is wrapped with a skin graft. Plaster of Paris is used to keep the two limbs immobilised for three weeks, when limbs are separated and the nerve repair is performed between the donor and recipient nerves.

MATERIAL AND METHOD

Three clinical cases in male patients aged between 20 to 30 years have been performed by the technique described in this paper. One case having three years follow up is detailed. Surgical technique is presented in detail.

Surgical technique

Technique of elevation of this flap and its vascular anatomy has been very well described in the past (1, 5, 6, 10). However there are certain differences related to this technique which need some comment. Flap of desired dimensions is raised under tourniquet control, working distal to proximally. Proximal dissection is extended along the anterior tibial artery and its vena comitans to get extra length of vascular pedicle by opening the extensor retinaculum. All small branches of the artery and the tributaries of the accompanying veins are carefully ligated.

An attempt is made to include the great Saphenous vein along with the vascular pedicle. This is achieved by lateral translocation of this vein after ligating all its tributaries proximal to the flap in distal leg for about 10 cm. Superficial peroneal nerve is dissected and divided about 5 cm proximal to the proximal limit of the flap. The extra length of the nerve is marked by a marker stitch and safely stored under the edge of the flap. Donor area of the flap is now skin grafted using tie-over dressing.

Fixation and positioning

This will depend upon which part of the leg it is used for. For heel defects the recipient foot is put on the donor foot in such a way that its heel area lies over the recipient ankle. In this position the dorsalis pedis flap is rotated by 180 degrees and turned inside out. Flap is now stitched. Initially a couple of holding stitches are applied and lower thirds of both legs are anchored together using plaster of Paris fixation by the unscrubbed member of the team in such a way that the vascular pedicle is visible all the time, so that there is minimal tension and twist over the vascular pedicle. Stitching of the rest of the flap is now completed. Finally a split thickness skin graft is wrapped around the vascular leash and only a single layer of saline gauze is wrapped over it as a dressing. The rest of the wound is dressed with a bulky dry dressing.

Ligation of this vascular leash at three weeks and separation of feet is easy and quick. After separating the feet the stored superficial peroneal nerve under one of the edges of the flap, and sural nerve behind the medial malleolus are dissected and nerve co-optation is performed between the two under loop magnification. Partial weight bearing is allowed after 3 weeks of second stage operation and is continued for the 6 weeks before the patient is allowed full weight bearing.

Case report

A 28 years old farmer with a nonhealing ulcer surrounded by unstable scar covering the entire heel (Fig. 1) of his left foot. This was present for the past 12 years and multiple attempts at some other hospitals have failed to make it heal. He had a history of recurrent breakdown and because of this for the past 12 years he has been walking on crutches and has withdrawn from active work at his farm.

In march 1984 we excised his entire unstable scar on the heel including the nonhealing ulcer and covered it with a 10cm × 8cm size dorsalis Pedis

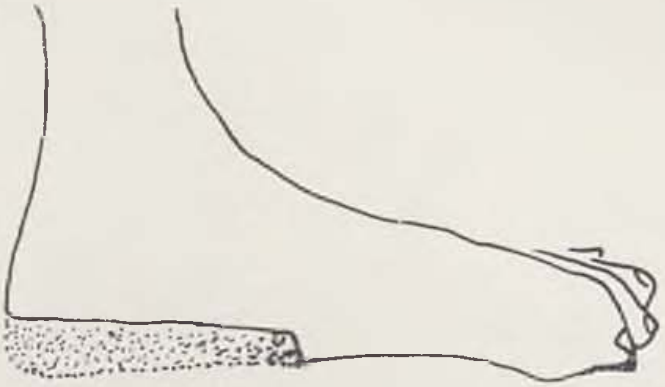

Fig. 1 Schematic drawing of the loss of tissues on the heel

Fig. 2 Dorsalis Pedis Neurosensory Island flap raised from the contralateral foot

Neurosensory Island flap (Fig. 2) from the other foot. Not only ipsilateral dorsum of foot was scarred but was not enough to cover the entire area. At the time of elevation of the flap 3 cm of the superficial peronneal nerve was dissected from the flap proximally in the leg and was stored under the flap inset to be utilised at the time of flap separation for sensory purposes. Gross postoperative oedema of the flap was noticed for the first 7 days after the transfer but then it settled gradually. Three weeks later the thin vascu-

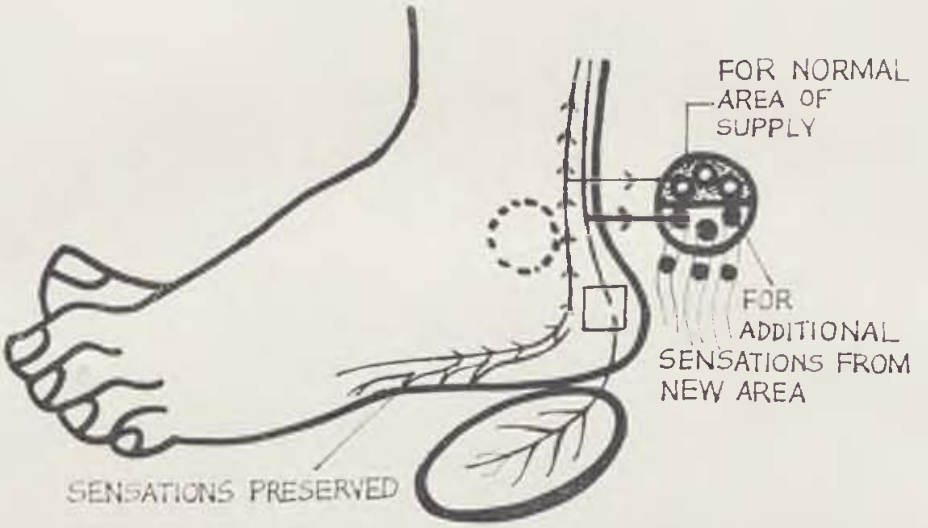

Fig. 3 Schematic drawing explaining how microneural repair saving sensations in the area of distribution of the recipient sural nerve was performed

lar leash connecting the two feet was divided and the feet separated. Microneural repair between superficial peronneal nerve and three fascicals (Fig. 3) of sural nerve was performed to preserve the sensations in the area of distribution of the recipient sural nerve (Nerve Sharing Technique), see Fig. 4, 5. Flap and the foot healed in 2 weeks time uneventfully (Fig. 6). Three

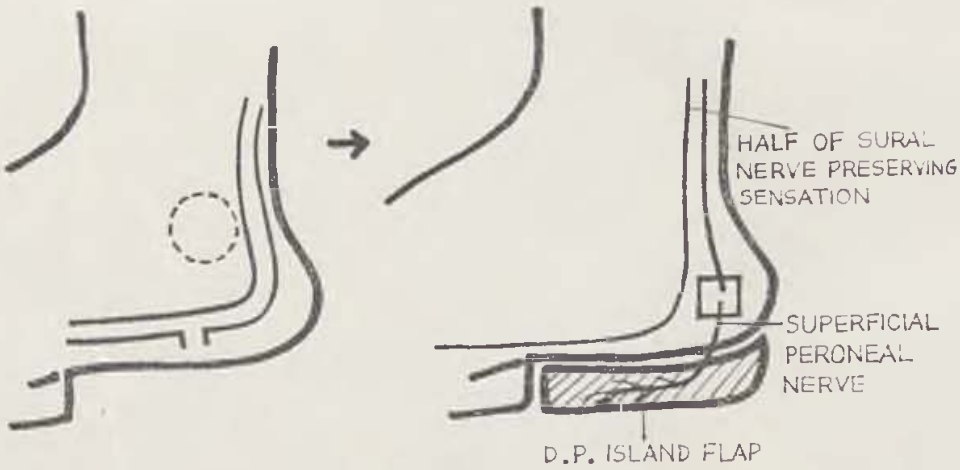

Fig. 4 Schematic drawing explaining how sensations were provided to dorsalis pedis Island flap reconstructing the heel

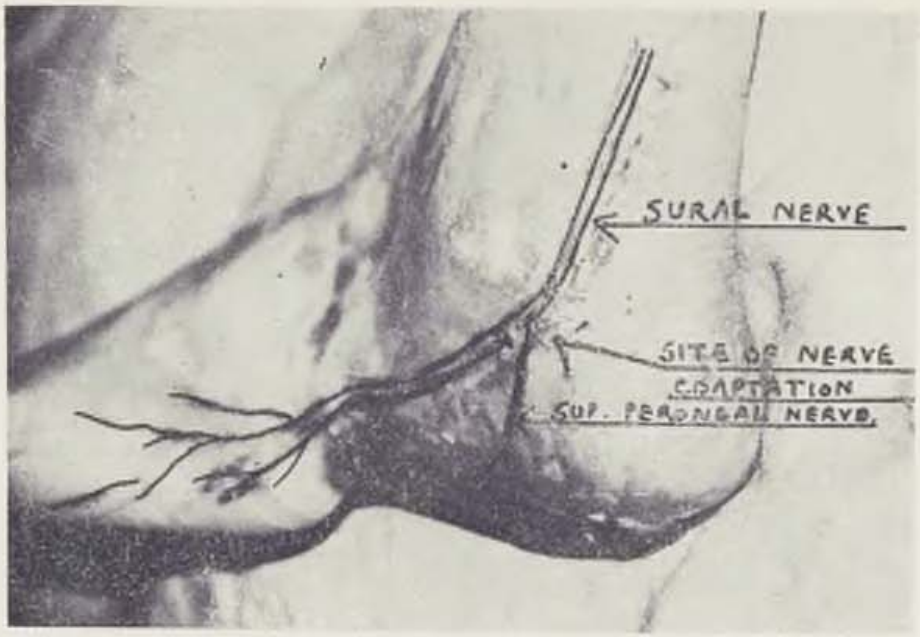

Fig. 5 Two weeks after the flap separation and the microneural repair. Explanatory lines are drawn on the healed suture line used for exposure for nerve repair between superficial peronneal nerve and half of the sural nerve

Fig. 6 Two weeks after flap separation, patient had no sensory loss in the area of distribution of the sural nerve

Fig. 7 Patient bearing full weight 3 months postoperatively. Elastic compression bandage could be seen on the skin grafted donor foot. This was continued for 6 months after surgery, to minimise graft contraction

Fig. 8 Six months after the reconstruction of the heel

months later (Fig. 7) the patient was able to bear his full weight. In 6 months he had sensation of touch, pain nad pressure in the entire flap and there was no loss of sensations in the distribution of the recipient sural nerve (Fig. 8); three years follow-up he has sensations of touch, pain and temperature in the flap, and has suffered no breakdown in past 3 years after reconstruction. He is back to hard work as a farmer and can walk long distances without trouble.

RESULTS

Surgical technique and method of transfer of dorsalis pedis flap as a neurosensory flap to distant defects is presented. In three cases (all males between 20 to 30 years) results have been satisfactory.

DISCUSSION

Architecture of heel is such that it can withstand 200 pounds of body weight without breakdown for the lifetime of an individual. The skin is thick and sensitive. There are shock absorbers (8) of fatty connective tissue in tight fascial compartments between bone (Calcaneum) and the skin. This specific requirement of the heel creates difficulty in reconstruction. Methods which provide good sensations alone yield lasting results. Methods which provide bulk but not sensations fail in the long run. Neurosensory flaps such as radial forearm flap (12) and dorsalis pedis flap provide good sensation but lack the desired bulk. However they have enough strength to sustain weight without breakdown, and to my belief are the best options so far available.

In an under-facilitated country such as India a need is always felt to evolve methods of safe tissue transfer without the need of microsurgical facility. This technique of tissue transfer not only eliminates the need of an operating microscope but also removes the risk of failure rate associated with such a technique. This method is now available to an average plastic surgeon who does not have a microsurgical background to reconstruct weight bearing parts of foot without difficulty almost as a single stage.

SUMMARY

A method of transfer of Dorsalis Pedis Neurosensory Island flap to defects at distant sites is presented. This method could be employed to provide sensory flap coverage to weight bearing parts of the other foot when other methods are either not available or are not applicable. Three cases of reconstruction of the weight bearing parts of the foot are presented. Surgical technique is described in detail. One case report is detailed.

Key words: Dorsalis Pedis Neurosensory Island flap, Distant defects, Nerve Sharing Technique.

RESUME

Lambeau neurovasculaire pédiculé dorsalis pedis en îlot — transposition microchirurgicale dans des sites éloignés

Govila, A.

