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BONE LENGTHENING IN MALFORMED UPPER LIMBS: A FOUR YEAR EXPERIENCE

G. Pajardi, G. L. Campiglio, P. Candiani

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SUMMARY

Bone lengthening by corticotomy, gradual distraction and stabilization with an external frame has proved to be effective in the repair of osseous defects in lower extremities. More recently this technique has been introduced also in the treatment of post-traumatic deformities and malformations of the upper limbs.

From 1989 to 1992 we treated 38 patients (46 upper limbs) with bone lengthening of which 12 (16 upper limbs) affected by post-traumatic deformities and 26 (30 upper limbs) by malformations. We present herein our four year experience with malformed cases only.

The results suggest that bone lengthening is a simple and reliable procedure to obtain good function, to correct angular deviations and, also, to give a better esthetic appearance. Satisfying results, low complication rates and simple execution recommend its use in the treatment of many congenital malformations of the upper limbs, usually in association with traditional techniques.

However, we are now strongly selecting the indications in order to improve our future results. We stress in particular that the treatment of some malformations, as ulnar or radial club hands, could be radically modified by introduction of bone lengthening.

ZUSAMMENFASSUNG

Knochenverlängerung bei Missbildungen der oberen Extremitäten: Vierjährige Erfahrungen

G. Pajardi, G. L. Campiglio, P. Candiani

Knochnverlängerung durch Kortikotomie, almähliche Distraktion, und Stabilisierung mit einem äusseren "Rahmen" erwies sich ais wirksam bei der Korrektur von Knochendefekten an den oberen Extremitäten. In letzer Zeit wurde die diese Behandlung auch bei post-traumatischen Deformationen und bei angeborenen Missbildungen der oberen Extremitäten angewandt.

In der Jahren 1989 - 1992 behandelten wurden 38 Patienten (46 obere Extremitäten) durch Knochenverlängerung. Davon waren bei 12 (16 obere Extremitäten) post-traumatische Deformationen, und bei 26 (30 obere Extremitäten) angeboren Missbildungen vorhanden. Wir beschreiben in dieser Mitteilung auschliesslich unsere Erfahrungen mit der Behandlung von Missbildungen im Laufe von 4 Jahren.

Die Ergebnisse zeigen, dass die Knochenverlängerung eine einfache und verlässliche Methode zur Erreichung einer guten Funktion, zur Korrektion von Winkel-Deviationen darstellt und zu besseren kosmetischen Ergebnissen führt.

Gute Erfolge, eine niedrige Komplikationsrate und die einfache Anwendung dieser Methode liefern den Nachweis ihrer Nützlichkeit in der Behandlung von zahlreichen angeborenen Missbildungen der oberen Extremität, meistens in Kombination mit traditionellen Verfahren. Zecks einer weiteren Verbesserung der Behandlungserfolge erfolgt bei uns gegenwärtig eine strenge Indikationsstellung.

Es wird unterstrichen, dass die Anwendung der Knochen verängerung, insbesonders bei gewissen Missbildungen, wie bei der ulnaren, bzw. radialen Klumphand in radikaler Weise die Ergebnisse modifizieren könnte.

Key words: bone lengthening, corticotomy, upper limbs

Bone lenghtening by gradual external distraction was introduced in reconstructive surgery by Codivilla in 1905 (5) and later popularized by Ilizarov (11) and De Bastiani (8, 9).

Initially a high rate of complications (local edema, skin necrosis, pin tract infection and unpredictable ossification of the expanded zones) limited the clinical diffusion of this technique; subsequently Ilizarov demonstrated that the incidence of these complications could be reduced by performing only a corticotomy with minimal disruption of the periosteum and endosteum (11).

Bone lengthening has been widely and successfully used for lower extremities (1, 2, 3, 7, 13); however, in the last ten years many authors proposed this technique for the upper limbs in order to improve both function and esthetic appearance (4, 14, 15, 16, 17, 18, 19, 20).

This delay in extending the benefits of bone lengthening to upper limbs has been probably due to two principal factors. The first was technical, i.e. the lack of small and light distractors which could be well tolerated by the patient; the second was related to some intrinsic surgical difficulties.

We report herein 26 cases of bone lengthening in malformed upper limbs. The indications, clinical observations and the results are presented.

MATERIALS AND METHODS

From 1989 to 1992 we treated 38 patients (46 upper limbs) with bone lengthening of which 12 (16 upper limbs) affected by post-traumatic deformities and 26 (30 upper limbs) by malformations.

Regarding the malformed cases 11 were synbrachydactylies, 9 longitudinal defects, 2 brachymetacarpiae, 2 Apert syndromes, 2 delta phalanges. The segment elongated was the metacarpus in 11 limbs, the radius/ulna in 9, the phalanx in 9 and the first web space in 1.

As the most of patients (15 infants, 18 upper limbs) were operated from 1989 to 1990, the mean follow-up is 30 months.

The details of the surgical technique are well-known and described in previous papers (14, 15, 16). Briefly, in order to ensure a uniform distraction force, four pins at least were placed, followed by the corticotomy. Beginning from the 10th - 15th post-operative day, an external distraction (mean elongation rate = 0.7 cm/die) with a monolateral axial frame was applied. Distraction was stopped temporarily if there was any sign of vascular compromise or skin irritation or significant pain.

We used only axial and not circular frames as they are more comfortable to bear and easier to use. The type of distractor was a Hoffman device in 20 cases and an Orthofix in the remaining 6 patients. The pins were placed as close as possible and were turned completely (360°) to correct the angular defects.

A monthly X-ray exam followed the bone distraction checking its correctness and adapting it to the various situations.

RESULTS

The results are summarized in the Table 1. The time of consolidation was, usually, inferior to that of lower limbs due to the absence of load problems.

Table 1

	min.	max.	mean
ELONGATION (cm)	2.5	9	4.5
ELONGATION TIME (days)	45	150	98
CONSOLIDATION TIME (days)	40	240	130
DURATION OF TREATMENT (days)	90	390	208
INDEX (days of treatment/cm of elongation)	36	46.2	43.3

As reported in Table 2 the complications rate is low (33.3%), probably for the minimal disruption of the periosteum. However we think that also the exact evaluation of the elongation rate and of the moment of distractor removal is important.

Table 2

		% of upper limbs treated
INFECTIONS	3	(10%)
PSEUDOARTHROSIS	1	(3.3%)
DELAY OF CONSOLIDATION	4	(13.3%)
TOTAL INSUCCESSES	2	(6.6%)
TOTAL	10	(33.3%)

The 2 total insuccesses (6.6%) were probably related to an excessive traumatism either during the surgical phase or in the subsequent elongation period. In 2 other bone distractions (6.6%) the excessive elongation rate caused a periostal suffering and required placing a bone graft to make the lengthened bone stronger.

CONCLUSIONS

Malformations have always catalyzed the attention of reconstructive surgeons. A careful analysis of the literature shows that every time when a new therapeutical approach or surgical technique is reported it is almost immediately adapted to the treatment of malformations, especially those involving the face or upper limb.

In the same way bone lengthening by external gradual distraction, originally used in lower limb reconstruction (1, 2, 3, 7, 13), was subsequently extended to the upper limb (4, 14, 15, 16, 17, 18, 19, 20) and, more recently, to the facial skeleton (6, 10, 12).

This paper reviews our four year experience in bone lengthening of malformed upper limbs. Although it is difficult to quantify the results we believe to have obtained evident improvements both of the function and of the esthetic appearance of the upper limb in all cases (Fig. 1-2-3-4-5).

The treatment was well tolerated by the patients and in some cases we repeated it in another ray.

We have recorded few major complications and the problems experienced have prevented us to conclude the treatment only in a limited number of cases.

Our experience allows us to consider bone lengthening a simple and reliable method which yields good results both in the short and long term.

Satisfactory results, poor complication rate and simplicity of execution would suggest to use it in the most of congenital malformations of the upper limbs, rarely alone, more often in association with other classic techniques. However, we are

now strongly selecting the indications and the timing of treatment to further improve our results.

Today we can state that in longitudinal deficiences, in mirror hands, in delta falanges and in Madelung's disease, bone lengthening by external distraction introduces a completely new therapeutic approach and outdates some basic steps, such as, for example, epitrochlear muscle detachment or corrective osteotomy in radial club hand treatment. In fact, considering that bone lengthening represents a fundamental step, we propose a new protocol of treatment for these diseases: centralization in the first months, pollicization and epitrochlear detachment within the third year and bone lengthening with angular correction at the age of 8 to 10.

Fig. 1: Bilateral brachymetacarpia of the fourth ray.

Fig. 2: Result after 6 months from the bone lengthening.

Fig. 3: Bilateral radial club hand.

Fig. 4: After centralization of the ulna, detachment of epitrochlear muscles and pollicization of the second finger an external monolateral distractor is applied with an additional osteotomy and without bone graft.

Fig. 5: A 1 year follow-up shows the different length between one upper limb and the contralateral.

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APPLICATION OF FREE RADIAL FOREARM FLAP IN RECONSTRUCTION OF THE FACE AND ORAL CAVITY

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SUMMARY

The authors have shown the possibilities of application of the free radial forearm flap in clinical cases when reconstructing defects in the region of the face and of oral cavity. This flap is particularly useful in cases where it is necessary to duplicate the flap and to reconstruct two layers at the same time.

ZUSAMMENFASSUNG

Anwendung freuer Lappen aus der medialen Seite des Unterarms bei der Rekonstruktion im Gebiet des Gesichtes und der Mundhöhle

M. Tvrdek, A. Nejedlý, J. Kletenský, Z. Pros

An klinischen Beobachtungen zeigen die Autoren die Möglichkeiten der Anwendung von freien Lappen aus der medialen Seite des Unterarms bei der Rekonstruktion im Gebiet des Gesichtes und der Mundhöhle. Die Vorteile dieser Lappen treten insbesonders dort hervor, wo eine Duplikation des Lappens zur Rekonstruktion von zwei Gewebsschichten notwendig ist.

Key words: free flap transfer, face and oral reconstruction

The free radial forearm flap is one of the most frequently used flaps because of its qualities. Its use for intraoral reconstruction, reconstruction of the cervical part of the oesophagus, palmar aspect of the hand, plantar aspect of the foot, in reconstruction of thumb and penis prove its multifaceted suitability. The further application where its thinness and flexibility are of importance, is the face and the oral cavity particularly in the cases where the flap must be duplicated in order to form the inner and outer layer.

In course of the past year, the authors used this type of reconstruction in four patients. In two cases reconstruction of an extensive skin defect of the face was performed, in the next case nasal full thickness defect was concerned, and finally the flap was used in a patient with a defect of the hard palate.

CLINICAL CASES

Case No. 1 (Figs. 1-3)

J. Z., a 45-year-old man, was repeatedly treated for recurring tumor of the right face, of the type of invasive basal cell carcinoma. In course of nine years, the tumor was six times removed and the resulting defects were covered by local flaps and by use of dermoepidermal skin grafts. In spite of the fact that histologic examination showed removal of the whole tumor, relapses from a number of centres occurred. Because of this, a radical excision of the whole affected region was performed, where relapses had occurred. The extensive defect affecting the greater part of the right face and involving the outer canthus and the temporal region, was reconstructed by free forarm flap, fitted exactly to the shape of the defect. Vascular pedicle of the flap was anastomosed to the recipient facial vessels. Three months later, the correction of the outer canthus was performed.

Case No. 2 (Figs. 4-7)

A. P., a 57-year-old man, suffering from diabetes, was treated repeatedly in the past 12 years at various clinics because of recurring invasive BCC of the nose and inner canthus. The skin cover of the left side of the nose was reconstructed by

Fig. 1: Multicentric invasive BCC of the right face.

Fig. 3: Four month follow-up.

Fig. 2: Defect after radical excision of the affected region.

transposition of skin flaps from the face. Invasive growth of the tumor on the right caused final loss of the right side of the nose. Biopsy from the margin of the defect did not show presence of a tumor. Subsequently, reconstruction by a duplicated radial forearm flap was undertaken. On the fold of the flap, a stripe about one cm wide was deepithelised, the distal part of the flap was used for forming the nasal layer, and the proximal part was used for forming the outer nose cover. The vascular pedicle was anastomosed to facial vessels. Four months later, the right nasal ala was reinforced by a cartilage graft.

Case No. 3 (Figs. 8-10)

K. R., a 21-year-old man, was operated on because of a palatal cyst when nine years old. Removal of the cyst caused an extensive defect that could not be covered by transposition from neighbouring tissues. The defect was reconstructed by free radial forearm flap. The flap was duplicated so as to form both nasal and oral layer. A stripe one cm wide was deepithelised at the fold. Vascular pedicle was anastomosed to facial vessels.