On allègue une méthode de transposition du lambeau en îlot, au pédicule vasculo-nerveux dorsalis pedis, dans des sites éloignés. La méthode convient aus transpositions des lambeaux, dont sensibilité reste conservée, dans les zones sur l'autre pied qui sont exposées à la pesanteur, et cela aux cas, où d'autres méthodes sont impossibles ou inaccessibles. On a résolu trois cas de reconstruction des parties du pied, sur lesquelles repose le poids corporel. Le procédé opératoire est détaillé, surtout à propos d'un cas.

ZUSAMMENFASSUNG

Die nichtmikrochirurgische Übertragung eines dorsalis pedis neurovaskulären Island-Lappens auf einen entfernten Defekt mittels Nerventeiltechnik

Govila, A.

Es wird die Methode einer Übertragung eines Insellappens auf der neurovaskularen Wurzel des dorsalis pedis in entferntere Lokalisierungen beschrieben. Diese Methode eignet sich zur Übertragung von Lappen mit aufrechterhaltener Empfindlichkeit auf Stellen, die einer Belastung des zweiten Beins in solchen Fällen ausgesetzt sind, wo andere Methoden undurchführbar oder unerreichbar sind. Es wurden drei Fälle einer Rekonstruktion von Beinteilen gelöst, die die Belastung körperlicher Masse trugen. Der chirurgische Vorgang wird detailliert beschrieben, besonders in einem der Fälle.

SUMARIO

La transferencia — sin ayuda de microcirugía — del lóbulo insular neurovascular de dorsalis pedis al defecto distante empleando la técnica de nervio ahorrado

Govila, A.

Se describe un método de la transferencia del lóbulo de islote empleando el pedículo neurovascular dorsalis pedis a las zonas distantes. El método se puede usar con ventaja para la transferencia de los lóbulos preservando la sensibilidad de las zonas expuestas al esfuerzo excesivo de las segunda pie en los casos, donde otras técnicas no pueden ser empleadas o no son a la disposición. El papel examina tres casos con la reconstrucción de una parte de pie en la cual se concentraba el peso corporal. Se detalla la técnica quirúrgica, especialmente empleada en uno de los casos descriptos.

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Additional references may be obtained from the author.

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(The 2nd Congress of the European Burns Association)

I am sure the participants in the 2nd Congress of the European Burns Association would want to congratulate Dr. Rolf Hettich and his helpers for making the occasion such a successful and happy one.

The care and understanding of burn injury today involves many people from many different disciplines, and it is important that they meet from time to time to discuss the problems they have in common.

I, with I am sure, many others, am pleased that the European Burns Association is now well established, and we would welcome any who want to join.

We all look forward to the 3rd. Congress in Prague in the Autumn of 1989.

Ann Sutherland
President of EBA

Comenius University Medical Faculty (Bratislava), Department of Plastic Surgery
Head Prof. F. Mariš, M. D., CSc.
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Director Prof. R. Dzúrik, M. D., DrSc.

MORPHOLOGY OF IMPLANTED PERICHONDRIUM AND ITS GRADUAL RESTRUCTURING INTO ARTICULAR CARTILAGE

A light microscopic study

M. BROZMAN, J. JAKUBOVSKÝ

The literature available to us contains relatively few facts on the structure of perichondrium. Not even Hall (1983) in his extensive monograph devotes any particular attention to the perichondrium. Much the same applies to Horký's (1985) major study discussing, among other things, functional and morphological relationships in articular cartilage. As to recent Czechoslovak literature, some basic facts and figures can be found in Maršala's monograph (1983).

MATERIAL AND METHOD

Samples of tissue taken from the cartilaginous part of ribs 6—7 and implanted perichondrium excised from the articular areas of finger joints were fixed and treated using the usual formol-paraffin technique, and subsequently examined from sections stained with haematoxylin and eosin. Some of the samples were also examined under a transmission electron microscope. These were fixed with the use of the now routine technique of double fixation in 3% glutaraldehyde (SERVA, Heidelberg, FRG) and 1% OsO_4 (JOHNSON-MATTHEY CHEMICALS, Ltd, Hertfordshire, England). Both solutions were buffered with phosphates, pH 7.2. A part of the samples were also fixed in the presence of ruthenium red in the fixative (Jakubovský et al., 1984). The results reported in the present communication were obtained from the above described material by examining semi-thin sections under a light microscope (Brozmanová et al., 1976).

RESULTS

The following is a report on a light microscopic study of the perichondrium and its gradual transformation into articular cartilage.

The perichondrial implant was made up of collagen connective tissue with an admixture of elastic fibres. The less dense neighbouring tissue consisted of small arteries, arterioles, veins, venules and capillaries as well as a few adipose cells and droplets of fat, myelinized nerve fibres, perivascular mastocytes and thinly distributed collagen fibrils running in diverse directions (Fig. 1, 2).

Fig. 1 Part of perichondrium facing the articular cavity. Layers of collagen connective tissue made up of trabeculae of collagen and fibrocytes running parallel to each other. Methylene blue + azure II (MBA), × 1440

In 3 to 6 months following the implantation the implant consisted of rigid vascularized connective tissue. Its surface inside the joint had layers of collagen connective tissue running parallel to the surface (Fig. 3). The deeper layers showed visible signs of vascularization (Fig. 4). Apart from the fibrocytes, the original cellular compartment of the perichondrium was undetectable. The fibrocytes beneath the articular surface were spindle-shaped with the longer axis running parallel to the surface, and stellate in the deeper layers rather than round-shaped. There were sporadic cases of inconspicuous focal hyalinization of small size (Fig. 5). In some specimens examined at around the 6th post-operative month the implant contained star-shaped clusters of polygonal cells (Fig. 6).

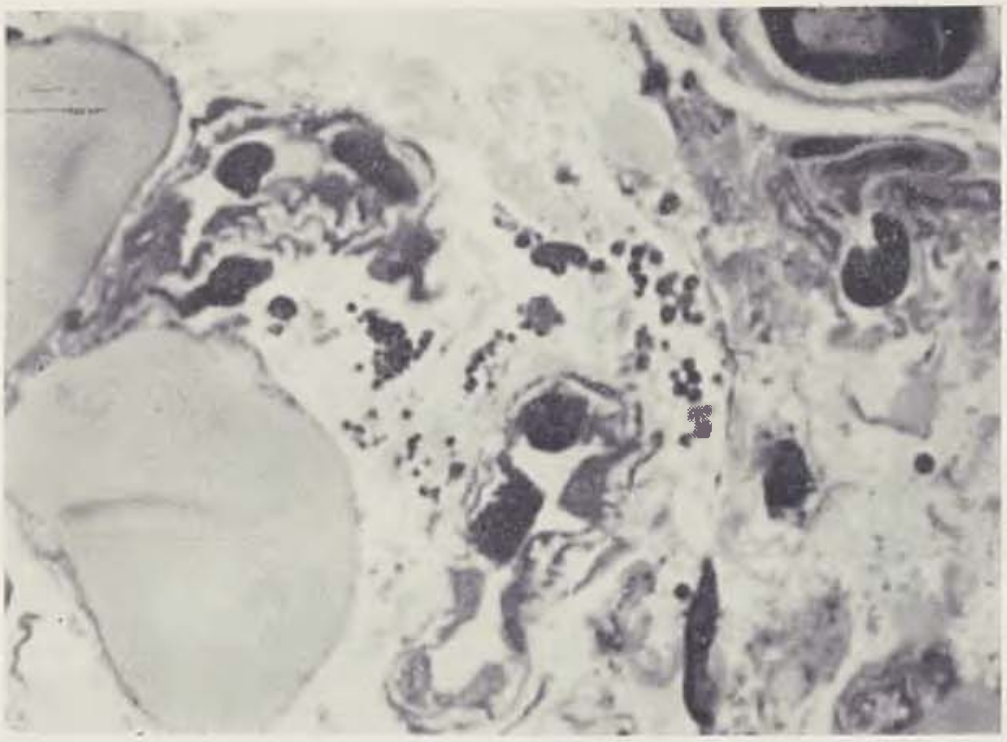

Fig. 2 Part of perichondrium turned away from the articular cavity and containing blood capillaries, venules, adipose cells and droplets of fat, myelinized nerve fibres, collagen fibrils, fibrocytes and clusters of tiny granules, probably of mastocytic origin. MBA, × 1440

Fig. 3 3-months old implant of perichondrium. Some cells become stellate or round in shape. MBA, × 1440

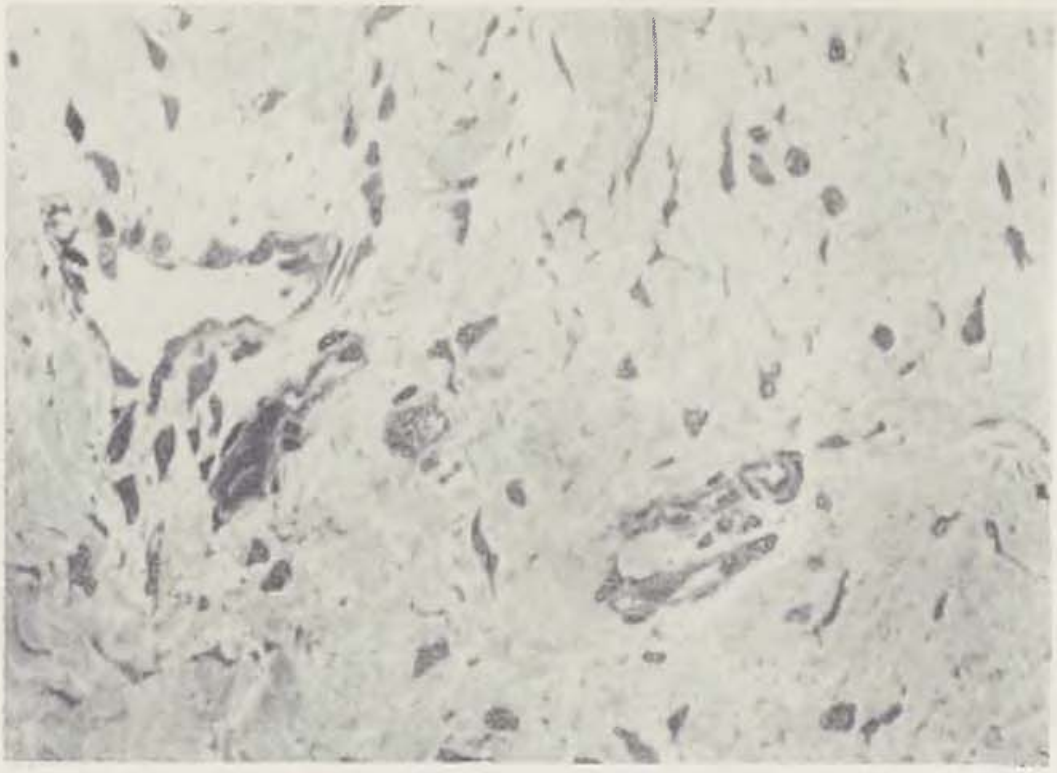

Fig. 4 (as in Fig. 3) Capillaries, arterioles and venules in deep layers of implant. Some cells are rounded. Fibrocytes and trabeculae of collagen fibres run in different directions. MBA, × 360

Fig. 5 (as in Fig. 3). Sporadic tiny foci of hyalinized connective tissue. MBA, × 150

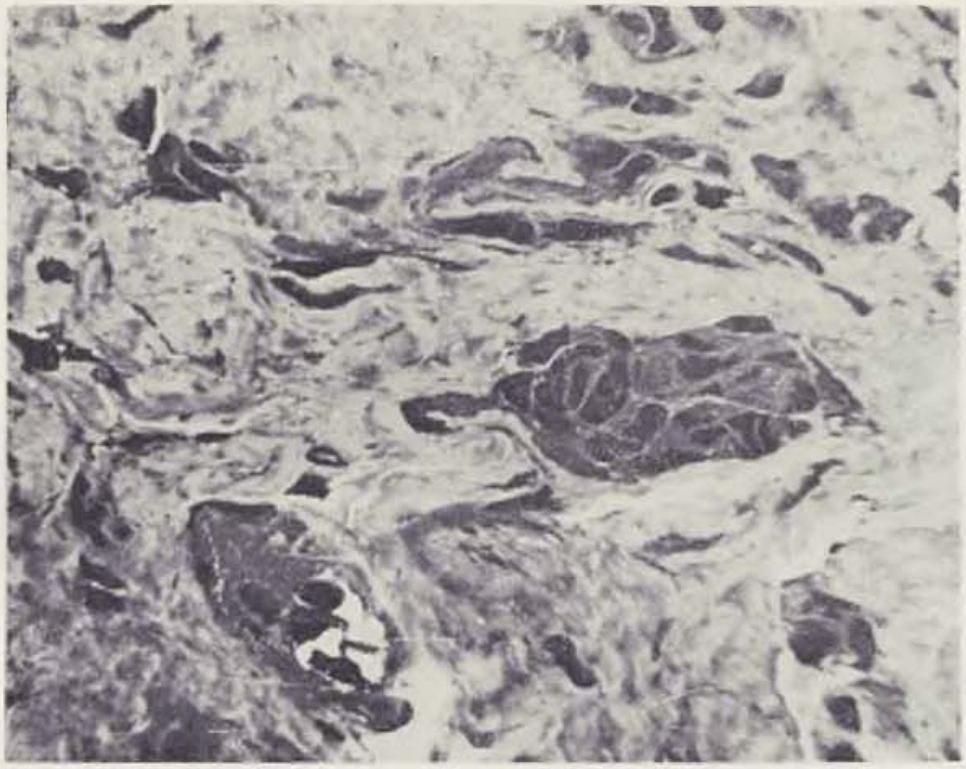

Fig. 6 Implant at 6 months. Clusters of polygonal cells between trabeculae of collagen fibres. MBA, × 360

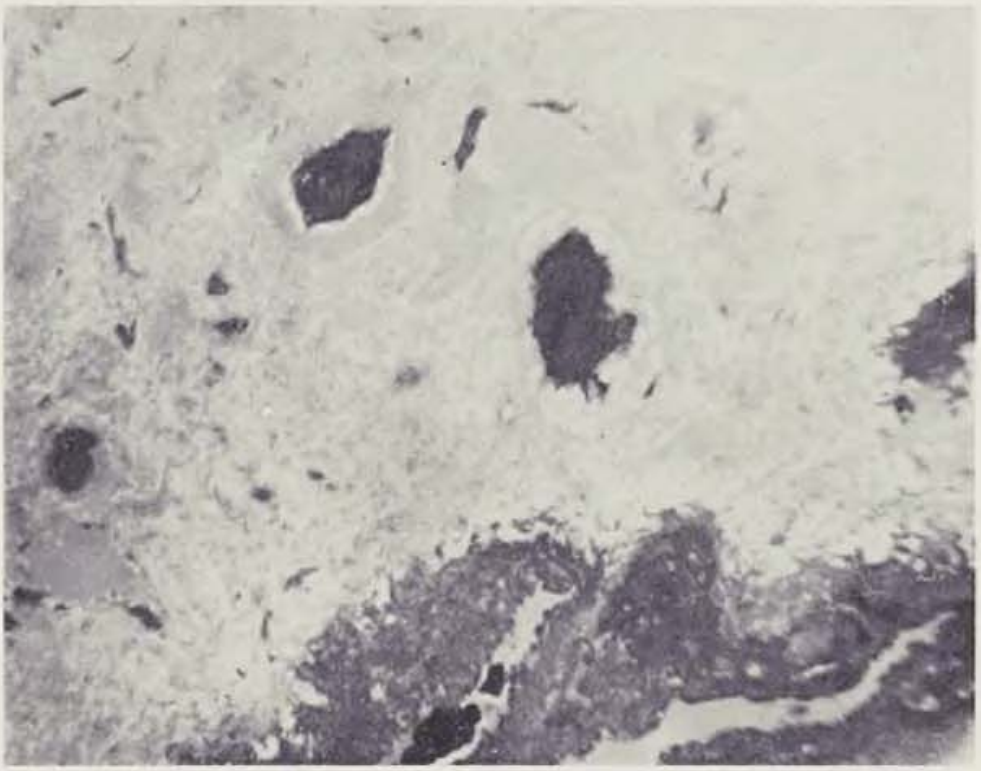

Fig. 7 Implant at 10 months. Foci of hyalinized connective tissue with rounded cells. MBA, × 1440

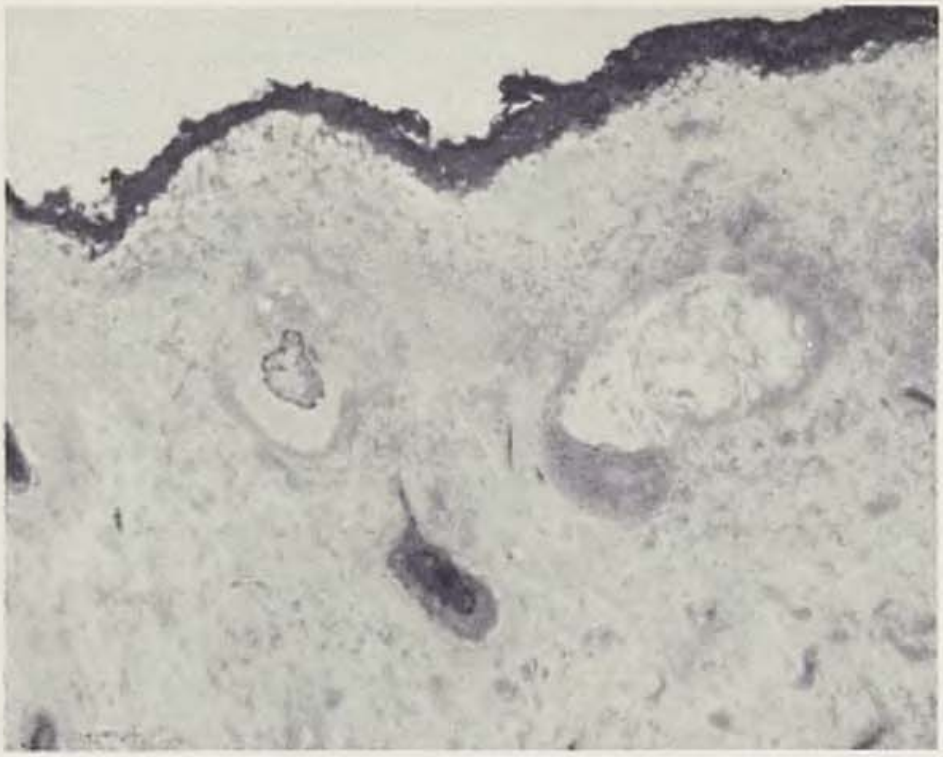

Fig. 8 (as in Fig. 7). Compartment-like formations occasionally developing in hyalinized cells. MBA, × 1440

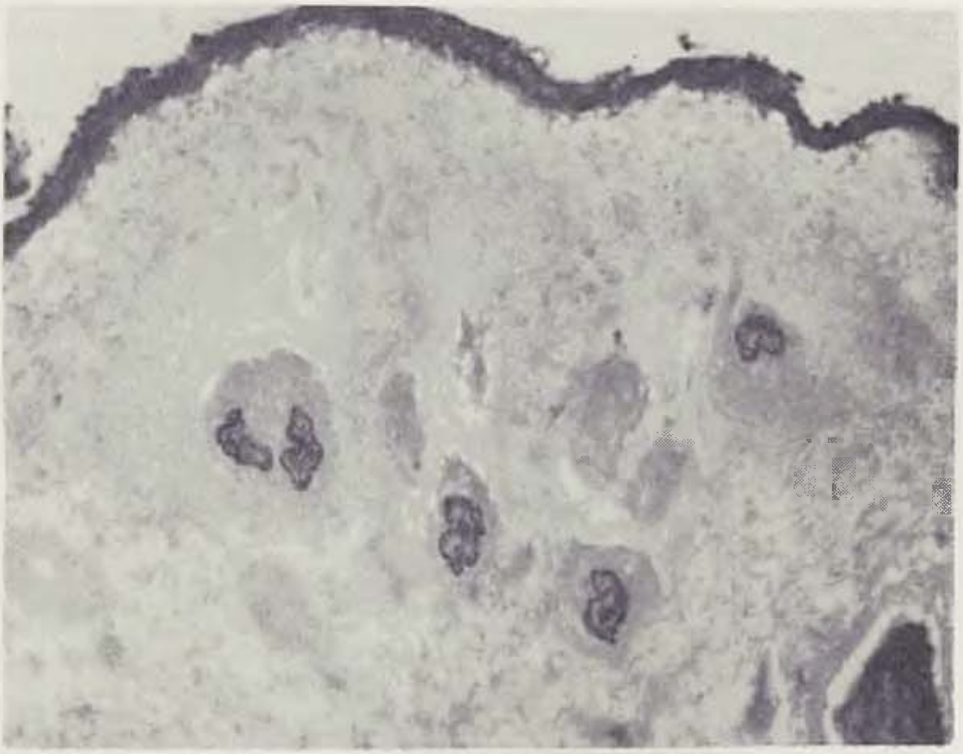

Fig. 9 (as in Fig. 7). In addition to mononuclear cells, binuclear cells may also be present in such places. MBA, × 1440

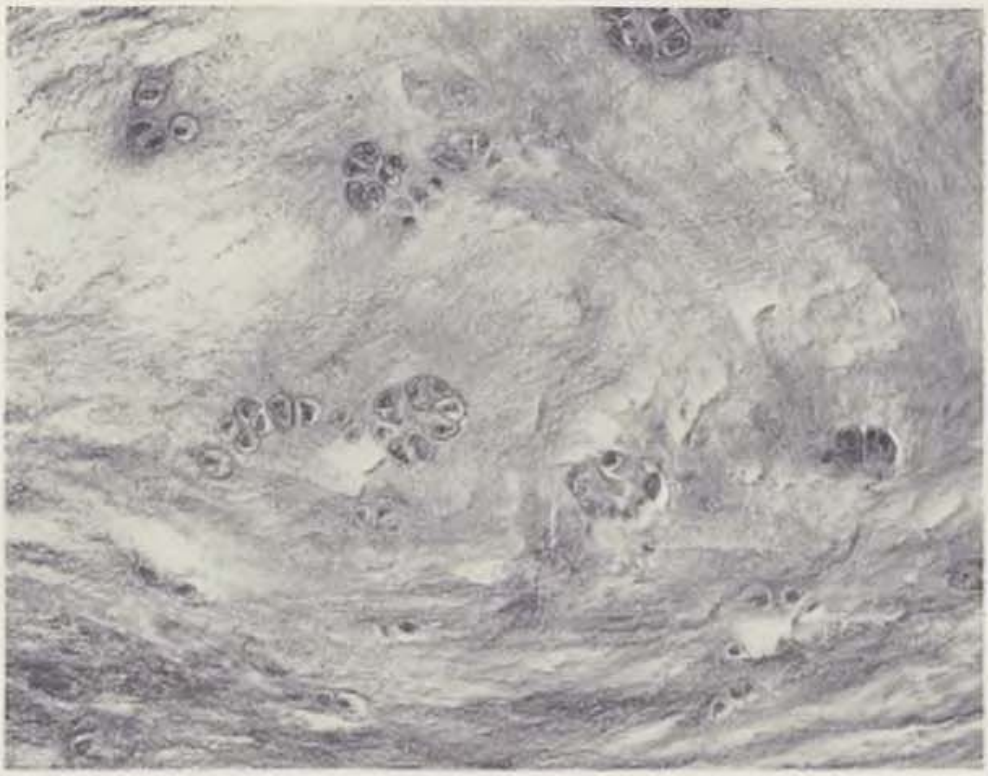

Fig. 10 Implant at 7 years. Hyaline cartilage with clusters of chondrocytes, Formol, H+E, × 360

Fig. 11 (as in Fig. 10). Columns of chondrocytes in hyaline matrix. H+E, × 360

One year after implantation, more and larger foci of hyalinization were noted containing cells of various degrees of rounding (Fig. 7), or else there were cell-free trabeculae of hyaline-like substances. At about one year after implantation there occurred also cells reminiscent of chondrocytes in imperfectly developed compartments (Fig. 8, 9). However, not even in cases of more pronounced hyaline transformation were we able to find any regular patterns of groups of chondrocytes arranged in columns.

Fig. 12 (as in Fig. 10). Borderline between hyaline cartilage and collagen connective tissue with individual chondrocytes nearby. H+E, × 360

Seven years following implantation of perichondrium there was a large focus of hyaline cartilage on the surface of the implant facing the articulation with fibrous connective tissue underneath. The hyaline matrix contained nests of chondrocytes (Fig. 10) as well as chondrocytes arranged in columns running parallel to each other and separated by larger quantities of hyaline matrix (Fig. 11). At the cartilage-fibrous connective tissue interface we were able to observe unevenly distributed round cells enveloped in discernible cytoplasmic membranes impossible to tell from chondrocytes by means of light microscopy (Fig. 12).