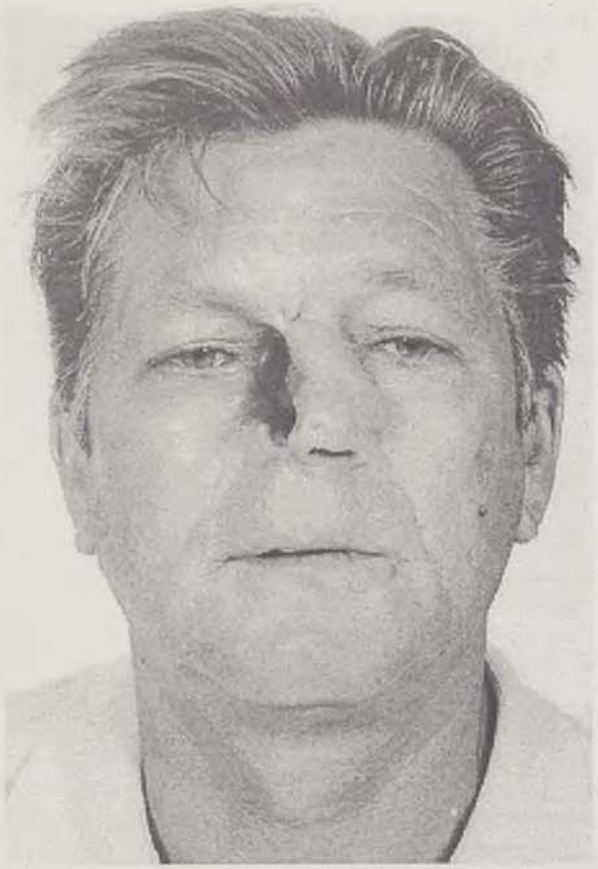

Fig. 4

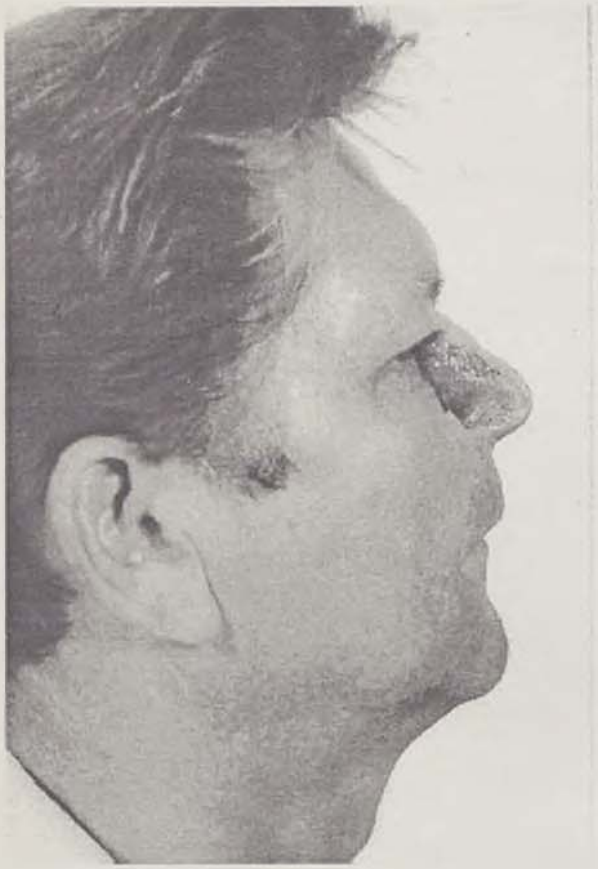

Fig. 4 and 5: Defect of the right side of the nose after repeated excisions of an invasive BCC before reconstruction.

Fig. 6

Fig. 6 and 7: Three month follow-up.

Fig. 8: Defect of hard palate after removal of a cyst in childhood.

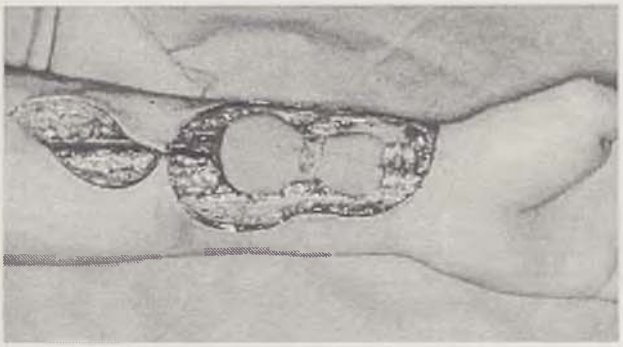

Fig. 9: Mobilised free radial forearm flap. On the fold is deepithelised stripe one cm wide.

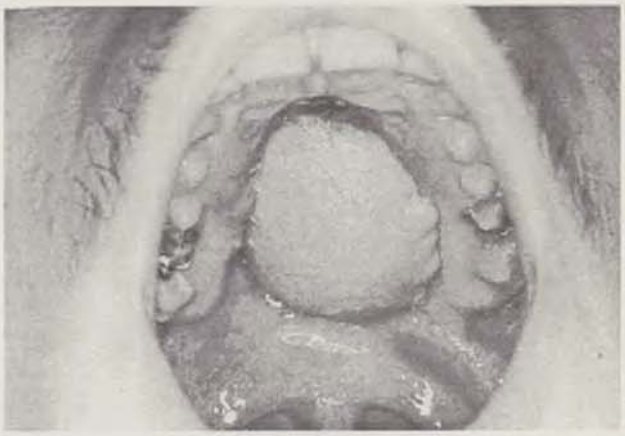

Fig. 10: Six month follow-up after closing minor fistulae in the region of foramen incisivum.

DISCUSSION

The free radial forearm flap proved again its qualities and usefullness in the quoted referred cases - possibility of harvesting the exactly required shape and further shaping it according to need. Thanks to this, it may be easily duplicated and used for covering defects, where two layers must be reconstructed at the same time. This type of duplication does not form any surplus, requiring reduction in the next surgical step, which is another advantage in comparison with other flaps.

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IMPORTANCE OF AN EARLY TISSUE TRANSFER IN THE TREATMENT OF COMPLICATED INJURIES OF LOWER EXTREMITIES

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SUMMARY

3rd degree fractures with extensive defects of soft tissues represent a major therapeutical problem. The technique of free tissue transfer makes it possible to adopt an active access to primary treatment to this injuries. Radical necrectomies may be performed without respect to the extent of the defect that will arise. The authors present their experience regarding an early coverage of the defect of the lower extremity by means of a free flap. The time period between the accident and tissue transfer as well as a suitable flap type are taken in consideration.

ZUSAMMENFASSUNG

Bedeutung einer frühen Gewebesübertragung in der Behandlung von komplizierten Verletzungen der unteren Extremitäten

A. Nejedlý, M. Tvrdek, J. Kletenský, Z. Pros

Die Fracturen III. Grades mit umfangreichen Defekten weichen Gewebe bedeuten ein wichtiges therapeutisches Problem. Die Existenze eines freien Gewebelappen ermöglicht bei Erstbehandlung solcher Unfälle aktiven Zutritt. Es ist möglich radikale Necrectomien durchführen, ohne Rücksicht an Umfang des Defektes, welcher nach Behandlung entsteht. Die Authoren presentieren Ihre Erfahrungen mit der rechtzeitigen Defektdeckung durch den freien Gewebelappen der Unterexträmitäten. Die Authoren ermessen den Unfallzeitabstand der durchgeführten Übertragung, wie auch passenden Freilappentypus.

Key words: 3rd degree fracture, lower extremity, free tissue transfer, early free flap

Fractures of the 3rd degree, together with vast defects of soft tissue, represent a major therapeutical problem. Such injuries of lower extremities lead either to amputations, or to longtime healing, in the duration of years, and to the subsequent osteomyelitis with all its accompanying complications.

For the treatment of these serious injuries, some new operation procedures, both in the region of orthopaedy, and in the field of plastic and reconstructive surgery, are now available. They consist of the selection of suitable method of osteosynthesis, of the timely removal of ischaemised tissue, and of eventual fasciotomies. Necrectomy may be performed irrespectivaly to the size of the future defect. After the stabilization of the patient's status, when it is possible, again, to expose him to the stress of a longtime operation, it is necessary to cover the defect either by the transposition of the pedicled musculocutaneous flap, or by a free flap transfer.

In case of complicated fractures with losses, the necessity of tissue transfer is of paramount importance. The flap covers the exposed part of the skeleton. It inhibits the infection, or even suppresses the already existing infection. The flap has its own blood perfusion, independent on the defect. Within the defect itself, the total of administered antibiotics reaches an effective concentration. Last, but not least, the living, well perfused muscle tissue supports greatly the healing of the fracture. This complex, active and aggressive procedure brings about good results. Blessings that, otherwise, in cases of their conservative treatment would lead to longtime treatment with little hope to save the extremity.