In terms of chronological development, the histological findings can be described as the perichondrium being gradually restructured into connective tissue which, after several years from implantation, looks exactly like hyaline cartilage when examined by light microscopy. In terms of morphology, the implant can be assessed with the use of criteria available to us for nearly 150 years now, i. e., those set by Schwann (1839, quoted by Person 1983) and Virchow (1858, quoted by Person 1983): 1. Cartilaginous tissue is made up of cells or groups of cells suspended in a more or less solid matrix noted for different cell-matrix ratios. 2. The cells clearly synthetize the matrix. 3. The connective tissue — perichondrium — envelops the cartilage similarly as the periosteum envelops bone. Straightforward proof of detectable matrix synthesis exceeds the scope of this communication, while the rest of the criteria can be regarded as having been met.

There are a number of options for characterizing the type of cartilage, involving different criteria, e. g., macroscopic and topographic, microscopic — non-topographic, or the criterion of time. It should be noted, though, that at each structural level the cartilage can be defined differently. From the point of view of our microscopic and topographic criteria, the above described transformation of perichondrium into cartilage pertains to articular cartilage, initially of the connective-tissue, later of the hyaline type. However, the validity of each of the definitions and the resulting classification is confined to the structural level of the specific observation concerned. Hence Moss and Moss-Salentijn (1983) regard as relative all methods of classification.

The literature available to us carries relatively few established data on the structure of perichondrium. Amprino and Bairati (1934) described it as specialized connective tissue consisting of the internal chondrocytic zone and the external fibrous zone, the former coalescing indistinguishably with subperichondrial cartilage, the latter of densely crowded lamellae of collagen and elastic connective tissue coalescing with the surrounding connective tissue. The internal zone is merged undetectably with subperichondrial cartilage, and may be missing entirely from adult tissues. Our implants are morphologically identical with the external zone as described above. As the results suggested, this layer, too, is capable of chondrogenesis.

The generally established fact is that unlike interstitial growth of cartilage, appositional (peripheral) growth is a lifelong process going on as long as the perichondrium remains potentially active. One of the hypotheses which may account for the activation of this potential chondrogenesis is Wolpert's (1981) hypothesis of "controlled dilatation", according to which chondrogenesis can be redirected to places of the least peripheral resistance.

The morphological signs of incipient chondrogenesis include a loss of mesenchymal cell processes as well as the rounding and clustering of cells thus altered (Marsala, 1983). We were able to identify such rounding in three-months implants, and six months after implantation we also found deposits of clustered polygonal cells. Our morphological findings so far suggest that

chondrogenesis from implanted perichondrium coincides with at least the first three phases of cartilage formation as described by Streeter (1949). However, each phase is rudimentary rather than fully developed. This rudimentary nature appears to be consistent with the protracted restructuring of perichondrium into articular hyaline cartilage.

CONCLUSION

Light microscopic studies showed implants of perichondrium at this particular morphological level as being capable of producing connective-tissue and hyaline cartilage.

SUMMARY

The authors describe the morphology of perichondrium and its gradual restructuring at 3 months up to 7 years following implantation. The morphological findings suggest the possibility of perichondrium being restructured into connective tissue which closely resembles hyaline cartilage after several years from implantation.

Key words: morphology, perichondrium, articular cartilage.

RESUME

Morphologie du périchondre implanté et sa transformation en cartilage articulaire. Etude en microscopie lumineuse

Brozman, M., Jakubovský, J.

La morphologie du périchondre et sa transformation successive après l'implantation est décrite, dans le délai de 3 mois à 7 ans. Les observations morphologiques suggèrent les possibilités de transformation du périchondre en tissu qui — après un recul de plusieurs années de l'implantation — prend l'aspect du cartilage hyalin.

ZUSAMMENFASSUNG

Die Morphologie eines implantierten Perichondriums und dessen Umsetzung zu einem artikulären Knorpel (Lichtmikroskopische Studie)

Brozman, M., Jakubovský, J.

Es wird die Morphologie eines Perichondriums und dessen allmähliche Umsetzung nach der Implantation ein einem Zeitraum von 3 Monaten bis zu 7 Jahren beschrieben. Die morphologischen Befunde ergeben die Möglichkeiten einer Umsetzung des Perichondriums zu Gewebe, das nach mehrmaliger Implantation einem hyalinem Knorpel ähnlich wird.

SUMARIO

Morfología del pericondrio implantado y su transformación en el cartílago articular. Un estudio basado en la microscopía óptica

Brozman, M., Jakubovský, J.

Se describe la morfología del pericondrio y su transformación gradual luego de la implantación dentro del periódo desde 3 meses hasta 7 años. Los hallazgos morfológicos indican la posibilidad de la transformación del pericondrio al tejido, que tiene semejanza al cartílago hialino después de algunos años.

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MORPHOLOGY OF HYALINE CARTILAGE MATRIX IN ARTICULATIONS OF FINGERS

An electron microscopic study

M. BROZMAN, J. JAKUBOVSKÝ

Studying the options for the reconstruction of the small joints of the hand by means of cartilage produced by autoimplants of perichondrium obtained from costal cartilage (Brozman et al. 1984) we faced the need to identify the structural characteristics of normal cartilage in that particular localization. In trying to do so we were hampered by a total lack of information in the sources available to us. For that reason we regard as useful presenting our own relevant knowledge on the background of facts obtained mainly experimentally.

Proteoglycans, collagen and water are the principal constituents of the intercellular substance in hyaline cartilage. The precursors of both proteoglycans and collagen are synthetized in chondrocytes (Takeda et al. 1987, Vertel and Hitti, 1987). As Iozzo and Pacifici (1986) demonstrated, the Golgi complex of chondrocytes produces mainly large proteoglycans containing chondroitin sulphate and, to a lesser extent, proteoglycans. In contrast, most of the type II procollagen takes its origin in granular endoplasmic reticulum. In addition to type II collagen, other collagens, too, were identified in cartilaginous tissue (Ayad et al. 1987, Eyre et al. 1987).

Morphologically speaking, collagen dispersed among proteoglycan aggregates tended to attract the greater part of scientific interest, i. e., predominantly type II collagen as distinct from type I collagen characteristic of bone and perichondrial tissue (Sheldon 1983, Iozzo and Pacifici 1986). Sheldon reports (1983) that unlike osseous collagen epiphyseal cartilage is devoid of striated collagen. Others (see Horký 1985) have shown that this can be the rule solely within the confines of the perichondrocytic space. Apart from this space, numerous collagen fibrils of different thickness have repeatedly been found, their arrangement depending on the layer in which they are localized and on the loading of the cartilage (Horký 1978, 1980, 1984).

Cartilage proteoglycans are made up mainly of chondroitin sulphate and keratan sulphate which are joïned to the same protein core to produce proteoglycan monomers or subunits. Many monomers react specifically with one chain of hyaluronic acid to produce proteoglycan aggregates stabilized by being bound to proteins (Hascall 1977). Proteoglycan aggregates are scattered among fibres of type II collagen (Wezeman and Childs, 1982). They can be identified, for example, by means of monoclonal antibodies reacting with carbohydrate components, or by means of polyclonal rabbit antibodies aimed against their protein component (Hunziker and Herrmann 1987, Keiser and Diamond 1987). Their morphological identification requires, in particular, specific fixation. The options include cetylpyridinium-chloride-glutaraldehyde fixation (Englfeldt and Hjertquïst 1968), fixation with cupromeronic blue (Scott and Orford 1981) or ruthenium red in the fixative (Luft 1971, Blažeková et al. 1980, Jakubovský et al. 1984).

The content of glycosaminoglycans — polyanionic components of proteoglycans — varies with the topographical localization (Kiviranta et al. 1987). Their greatest concentration is found where the cartilage is the thickest and vice versa, the least concentration of proteoglycans indicates the thinnest portion of the cartilage. Their density varies in response to surgical operation (Oxford et al. 1986), in accordance with the site of loading (Säämänen et al. 1987), depends on the presence of certain quantities of vanadium (Kato et al. 1987) and on a number of other factors. It is age-dependent, too (Roughley 1987).

The problem of cartilage water content still escapes the range of morphological methods available to us. Biochemical and biophysical investigation indicate the presence of exchangeable water (Maroundas and Schneiderman 1987). However, there is a body of opinion admitting of the existence of unexchangeable water (Torzilli et al. 1982).

MATERIAL AND METHODS

The cartilage of interphalangeal joints of fingers following traumatic amputation in men aged 20 to 45 years was fixed for 1 hour in glutaraldehyde and osmium fixative with ruthenium red admixed (Luft 1971, Blažeková et al. 1980). The tissue was dehydrated in a series of acetones and embedded in Durcupan ACM (FLUKA AG, Buchs, Switzerland) as indicated in the manufacturer's directions for use. Thin sections made on ultramicrotome OmU 3 (C. REICHERT, Vienna, Austria) were contrasted with uranyl acetate and lead citrate (SERVA, Heidelberg, FRG), or examined uncontrasted. Preparing the blocks we refrained from removing the superficial layers of the tissue as otherwise routinely recommended.

RESULTS

Ruthenium red failed to reach the deeper layers of the blocks of cartilage. Without contrasting the sections with uranyl acetate and lead citrate the resulting contrast was clearly less distinct. The intracellular spaces of

undamaged chondrocytes, while showing no affinity to ruthenium red, exhibited striking affinity so long as the chondrocytes were seriously damaged. These were visualized mostly as isolated elements, less frequently in two-cell groups, separated from each other by variously wide septa (Fig. 1, 2).

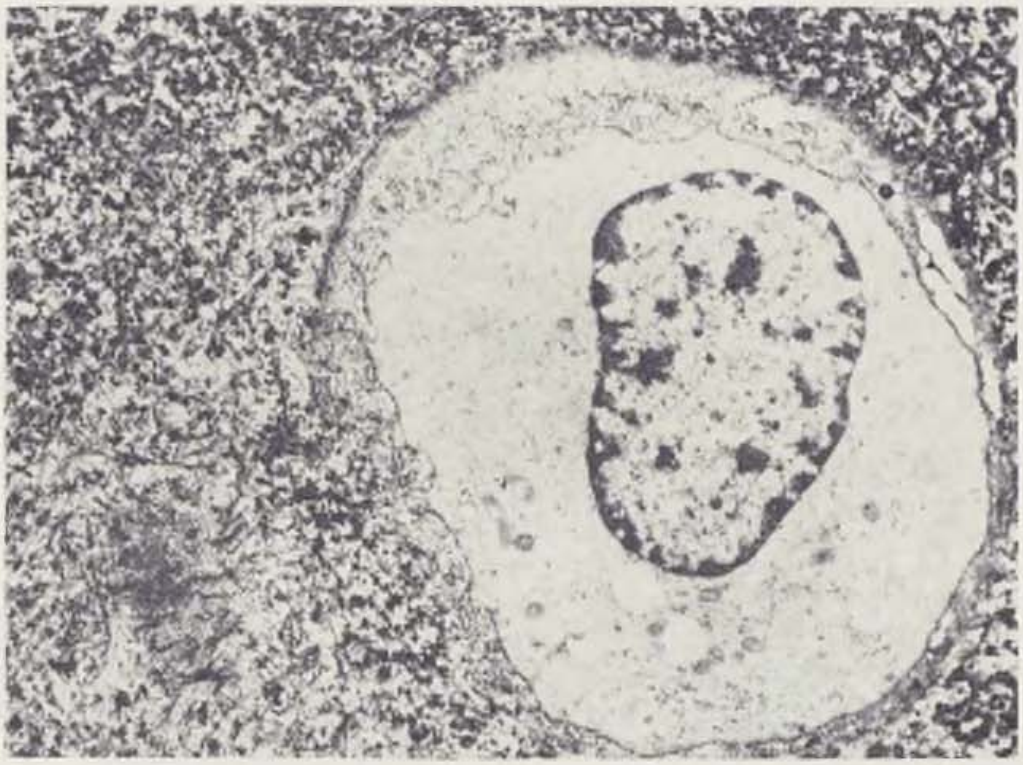

Fig. 1 Chondrocyte in hyaline cartilage matrix. Matrix exhibits marked affinity to ruthenium red (RR, black granules). Uranyl acetate and lead citrate (UALC). ×4000