The treatment is interdisciplinary. It necessitates a close cooperation between the traumatologist and the specialist in plastic surgery. At the Department of Plastic Surgery in Prague 9 patients were treated by the described procedure in 1993. First, they have been operated at the Orthopaedical Department of our hospital. After the stabilization of their overall status has been reached, they have been transferred to our department. The definitive cover provided by free flap

transfer was performed within one month's period after the accident. With respect to the extent, to the quality, and to the localisation of the fracture, as well as to necessity to secure a rather long pedicle of the flap, the authors selected free flaps of m. latissimi dorsi or serrati superioris. Two samples of the described procedure are to follow.

Patient P. Z. aged 24 years, suffered an injury of the left lower leg while driving in a truck. A nonischaemizing subtotal amputation with fractu-

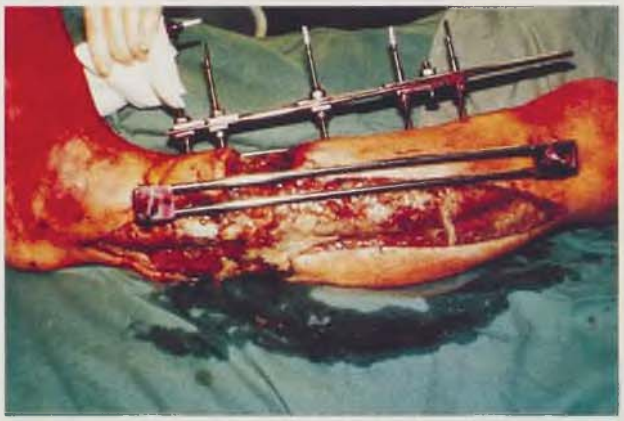

Fig. 1: 3rd degree fracture of lower leg after primary treatment, before flap transfer.

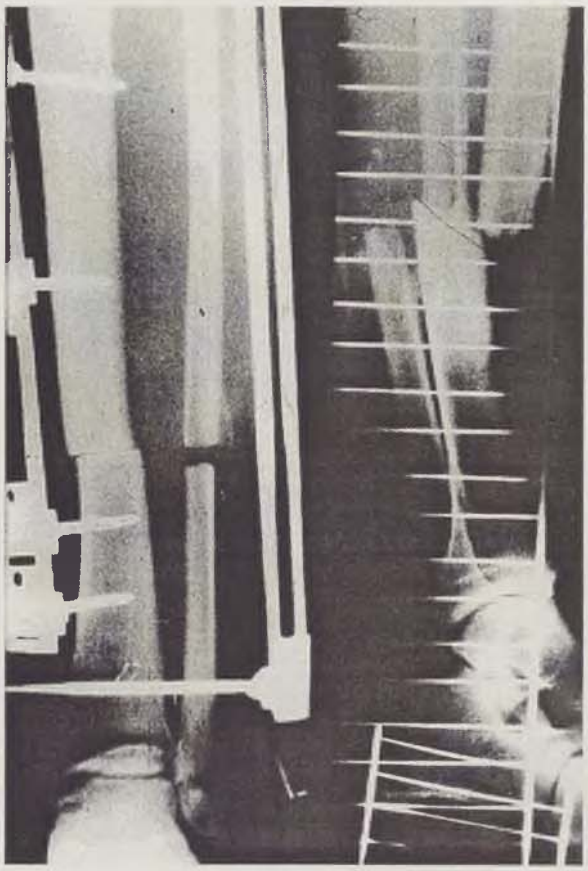

Fig. 2: Radiographs before and after by the external fixation.

Fig. 3: The status after three weeks of the free flap transfer - medial view.

Fig. 4: The status after three weeks of the free flap transfer - lateral view.

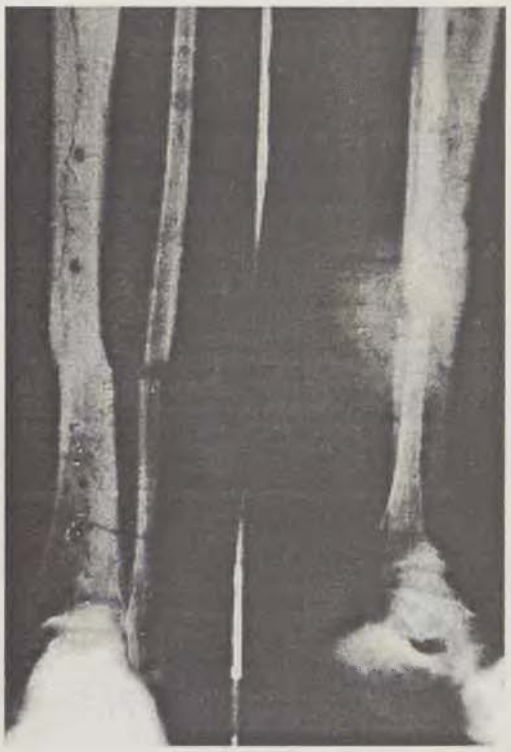

Fig. 5: Healed fracture of lower leg after removal of an external fixation.

res of tibia and fibula of the distal third of the leg and with a loss of soft tissues in the region of the fractures has been present (Fig. 1). The bones after shortening were stabilised by an external fixation (Fig. 2). The necessary necrectomy and fasciotomy have been performed. On the 21th day since the injury, the definitive treatment of the defect by means of a latissimus dorsi muscle free flap transfer was performed. The pedicle of the flap was connected with a tibial posterior bundle. Further healing was uncomplicated (Figs. 3, 4), and the patient's soft tissues healed during three weeks postoperatively. After tree months, the external fixation has been removed (Fig. 5).

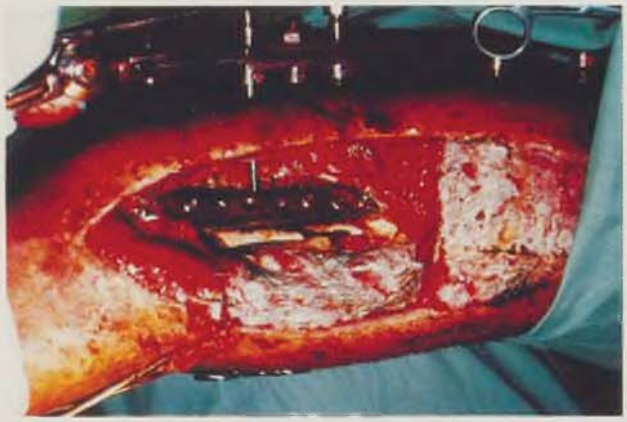

Fig. 6: Extensive soft tissue defect of lateral part of the thigh exposing fragments of the femur and plate with screws.

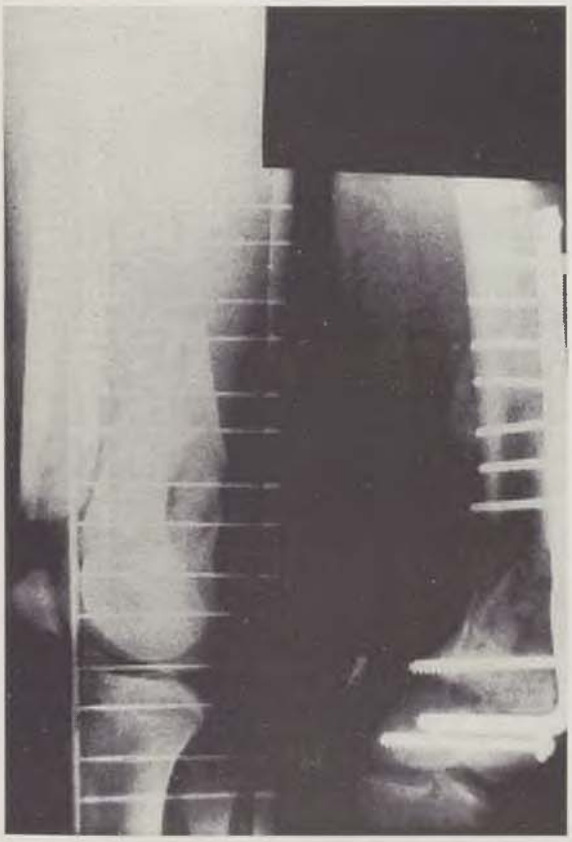

Fig. 7: Radiographs before and after the stabilization of the fracture.

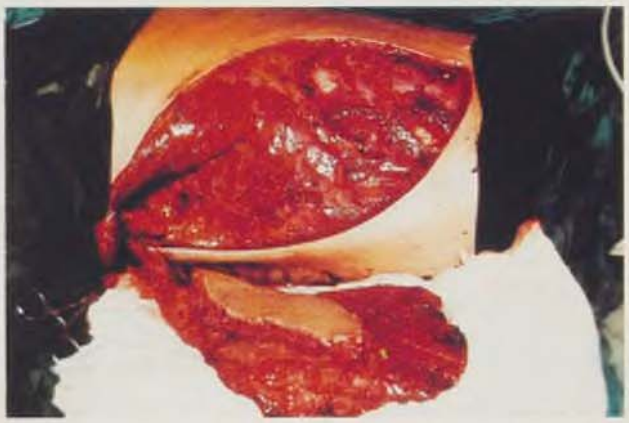

Fig. 8: Harvested free latissimus dorsi flap.

Fig. 9: Popliteal artery and vein prepared as recipient vessels.

Fig. 10: Status after performed end to side anastomoses of recipient and pedicle vessels.

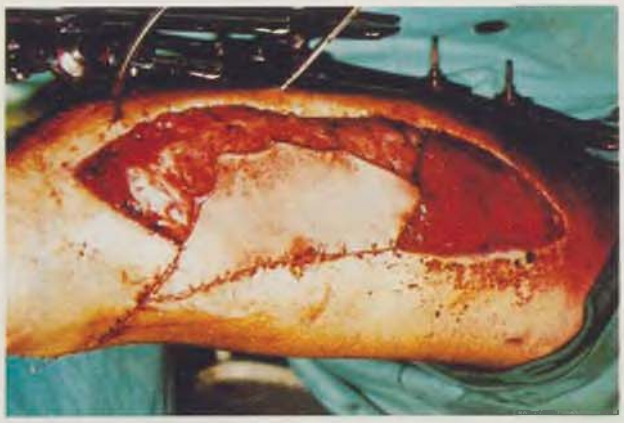

Fig. 11: Free latissimus dorsi free flap placed in the defect of the lateral part of the thigh.

Fig. 12: A good closure of the defect enabled a subsequent spongioplasty. A healed thigh after removal of external fixation.

Patient P. K. aged 18 years, while working at a car repair workshop on a high platform vehicle, suffered a devastating injury of the left thigh. A comminutive fracture in the distal third of the femur with a vast defect of soft tissue exposing the bone and the osteosynthetic material the lateral side of the thigh was present (Fig. 6). The fracture has been primary treated by an A.O. internal osteosynthesis (Fig. 7). This stabilisation was supplemented by means of an external fixation. On the 14th day since the injury, the patient was transferred to our department, and on the 16th day since the injury the defect of the lateral thigh was covered by means of a free latissimus dorsi flap transfer (Fig. 8) with connection of the vessels of the pedicle end to side to the popliteal artery and vein (Figs. 9, 10). Further healing of soft tissues was uncomplicated (Fig. 11). A good closure of the defect enabled a subsequent spongioplasty. After healing of the bone, the patient begun gradually to load the lower extremity (Fig. 12).

CONCLUSIONS

The prognosis of the 3rd degree fractures in the region of the lower extremities used to be absolutely dependent on the status of the soft tissues. The feasibility of the free tissue transfer brings about the fundamental change into the treatment of those injuries, and makes it possible to adopt, at the primary treatment of these injuries an active and aggressive approach. The author's experience, in accordance with experience published by others, show that not only the emergency free flap transfer but also early covering of the 3rd degree fractures defects, makes the prognosis in those serious cases extensively more promising.

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ACTA CHIRURGIAE PLASTICAE 36, 1, 1994, pp. 15-18

TEN YEARS OF REPLANTATION SURGERY AT THE DEPARTMENT OF PLASTIC SURGERY, CHARLES UNIVERSITY HOSPITAL, PRAGUE

J. Kletenský, A. Nejedlý, Z. Pros, S. Svoboda, M. Tvrdek

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SUMMARY

The authors present results of the ten years replantation surgery centre at the department of plastic surgery in Prague. The presented series of patients includes 393 persons operated on because of amputation or ischaemic injury to the region of the upper extremity. The number of replantations and revascularisations in the individual years is analysed, as well as the age of the patients, type of injury, mechanism of injury and operation results.

ZUSAMMENFASSUNG

Zehn Jahre der Replantationschirurgie an der Klinik für Plastische Chirurgie des Fakultätskrankenhauses in den Königlichen Weinbergen in Prag

J. Kletenský, A. Nejedlý, Z. Pros, S. Svoboda, M. Tvrdek

Die Autoren berichten über die Ergebnisse der zehnjährigen Tätigkeit auf dem Gebiet der Replantationschirurgie an der Klinik für Plastische Chirurgie in Prag. Das präsentierte Krankengut umfasst insgesamt 393 Patienten, die wegen Amputationen oder ischämischen Läsionen im Bereich der oberen Extremitäten operiert wurden. Es wurde eine Analyse des Anteiles der Replantationen und der Revaskularisationen in einzelnen Jahren, des Lebensalters der Kranken, des Types und des Mechanismus der Verletzungen und der Ergebnisse der Operationen, durchgeführt.

Key words: neurovascular microsurgery, replantation and revascularisation, upper extremity injury

One of the important fields constituting the contents of plastic surgery is undoubtedly neurovascular microsurgery. The range of surgeries requiring mastership of microsurgical technic in this field includes both planned operations and urgent ones, that cannot be planned. The most important urgent surgeries are replantations and revascularisations. The technical demands of replantations and revascularisations together with demands on the staff and technical equipment lead to concentration of these operations to replantation centres. There are two centres of this type in Czech republic. The region of Bohemia (region with 6 300 000 inhabitants) is served by the Department of Plastic Surgery in Prague, the region of Moravia (region with 4 033 000 inhabitants) by the Department of Plastic Surgery in Brno.

The Department of Plastic Surgery in Prague provides a continuous 24 hours replantation service since 1984. The group of patients treated in the past 10 years provides a good ground for consideration of the origin, possibilities of the treatment and treatment outcomes in injuries combined with amputation and ischaemia.

The group is formed by 393 patients. In 183 of them replantation of an acral part of the upper extremity was performed, in 210 patients the injury causing ischaemia required microsurgical vessel reconstruction (Fig. 1). The ratio of male and female patients shows a clear prevalence of men (Fig. 2). Amputation and ischaemic injuries usually affect persons of productive age. The youngest of our patients was one year old, the oldest one was 74 years old. The graph shows the age distribution (Fig. 3).