Some of the chondrocytes were surrounded by variously wide spaces showing discernibly thinner content in contrast to material found farther away from the surface of the chondrocytes (Fig. 3). Other chondrocytes had no such zones of matrix of different density around them. In cases where such zones did exist a chamber-like compartment well familiar from light microscopy was present. The walls of such "chambers" were made up of a quantity of dense, round-shaped conspicuously crowded granules, 10—80 nm in size. The larger granules were made up of clusters of smaller units (Fig. 3). The spaces between the chondrocyte surface and the walls contained spherical particles, 10 nm in size, sometimes closely attached to the cytoplasmic membrane of the chondrocytes. The membrane often projected, in a ruffled fashion, into the "chambers" (Fig. 3). The "chambers" contained collagen fibrils, 35—50 nm thick, exhibiting characteristic transverse striation (Fig. 4). Attached to their surface, too, were dense granules, 10 nm in diameter, the same as those on the surface of the chondrocytes. Between the free granules and those fixed to the collagen fibril surface there were occasionally far finer fibres of less

Fig. 2 Part of two-cell group of chondrocytes separated by septum. Around chondrocytes — conspicuous condensation of matrix with substance fixed with RR, black annulus. UALc. ×4000

Fig. 3 Black annulus similar to that in Fig. 2, at greater distance from chondrocyte surface. Space between the annulus and chondrocyte surface is dotted with black granules aggregated in larger clusters. Chondrocyte surface shows finger-like projections studded with tiny black granules. UALC, ×10 000

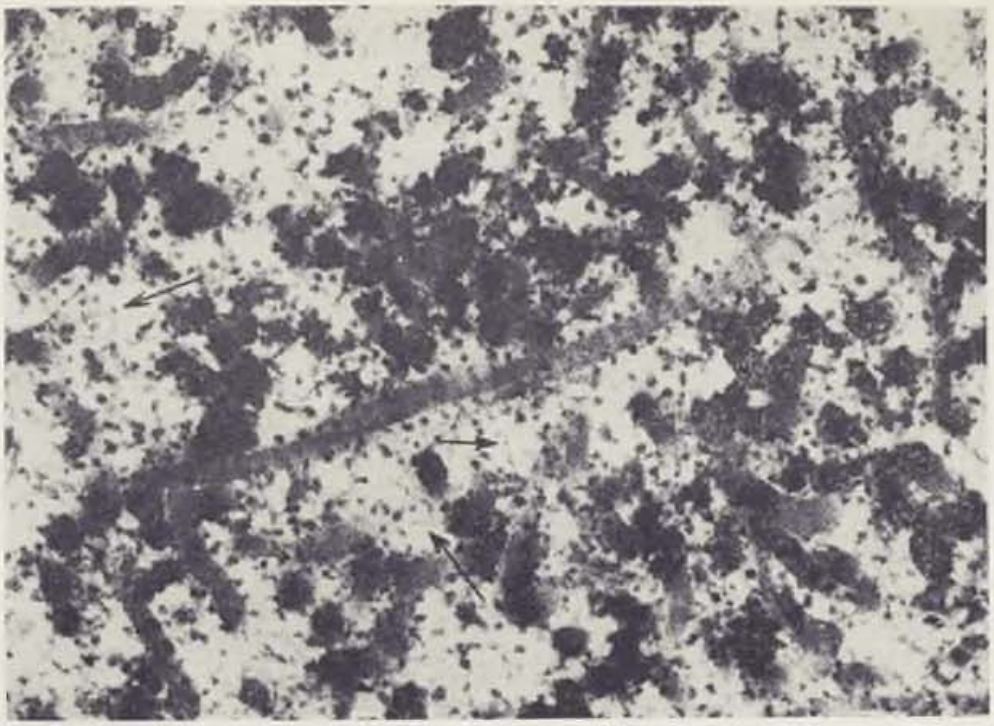

Fig. 4 Collagen fibril inside „chamber". Attached to its surface are dense granules similar to those on the surface of chondrocytes. Y-shaped fibrils seen in some sites between the granules (arrows). RR, UALC, ×80 000

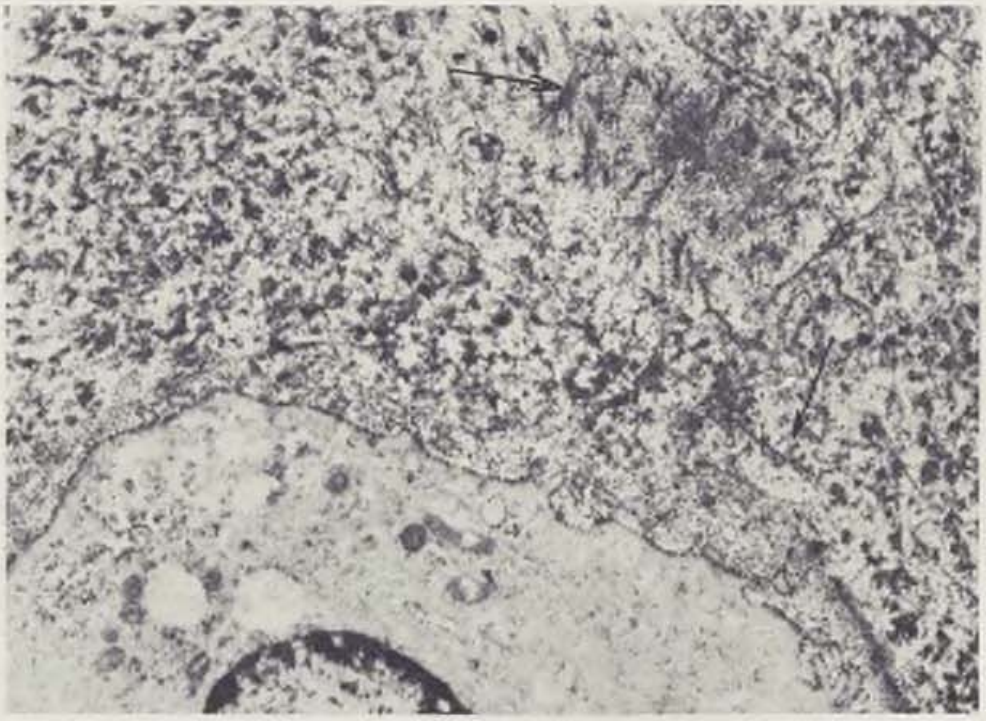

Fig. 5 Collagen fibrils unevenly distributed throughout the matrix (arrows). RR, UALC, ×5000

regular course and no internal structure, 4 nm in diameter. These were sometimes bifurcate in a Y-shaped fashion (Fig. 4). A similar pattern of intercellular matrix arrangement was also seen outside the intercompartment space. There was a greater number of densely crowded dense granules there, with single or sparsely clustered collagen fibres of regular or irregular pattern of arrangement scattered among them (Fig. 5).

DISCUSSION

The usual treatment of tissue prepared for electron microscopic examination entails loss of diverse material, including cartilage proteoglycans. One of the methods of prevention is cryotechnical treatment of specimens designed for morphological study (Hunziker and Herrmann 1987), another is the stabilization of proteoglycans during fixations, e. g., by adding ruthenium trichloride hexamine (Hunziker et al. 1982) or ruthenium red which is known for its low capacity to penetrate tissues in general. In our study of human hyaline cartilage of interphalangeal articulations we found ruthenium red difficult to penetrate the blocks of tissue. Since ruthenium red is noted for its relatively wide range of affinity to different components of cell surfaces and intercellular matrix (Luft 1971, Blanquet 1976, Blažeková et al. 1980), Thyberg et al. (1973) used the digestive effects of chondroitinase ABC, papain and hyaluronidase to study cartilage (alongside biochemical analysis of the material extracted). Their results pointed to the proteoglycan nature of the matrix of the granules of extracellular substance with prominent affinity to ruthenium red. Myers et al. (1973) arrived at similar conclusions in their extraction studies using guanidine chloride, and described the fine fibrils interconnecting the collagen fibres and dense granules as linear aggregations of proteoglycans. Since the fibres we studied were so unambiguously like those structures we did not think it necessary to repeat their extraction studies.

A precise electron microscopic identification of the components of the hyaline cartilage matrix would only be feasible with the use of cytochemical and immunohistochemical methods (Wezeman and Childs 1982). In this respect silver proteinate of iron diaminothiocarbazide is recommended for the demonstration of sulphated glycosaminoglycans, the immunoferritin method for the identification of chondroitin sulphate A, tannic acid and iron trichloride for the visualization of the granule matrix (Takagi et al. 1983). These methods were used for the study of proteoglycans of rat cartilage. Similar investigation of human material represents a much more intricate problem of organization, and we have as yet no knowledge of a relevant human study.

Literary reports often analyze the problem of perichondrocytic "chambers", well familiar from light microscopy. This is a general description of the space housing chondrocytes in the intercellular matrix. Where, during the treatment of the material, the chondrocytes shrink, fissure-like space will develop between their surface and the matrix. In our own material we

found no empty "chambers", though occasionally we were able to see spaces filled with rather thin granules of proteoglycans and fewer fibrils as distinct from the matrix of more remote chondrocytes. The "chambers" were bounded by densely crowded proteoglycan granules indistinguishable from particles in other localizations. Hunziker et al. (1982) refer to wrong handling of the fixatives osmolarity to account for the fissure-like spaces in the vicinity of the chondrocytes. When they used ruthenium hexamine trichloride with its molecular weight much lower than the cation dyes still in use they found the chondrocytes filling completely the space within the "chambers" with no fissure whatsoever between the chondrocyte surface and the compartment wall. However, even this technique of fixation resulted in a pericellular condensation of proteoglycan granules. We seem to be still in the dark as to the concept of the "chambers". In Sheldon's view (1983), the "chambers" — unlike the rest of the matrix — contain material which is easier to extract in the course of the preparatory procedures. This means that in close vicinity to the chondrocyte of in vivo cartilage there is material which is not quite so fixed or polymerized as in other parts of the cartilage. Our own results appear to lend support to this view. At a certain distance from the chondrocytes we were sometimes able to observe visible condensation of the matrix making up the "wall" of the compartment. Such condensation might be due to an accumulation of proteoglycan granules of newly developed matrix substance pressed against the stronger polymerized material in parts more remote from the chondrocyte surface. The development of such "chambers" around chondrocytes, or their absence, might then be indicative of the production activity of the particular chondrocytes.

In the present study we prefer to refrain from commenting in any great detail on the differences in the diverse zones of cartilage tissue as described by many authors. Their assessment in bioptic material is a far more difficult affair than in tissues obtained for electron microscopy from the common laboratory animals. More detailed information on this subject can be found, e. g., in the study by Horký (1985).

SUMMARY

The intercellular matrix of hyaline cartilage was fixed in the presence of ruthenium red capable of stabilizing, among other substances, also proteoglycans. These were visualized on the surface of chondrocytes and collagen fibrils as dense granules. In between the granules, fine filaments were found, often bifurcated in a Y-shaped fashion. The problem of chondrocytic chambers is discussed. A less dense matrix is occasionally found in the vicinity of chondrocytes. The boundary with the more remote part of the matrix is made up of condensation of proteoglycan granules.

K e y w o r d s : man, hyaline cartilage, fingers, electron microscopy, proteoglycans.

RESUME

Morphologie de la matrice du cartilage hyalin des articulations de la main. Etude en microscopie électronique

Brozman, M., Jakubovský, J.

On décrit la matrice intracellulaire du cartilage hyalin après la fixation, on présence du rouge ruténifère qui exerce — entre autre — l'effet stabilisant même sur les glucoprotéines. Celles-ci ont été visualisées à la surface des chondrocytes et des fibres collagènes comme de denses granules. Parmi les granules on a trouvé de fins filaments qui étaient souvent bifurqués en forme de „Y". Le problème de la petite cavité des chondrocytes est discuté. Au voisinage d'un chondrocyte on trouve parfois une matrice moins dense. Les limites de la partie distale de matrice sont composées d'un entassement des granules glycoprotéiques.

ZUSAMMENFASSUNG

Die Morphologie der Matrix des hyalinen Knorpels der Fingergelenke (Elektron-mikroskopische Studie)

Brozman, M., Jakubovský, J.