Apart from injuries indicated for microsurgical reconstruction, people with injuries where reconstruction is not possible, are sent to our centre as well. The ratio of these is quite considerable. This continuing situation is probably caused by several factors:

- a part of the patients comes on their own without any primary attendance,
- a part of the patients is sent on recommendation of a specialist other than surgeon,
- a considerable part is unfortunately formed by patiens who received primary treatment at a surgical ward and are sent without, or even after

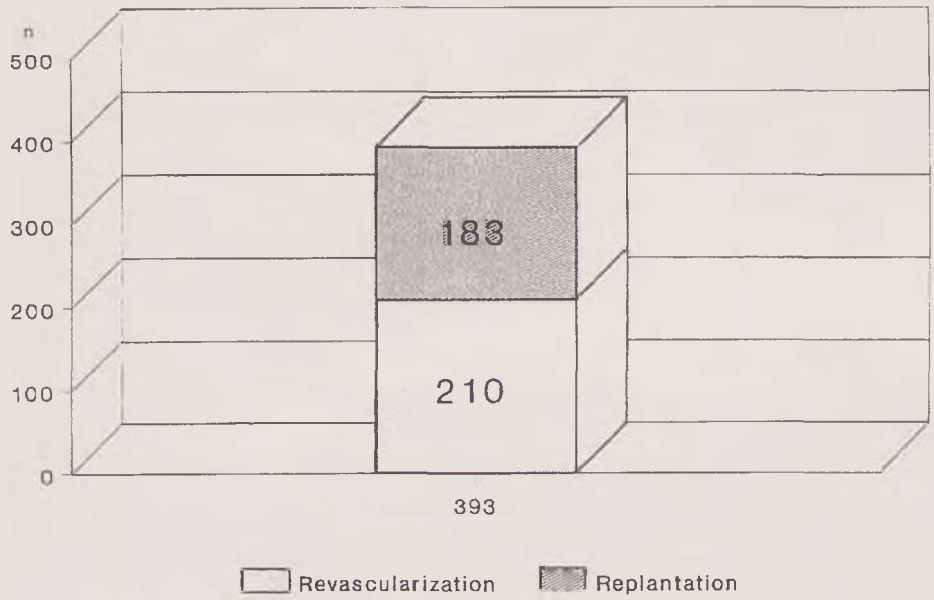


Fig. 1: Numbers of patients with replantation and revascularization, 1984-1993.

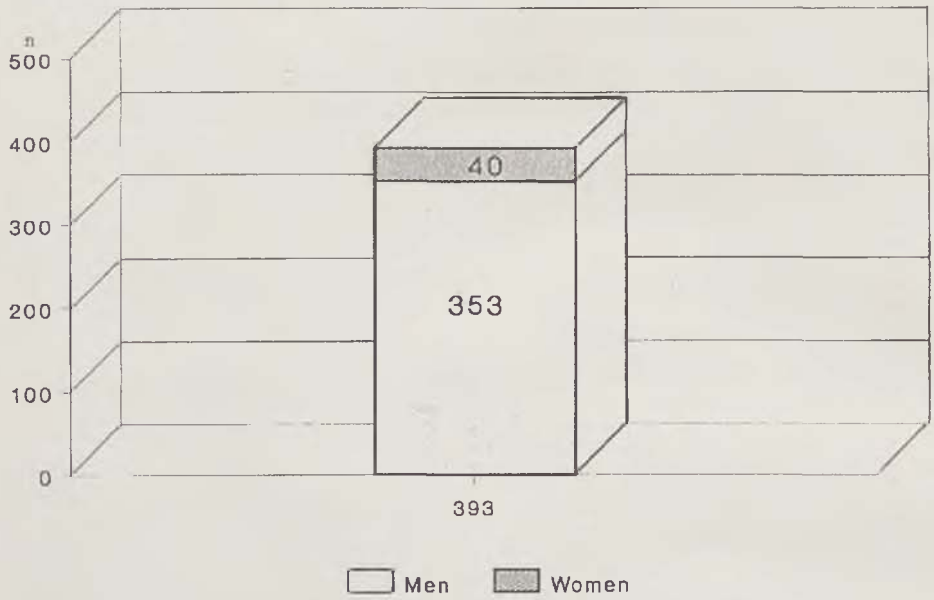


Fig. 2: Subdivision of patients according to sex.

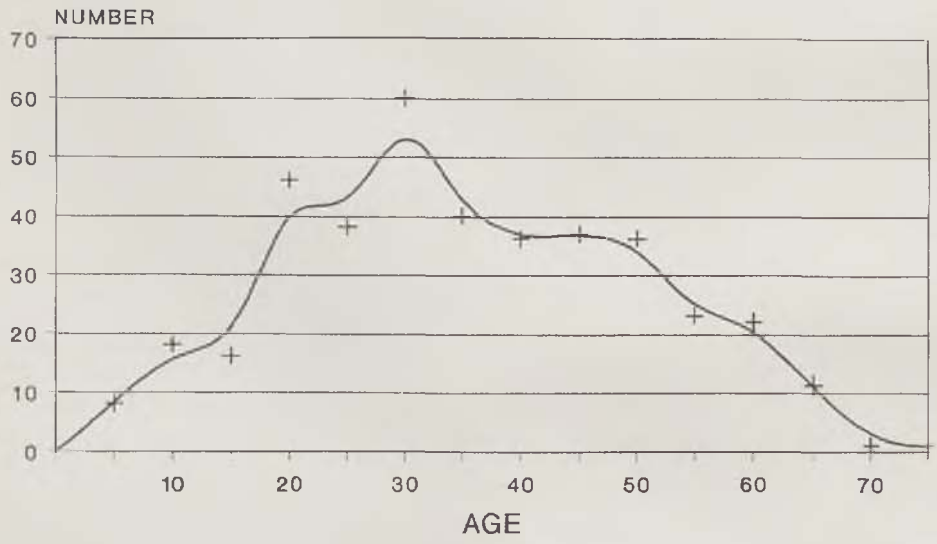
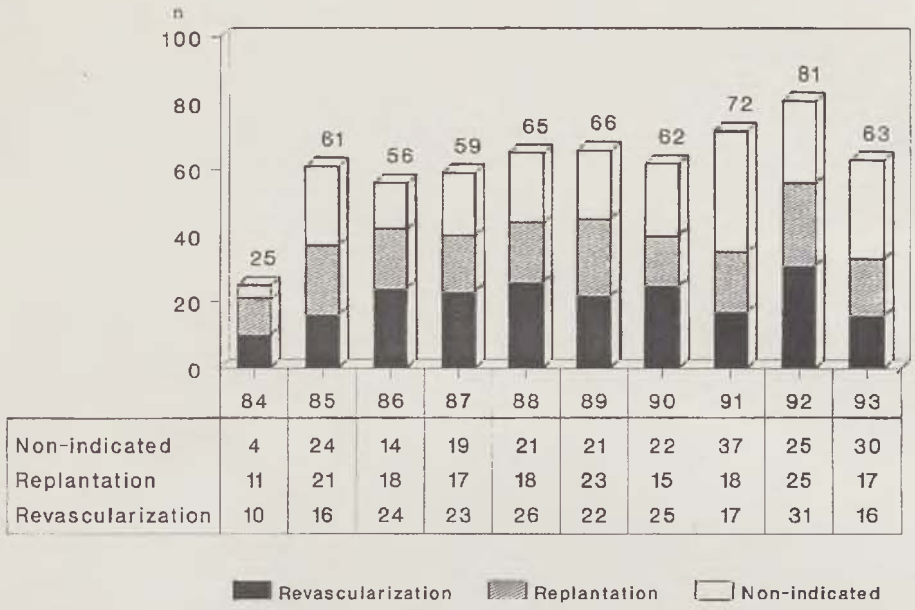


Fig. 3: Distribution of patients according to age.



	84	85	86	87	88	89	90	91	92	93
Non-indicated	4	24	14	19	21	21	22	37	25	30
Replantation	11	21	18	17	18	23	15	18	25	17
Revascularization	10	16	24	23	26	22	25	17	31	16

Fig. 4: Replantations and revascularizations in individual years 1984-1993.

a phone consultation with our centre, where the interpretation of the local and sometimes even of the general condition of the patient does not correspond with reality. In peripheral injuries an unconsidered transport may mean unnecessary generalised stress to the patient both from the medical point of view and from the economic one. An injury of higher levels, or in patients with other complications may a non-indicated transport present a serious risk. The ratio of patients indicated for replantation or revascularisation and of the non-indicated ones is shown in Fig. 4 for each year. The average number of replantations and revascularisations is about 40 per year. We have no clear explanation for the disproportions in the past years. There is a disproportion between the frequency with which single surgical wards send patients for replantations and revascularisations and between number of inhabitans living in the district of these wards. The question remains if this disproportion can be explained solely by frequency of injuries in the separate districts.

The injuries may be ranked by the level of approximate amputation or injury line. The authors have used a simplified classification. In the group of replantations (Tab. 1) amputations of the thumb and of individual fingers prevail. Proceeding centrally, the number of amputations decreases. The situation is reversed in revascularisations. Neurovascular reconstruction of higher levels are carried out in a significantly higher number of patients.

Considering the mechanism of the injury, the ratio of professional and non-professional accidents is worth noticing, the latter ones being more than twice as frequent as professional accidents. The most frequent form of ischaemic and amputation injuries indicated for reconstruction are the non-professional accidents by circular saw (Tab. 2).

Table 1. Subdivision of injuries according to its localisation

	REPLANTATION (n)	REVASCULARIZATION (n)
Thumb	65	41
Single digit	62	12
Multiple digits	25	12
Metacarpal level	22	46
Wrist	6	22
Forearm, arm	3	30
Total	183	210

Table 2. Mechanism of injury

PROFESSIONAL INJURY	(n)	%	NON-PROFESSIONAL INJURY	(n)	%
Circular saw	44	11.2	Circular saw	172	43.8
Hydraulic scissors	16	4.1	Axe	40	10.2
Band saw	6	1.5	Glass	32	8.1
Drilling machine	5	1.3	Knife	9	2.3
Lathe	4	1.0	Lawn cutting machine	6	1.5
Others	37	9.4	Others	22	5.6
Total	112	28.5		281	71.5

The criterion of success of microsurgical reconstructions is usually considered to be the survival of the reperfused acral part. In our group, the general success is 85 percent, in replantations itselves it is 74.9 percent and 93.8 percent in revascularisations. Closer look at successfullness of single groups is shown in Table 3 and Table 4.

Table 3. Healing rate - replantation

	SURGERIES (n)	HEALED (n)	%
Thumb	65	46	70.8
Single digit	62	44	71.0
Multiple digits	25	16	64.0
Metacarpal level	22	22	100.0
Wrist	6	6	100.0
Forearm, arm	3	3	100.0
Total	183	137	74.9

Table 4. Healing rate - revascularization

	SURGERIES (n)	HEALED (n)	%
Thumb	41	37	90.2
Single digit	59	52	88.1
Multiple digits	12	12	100.0
Metacarpal level	46	44	95.0
Wrist	22	22	100.0
Forearm, arm	30	30	100.0
Total	210	197	93.8

The authors are aware of the deceptiveness of similar statistics though it is frequently used in the literature and even for testing the quality level of the replantation centres. It is well known, that in spite of generally formulated and well known indications schemes it is very difficult to present statistically the variability of individual injuries and often borderline indication for reconstruction surgery. Another criterion of successfullness - the functional effect of the reconstruction - is not presented by this paper.

The frequency of upper extremity injuries within the range of a district with 6 300 000 of inhabitans is not reliably reflected by our statistics. Ischaemic and amputation injuries form certainly only a minor part of these injuries. It may only be expected and hoped for, that the majority of ischaemic and amputation injuries suitable for reconstruction are concentrated at our centre, even if this fact may be doubted. Ten years of experience of the replantation centre of the Department of Plastic Surgery show more or less similar numbers of patients operated during each year. In spite of general good information to the lay public and education aimed at prevention of accidents, more pronounced changes in the number and structure of our patients can hardly be expected in the future.

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USE OF FREE FLAPS IN BURN TRAUMA

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SUMMARY

The present currently used method of treating and reconstructing injuries caused by electric current and deep thermal injuries is compared with the method of early reconstruction using free flaps. Brief summary of present experience substantiating this method is presented.

The three presented clinical cases show subacute reconstruction in this type of injury by free flaps transfer.

ZUSAMMENFASSUNG

Anwendung von freien Lappen beim Trauma nach Verbrennung

M. Tvrdek, A. Nejedlý, J. Kletenský, Z. Pros, L. Brož

Ein Vergleich der heute üblichen Methoden der Behandlung und Rekonstruktion bei Verletzungen durch elektrischen Strom und von tiefen thermischen Verletzungen mit der Methode der Frührekonstruktion mittels freien Lappen. Eine kurze Zusammenfassung der bisherigen Erkenntnisse die eine Anwendung dieses Verfahrens berechtigen.

Anhand einiger klinischen Fälle erfolgt die Beschreibung der subakuten Rekonstruktion bei diesen Verletzungen mittels der Überpflanzung von freien Lappen.

Key words: electric and thermal burns, free flaps transfer

At present, the concept of progressive necrotisation of tissues damaged by electrical or in deep thermal injuries still prevails. The method of treating these injuries corresponds to this and consists in repeated rather conservative necrectomies aimed at preserving as much of the tissues as possible. As a result of this conception, the reconstructing surgeons refuse early covering of these defects.

Objections to this conception appear recently and are based both on clinical and experimental experience and several specialised centres treat these injuries by early radical excision of all devitalised tissues and subsequent reconstruction by a free flap.

Based on our collaboration with the burn centre, four similar subacute reconstructions in three patients were performed in course of the past nine months.

Two of the patients suffered an electrical injury and in one case a deep thermal injury was concerned. Ages of the patients were 13 - 32 years.

CLINICAL CASES

Case No. 1 (Figs. 1-3)

O. K., a 32-year-old man, suffered an electrical burn of the right side of the face and palm of the left hand when was repairing a washing maschine. Because of fibrilation he was first admitted to internal department and three days later to the burn centre. The skin defect on the site of current exit on his left arm was covered by a skin graft. Necrosis of the right frontal region involved the front wall of the frontal sinus. On the thirty ninth day from the injury, the patient was transferred to our department and the defect was reconstructed by a radial forearm flap. The vascular pedicle of the flap was anastomosed to the recipient superficial temporal vessels. Five months later, eyebrow reconstruction and correction of the inner canthus were performed.