Es wird die Interzellularmatrix eines hyalinen Knorpels nach Fixierung in Gegenwart einer Rutheniumsröte beschrieben, die u.a. auch Proteoglycane stabilisiert. Diese waren auf der Oberfläche der Chondrozyten und Kollagenfasern als dichte Granulae zu sehen. Zwischen den Granulae befanden sich auch feine Filamente, die sich häufig in Y-förmige Bildungen verzweigten. Es wird das Problem einer Chondrozyten-Kammer diskutiert. In der Umgebung des Chondrozytes findet man manchmal eine dünnere Matrix. Die Grenze zum entfernten Teil der Matrix bilden zusammengeballte Proteoglycan-Granulae.

SUMARIO

Morfología de las matrices de cartílago hialino de las articulaciones de los dedos de la mano

Brozman, M., Jakubovský, J.

El papel describe la matrix intercelular del cartílago hialino después de la fijación en la presencia de la rojez de rutenio que, aparte de otras sustancias, estabiliza también los proteoglicanos. Estos fueron vistos en la superficie de los condrócitos a las fibrilas de colágeno como gránulos densos. Entre los gránulos se encontraban filamentos finos, a menudo bifurcados en la forma de la letra Y. Se discute el problema del cuartitos condrocitarios. En la vecindad del condrócito se encontraba alguna vez una matrix de menor consistencia. El borde con la parte de las matrix más distante está constituída por una condensación de los gránulos proteoglicanos.

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(The 2nd Congress of the European Burns Association)

As President of the 2nd EBA Congress I have the pleasure of expressing my deepest appreciation to all my colleagues who have made a great contribution to its notable achievement. With its 360 participating members, 137 contributions presented as lectures, videofilms and posters, the Congress stimulated an unprecedented interest and met with unusual response. Its considerable merit can also be seen in the high professional standard and wide spectrum of the papers delivered to present achievements attained in the fields of skin loss substitutes, inhalation trauma as well as in immunology, in fight against pain and in the monitoring of burned patients. The successful outcome of the Congress was not only due to its high scientific standard but also to its prevalent atmosphere of friendship. Over the few years of its existence, the EBA has been able to develop into a great European community.

The advantage of low registration fees achieved thanks to the generosity of several invited lecturers who disclaimed any repayment of their expense, greatly added to the family spirit of this young European society. Thus the Congress also made possible participation of the young medical generation from both the East and West.

R. Hettich
President of the 2nd Congress of the European Burns Association

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DERMOLIPECTOMY OF THE ABDOMINAL WALL

J. MĚŠŤÁK, V. VÍŠEK, M. ČAKRTOVÁ, J. ČERVENÝ

Flaccid abdominal wall in post-partum women or venter pendulus is a defect which often requires correction by plastic surgery. Post-partum women mostly complain of flaccid and shrunken skin of the anterior abdominal wall, marked by striae in the umbilical and hypogastric regions and of distended direct abdominal muscles. However, venter pendulus is often accompanied by persistent inflammations and eczemas below the overhanging skin, as well as by orthopeaedic, vascular and other complications (3, 8). The plastic surgeon is called upon to remove such defects for their health and social consequences.

Medical literature describes different surgical techniques varying in localization and direction of the incision applied at dermolipectomy proper (1, 4, 6, 8, 9). Vertical incision used for the excision of excess, low-quality abdominal wall tissue is favoured by Schepelmann and Küster, whereas others, Kelly, Thorek, Gonzales-Ulloa, Pitanguy and others, give preference to horizontal incisions. Babcock, Castanarez and others use a combination of both types of incision to make the resulting suture T-shaped, in the normal and inverted position. But there are a number of other surgical techniques which reduce the skin with subcutis of the anterior abdominal wall with differently directed incisions. Apart from considering the degree and type of the defect, the selection of a surgical technique is also to be judged by the final aesthetic effect (2, 3, 8).

At the Prague Department of Plastic Surgery, the first operation for venter pendulus was performed as early as 1936. Since that time more than 1,200 women suffering from various forms and degrees of anterior abdominal wall defects have undergone surgery. Within this period, the experience of many specialists, new surgery procedures and our own steadily growing experience have considerably contributed to improving the surgical technique and methods of abdominal wall reconstruction.

In the postwar period, abdominal wall dermolipectomy performed in the overwhelming majority of women at our centre was carried out using combined horizontal and vertical incisions, as proposed by Babcock (Fig. 1). This technique modified with that of Červený (1974) proved successful as it considerably reduced the risk of apical necrosis of lateral cutaneous flaps at

the suture junction by leaving the cutaneous triangular flap above the symphysis. In the next period, this modified surgical procedure was gradually abandoned in favour of transversal pubic dermolipectomy based on extensive mobilization of skin and abdominal wall subcutis from the subcostal region in the caudal direction. This technique, originally proposed by Pitanguy and Regnault has only recently been given priority as witnessed by the rate of use and by final results. The main reason for using this technique, apart from reducing surgery time substantially, is the absence of vertical scars above and below the umbilicus.

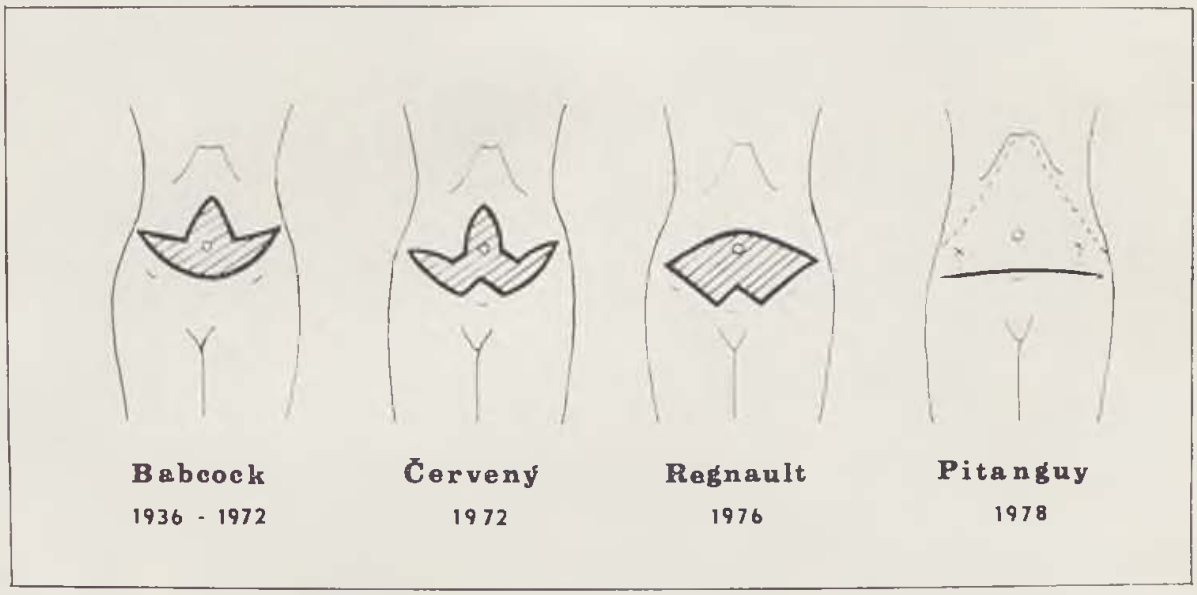


Fig. 1 Main techniques of abdominal wall dermolipectomy applied at the Department of Plastic Surgery, Medical Faculty of Hygiene, Charles University, Prague

In reconstructing the abdominal wall we give priority to transversal suprapubic incisions using a triangular skin flap above the symphysis and with lateral arms turned upward in a semi-lunar fashion with regard to skin splittibility as proposed by Regnault (Fig. 6) in preference to a strictly horizontal incision, as described by Pitanguy (4, 5). In most operated women, the incision follows the dividing line between the flaccid and excess skin with subcutis above the abdominal wall muscles and the firmly adherent skin cover above the groins and symphysis. To make up for the lateral tissue asymmetry, Pitanguy's technique requires the incision to go as far as the gluteal regions. Moreover, in case the direct horizontal suture is no longer possible after the excision of excess skin, the subsequent use of combined dermolipectomy involves the risk of insufficient blood supply to triangular flaps at the site where the sutures meet above the symphysis. However, in some women, we also used this incision to advantage, in combination with a suprapubic skin wedge.

The reason for leaving the triangular skin flap above the pubic area, as described by Regnault, consists, apart from providing a good blood supply, in relieving the post-dermolipectomy caudal shift of the wall, as well as in facilitating the medial shift from the sides during final suture. The medial shift from the sides can be achieved by making the incision areas variously long (Fig. 2). While the excision of excess skin obtained from the mobilized wall is performed in the direction from the umbilicus to both spines in a straight line, the inferior suprapubic incision area with its semi-lunar arms and triangular flap is about one quarter longer than the excised side. To level out the difference in length of the whole mobilised area a medial shift of its upper parts must be performed to obtain the required narrowing of the waist-line.

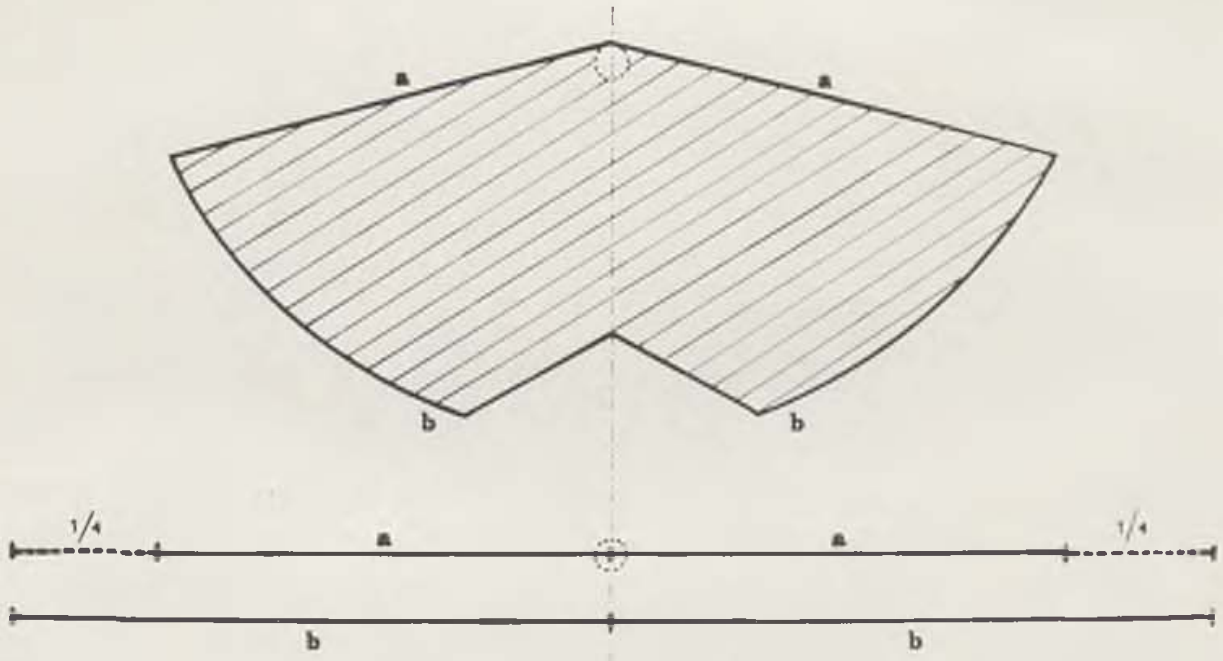
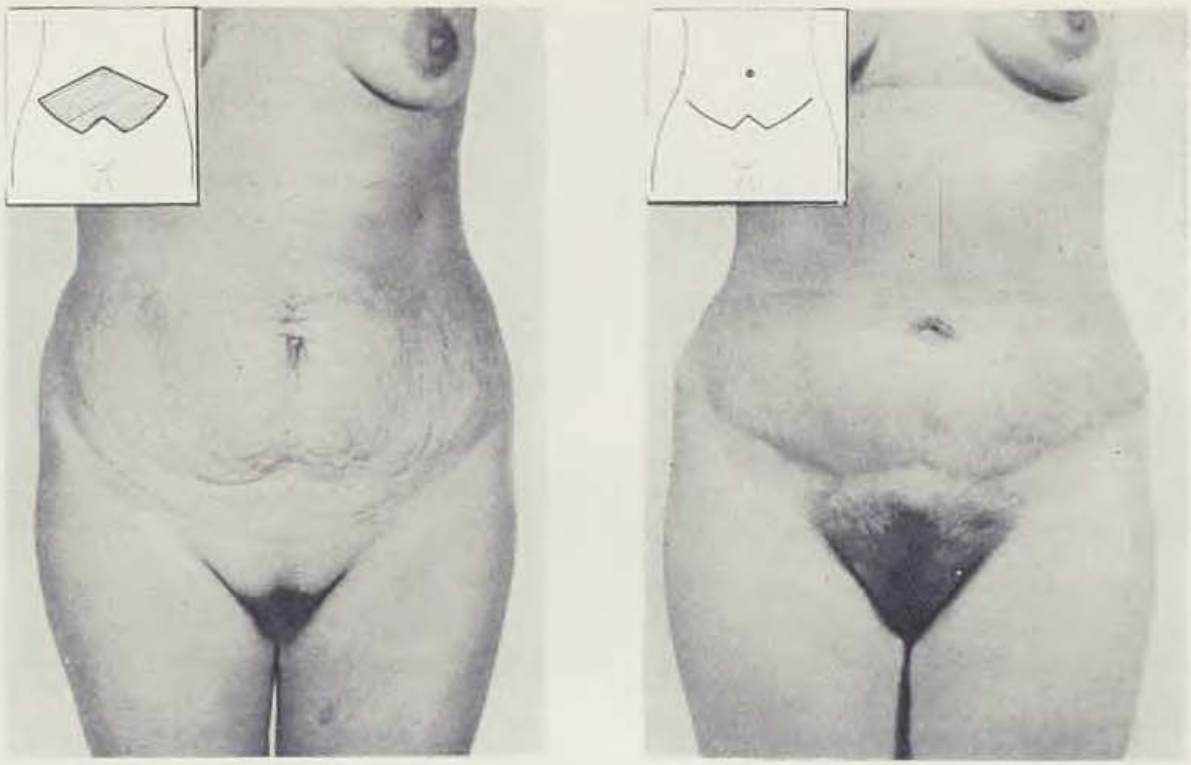


Fig. 2 Medial abdominal shift according to Regnault's technique

METHODS

At present, we divide our surgical female patients into four categories according to the type of the abdominal wall deformity. Each type requires a different surgical procedure.

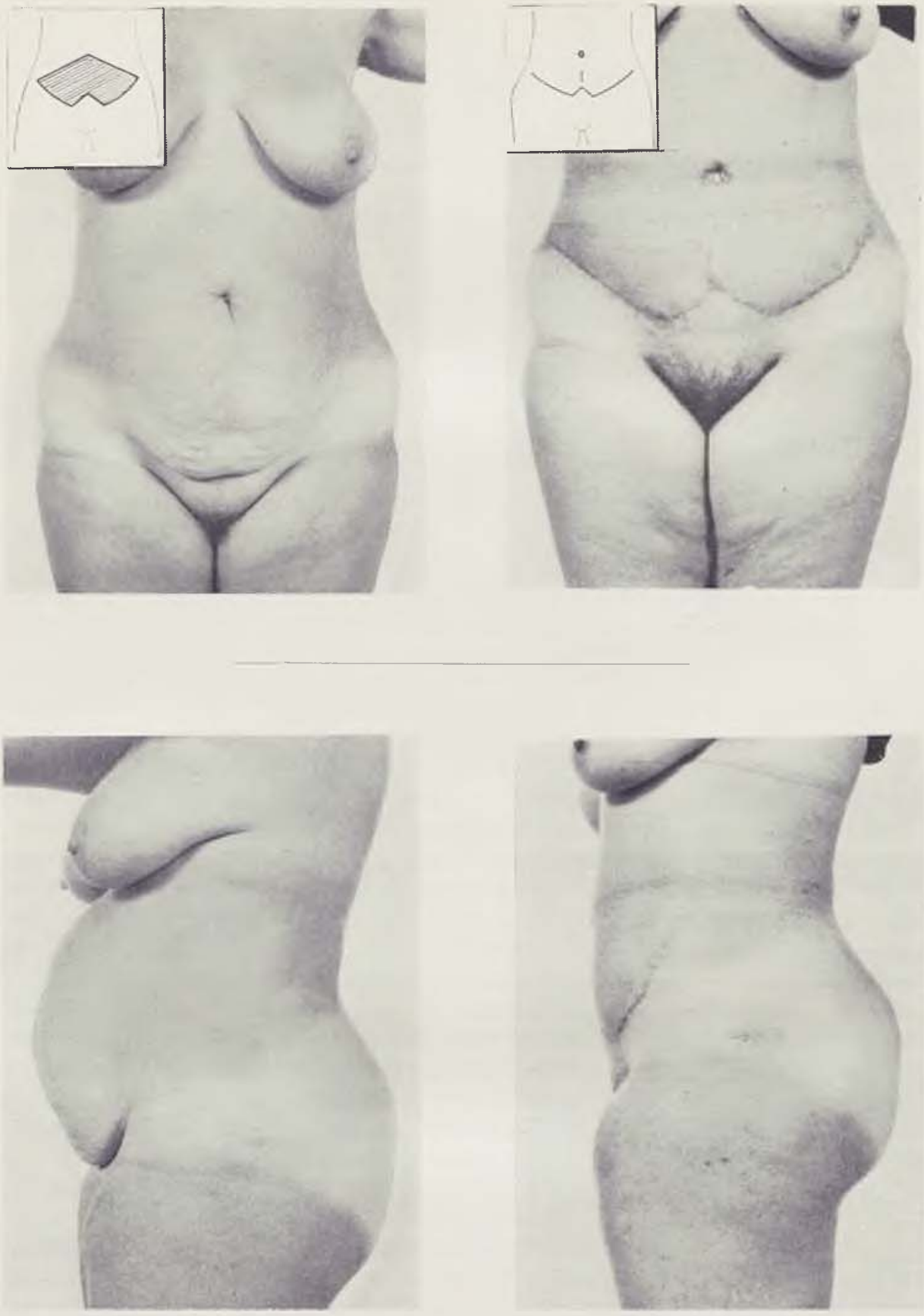
Women with smaller or medium thick fat layers, where the tissue over-hangings or deep striae are localized in the region of the hypogastrium and mesogastrium, abdominal wall is reconstructed according to Regnault (Figs. 3, 4). Following a major incision in the suprapubic region keeping the tri-angular skin flap and arms turned upwards in a semilunar way, we use semi-blunt dissection to detach the skin and subcutis from the abdominal muscle fasciae as far as the xiphoid and the costal margin. The wedge-shaped flap height should not exceed 3—4 cm. When lifting the wall, we carefully ligate



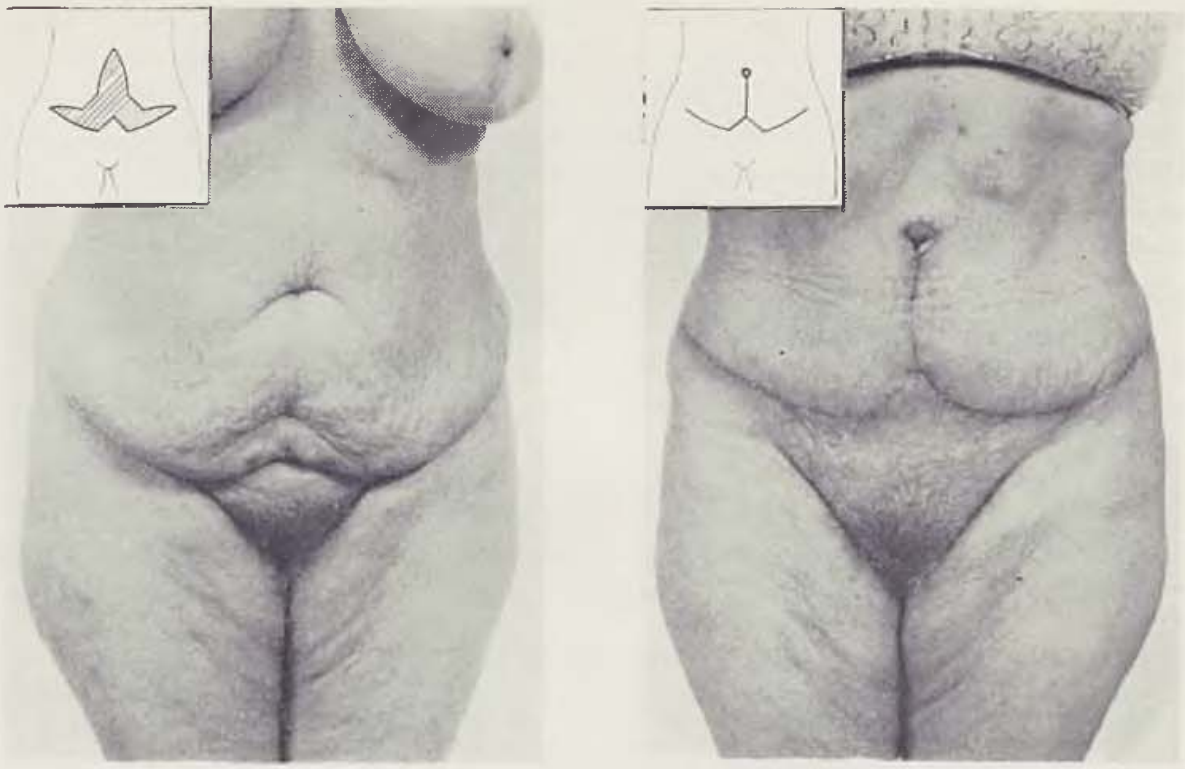
Figs. 3, 4 Patient A. S. — condition prior to and following abdominal wall surgery according to Regnault

the large perforating vessels to prevent them from being retracted under the fascia and from causing subfascial and intramuscular haematoma. The wall mobilization can be facilitated by cutting the skin in the middle of the lower abdomen starting from the apex of the triangular skin flap down to the umbilicus. In case of a direct abdominal muscle diastasis, we suture them together using strong monofile fibres placed behind the margin of the aponeurosis. By pulling the mobilized skin wall down over the edge of the suprapubic incision we establish the size of the excision. The caudal shift of the mobilised wall usually makes it possible to perform a direct suture of the skin edge originally adjacent to the circumcised umbilicus to the triangular flap apex situated above the symphysis. Prior to the skin suture, we level out the differences in the thickness of subcutaneous fat in both wound areas by cutting the subcutaneous tissue at the edge of the mobilized wall down to the level of the other side. The umbilicus is localized into the opening formed by a transversal semi-lunar excision at the level of both spines. Then we use suction drainage which we remove after 48—72 hours. The patient should rest in bed for 4—5 days with postoperative respiratory and limb rehabilitation.

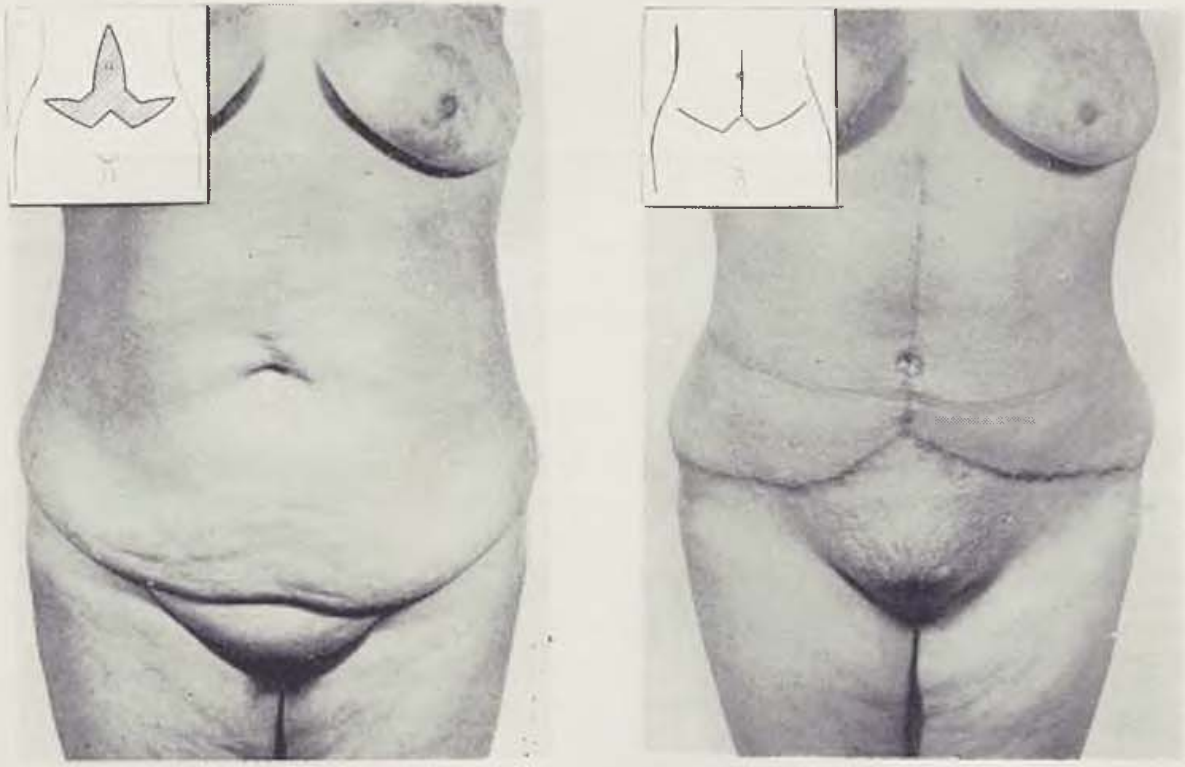
In some women with the abdominal wall skin not sufficiently elastic, we sometimes fail to approximate the edge remaining after the original umbilicus to the apex of the suprapubic triangular skin flap. In such cases we suture the umbilical opening so as to make it form a small vertically situated scar above the wedge-shaped flap (Figs. 5, 6, 7, 8).



Figs. 5, 6, 7, 8 Patient A. N. — condition before and after abdominal wall reconstruction using modified procedure according to Regnault



Figs. 9, 10 Patient J. U. — condition prior to and after abdominal wall reconstruction using Červený's technique



Figs. 11, 12 Patient I. F. — condition before and after abdominal wall surgery using Babcock and Červený's techniques

In asthenic post-partum women with no subcutaneous fat between the umbilicus and xiphoid, in cases of extensive and deep striae in the lateral parts of mesogastrium and epigastrium, and in patients with a large venter pendulus, we make use of the original technique developed by Červený, and locate the resulting vertical suture under the umbilicus (Figs. 9, 10). This enables us to remove not only tissue overhangings using supplementary vertical excision but also the low-quality tissue from the supra-umbilical area, and, at the same time, it facilitates a further medial shift from the sides.

Exceptions are made in patients with extremely large pendulous abdomen where we have to use combined incision with vertical excision resulting in a suture in the epigastrium (Figs. 11, 12). Only such excisions can reduce large tissue excess to the required degree.

Tab. 1. Number of women operated on at the Department of Plastic Surgery, Medical Faculty of Hygiene, Charles University, Prague, in 1980—1985, divided by abdominal wall deformity type

Type of deformity	Number of patients	%
Venter pendulus	38	21,7
Post-partum abdominal wall deformation	111	63,4
Post-operative scars	23	13,2
Others	3	1,7
Total	175	100,0

Tab. 2. Demolipectomy techniques applied at the Department of Plastic Surgery, Medica Faculty of Hygiene, Charles University, Prague, in 1980—1985

	1980		1981		1982		1983		1984		1985	
	n	%	n	%	n	%	n	%	n	%	n	%
Combined incision (Babcock. Červený)	18	75	17	63	14	52	6	24	6	18	7	19
Transversal incision (Regnault, Pitanguy)	4	* 16	9	* 33	12	* 44	19	* 73	26	* 74	28	* 78
Others	2	9	1	4	1	4	1	3	3	8	1	3
Total	24	100	27	100	27	100	26	100	35	100	36	100

RESULTS

In order to assess each of the techniques now used for the abdominal wall reconstruction at our department, we divided the women operated on in 1980—1985 into categories showing the type of defect (Tab. 1). Indirect factors indicating advantages or shortcomings of the surgical procedures concerned also include their applicability in the follow-up period (Tab. 2). This table shows a gradual transition from combined incision surgery to the

Tab. 3. Postoperative results in women operated on in 1980—1985 using Regnault's technique

Results	n	%
Very good	63	67,0
Satisfactory	28	29,8
Poor	3	3,2
Total	94	100,0

Tab. 4. Defects found in women operated on at the Department of Plastic Surgery, Medical Faculty of Hygiene, Charles University, Prague, in 1980—1985, using Regnault's technique

Causes	n	%
Insufficient excision	6	19,3
Asymmetry in subcutis thickness above and below scar	9	29,1
Vertical scar asymmetry	3	9,7
Lateral tissue excess	6	19,3
High suprapubic skin wedge	4	12,9
Others	3	9,7
Total	31	100,0

transversal suprapubic dermolipectomy. The postoperative results found in women who underwent this type of surgery are summarized in Tab. 3. Despite the high rate of success some of our results fell short of expectation as shown on Table 4. This group of patients did not include four female patients operated on using Pitanguy's technique.

CONCLUSION

The results achieved at the Prague Department of Plastic Surgery regarding abdominal wall reconstruction in women after childbirth or with venter pendulus emphasize the advantages of suprapubic dermolipectomy according to Regnault. Apart from reducing surgery time, the priority of this technique consists in eliminating vertical scars below and above the navel. The amply supplied cutaneous wedge above the symphysis facilitates the caudal shift of the abdominal wall following dermolipectomy and a direct suture of the edge — left by the original umbilicus — to the suprapubic region. The arch-like upward shape of the lateral arms of the suprapubic incision does not require long cuts for correcting lateral asymmetries as the horizontal incision according to Pitanguy.

In women with insufficiently elastic skin wall, we close the opening left after the navel so that it forms a short vertical scar in the lower abdomen. In female patients with deep and extensive striae in the lateral parts of the mesogastrium and epigastrium and in asthenic women after childbirth, we use Červený's technique with horizontal and vertical scars up to the navel region. Only in patients with extensive tissue overhangings as found in lipomatosis, we remove the skin and subcutis to a greater extent with the vertical scar apex in the upper abdomen.

However, none of the surgical techniques described above can be absolutized. It always depends on a detailed analysis of deformity and the surgeon's experience, which technique he will choose for maximum success.

SUMMARY

In their paper the authors discuss different techniques used in flaccid abdominal wall reconstruction in post-partum women or with venter pendulus, and indicate their potential application. Their study is based on experiences obtained from surgical operations for these deformities performed over a period of 50 years. The main concern of their study were suprapubic transversal dermolipectomies as examined and assessed in conclusion. The paper also lays stress on the authors' own contribution to surgical experience helping to guarantee favourable results.

Key words: flaccid abdominal wall in women, dermolipectomy

RESUME

Contribution aux dermolipectomies de paroi abdominale

Měšťák, J., Višek, V., Čakrtová, M., Červený, J.

Dans leur contribution, les auteurs font remarquer les modes de reconstruction de la paroi abdominale ptôsée des femmes après accouchement ou dans les cas de venter pendulus. Egalement, ils mettent à l'évidence les possibilités d'application des méthodes ci-dessus, s'appuyant aux expériences acquises au cours des opérations de ces défauts, pendant une période de 50 ans. Leur attention est attirée surtout aux dermolipectomies suprapubiques transversales. Les résultats des observations sont

établis dans l'évaluation finale, où les auteurs accentuent l'importance indiscutable de leurs propres expériences qui ont eu un effet favorable pour les résultats finals.

ZUSAMMENFASSUNG

Beitrag zur Dermolipektomie der Bauchwand

Měšťák, J., Višek, V., Čakrtová, M., Červený, J.

Die Autoren weisen in ihrem Beitrag auf die Arten einer Rekonstruktion einer schlaffen Bauchwand bei Frauen nach einer Geburt oder bei einem venter pendulus hin sowie auf die Moglichkeiten ihrer Anwendung. Sie stützen sich dabei auf die Erfahrungen, die sie während einer fünfzigjährigen Periode von Operationen solcher Gebrechen gewonnen haben. Sie richten ihre Aufmerksamkeit vor allem auf die suprapubische transversale Dermolipektomie, und sie fassen die Ergebnisse ihrer Untersuchungen in einer Schlusseinschätzung zusammen. Dabei betonen sie auch die zweifellose Bedeutung ihrer eigenen Erfahrungen zur Gewährleistung günstiger Endergebnisse.

SUMARIO

Dermolipectomia de la pared abdominal

Měšťák, J., Višek, V., Čakrtová, M., Červený, J.

En su papel los autores discuten las diferentes técnicas empleadas para la reconstrucción de la pared abdominal fláccida o venter pendulus en las mujeres después del parto llamando la atención a las posibilidades de su aplicación. Sus experiencias se basan en los resultados obtenidos mediante las operaciones efectuadas durante los últimos 50 años. Su setudio se orientaba, sobre todo, a las dermolipectomias suprapubicas transversales y los resultados de este estudio fueron resumidos y valorizados en la conclusión. Se acentúa también la importancia de las experiencias personales de los autores que así contribuye a garantizar favorables resultados finales.

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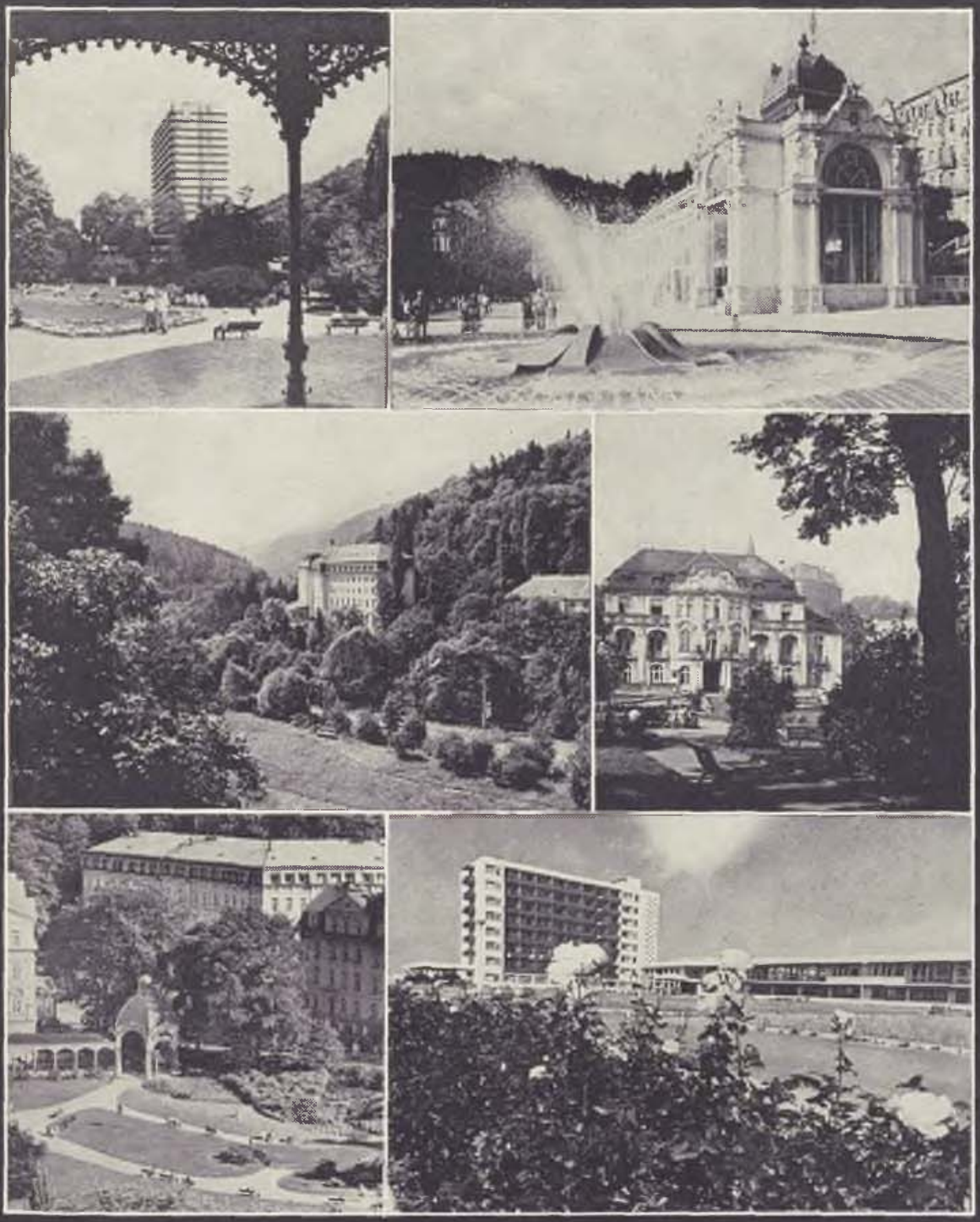

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