Fig. 1: Defect in the frontal region after electrical burn with exposed frontal bone and open frontal sinus.

Fig. 2: Following final debridement of the wound.

Fig. 3: Six months follow-up when eyebrow reconstruction and inner canthus correction were performed.

Case No. 2 (Figs. 4-7)

S. Z., a 19-year-old woman, suffered a deep burn and laceration injury of the left forearm in a laminating press. Superficial defects on the dorsal side of the forearm were covered by skin grafts. The defect on the hand dorsum involved extensor tendons of the third and fourth fingers. On the thirty first day from the injury, this defect was covered by a free flap from a superficial temporal fascia and the defects of the tendons were reconstructed by grafts from the deep temporal

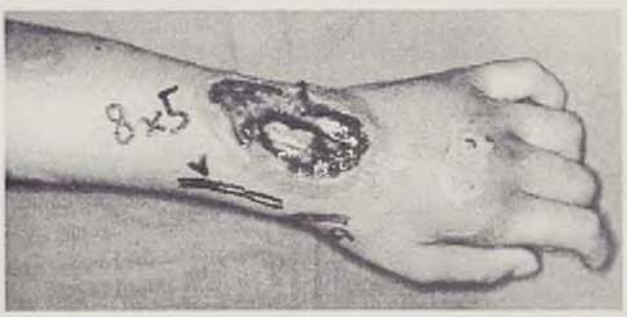

Fig. 4: Deep burn combined with laceration of dorsal side of the left hand. Defect of the extensor tendons of the third and fourth fingers.

Fig. 5: Flap elavation from the superficial temporal fascia.

Fig. 6: Flap from the superficial temporal fascia transferred to the defect. Extensor tendons of the third and fourth fingers reconstructed by grafts from the deep temporal fascia.

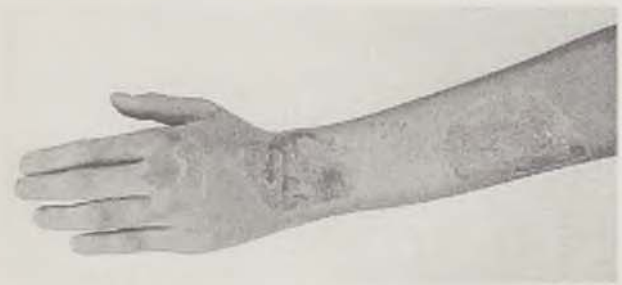

Fig. 7: Six weeks follow-up, good finger extension is evident.

fascia. The free fascial flap was skingrafted. After healing and subsequent rehabilitation, the range of motion of the fingers is normal.

Case No. 3 (Figs. 8-12)

J. D., a 13-year-old boy, suffered a high-voltage electrical burns when trying to throw a metal measuring tape over electric mains. The left upper and the right lower extremities were affected. The upper extremity was treated by fasciotomies including release of the carpal tunel. The defects on the arm were gradually covered by skin grafts. Necrotic tissue in the distal two thirds of the forearm were gradually removed preserving the deep flexor tendons, the long flexor of the thumb, the medial and the ulnar nerve. After admittance to our department on the sixteenth day after the accident, necrectomy on the forearm was completed and the tissue defect reconstructed by a free latissimus dorsi and serratus anterior flap with a common vascular pedicle. The pedicle was anastomosed to the rest of ulnar artery in the proximal part of the forearm, the artery was trombotised distally as well as the superficial venal system. Within the next few days trombosis occured in the radial artery and in the stump of the ulnar artery, causing necrotisation of the hand and of the muscular flaps and amputation in the proximal third of the forearm.

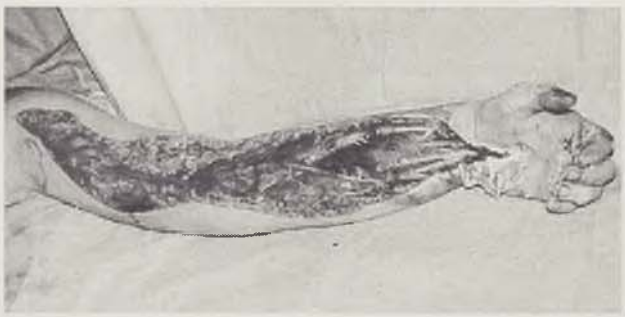

Fig. 8: Electrical burn. Fasciotomies including release of carpal tunnel.

Fig. 9: Fasciotomies on the dorsal side of the hand.

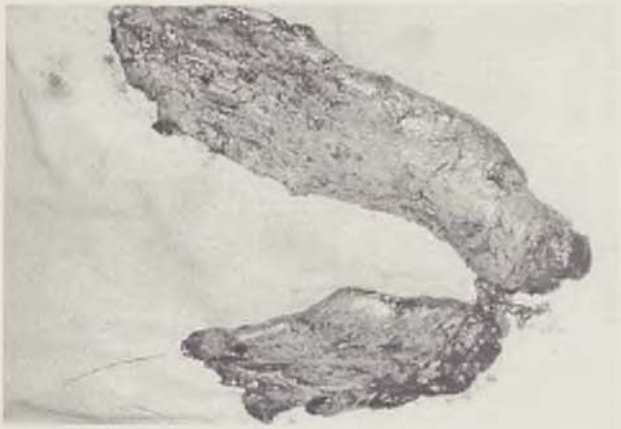

Fig. 10: Latissimus dorsi and serratus anterior flaps on a common vascular pedicle.

Fig. 11: The wound before ablation of neurotic muscular flaps and amputation in the proximal third of the forearm.

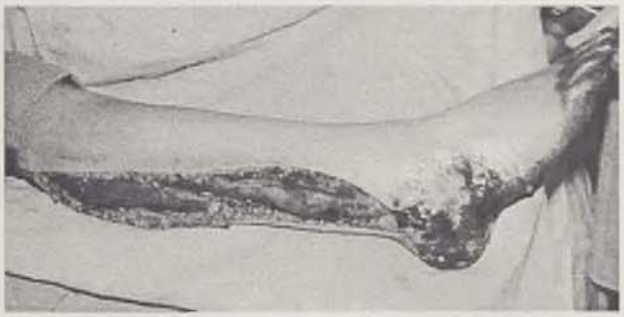

Fig. 12: Defect on the exit site under the right foot ankle and crural fasciotomy performed.

On the forty fourth day after the accident, the extensive defect on site of exit on the fibular side of the right leg was reconstructed by free latissimus dorsi flap; healing without any complications.

Fig. 13: Three weeks follow-up after reconstruction of the defect by free latissimus dorsi flap.

DISCUSSION

Clinical and experimental studies presented in specialised literature substantiate neither the original concept of progressive necrotisation of the tissues nor of the vascular damage. Repeated arteriographies of the same patients have shown that the initial damage to the vessels does not progress. Doubts were equally risen about progression of necrotisation of the muscle. The original impression of progression was believed to be caused by poor primary care including insufficient removal of all devitalised tissues.

Even if our cases are examples of rather subacute than of early treatment, our clinical experience is in agreement with the experience of other authors active in this field as stated above. The programme of early covering of defects after electrical and deep thermal injuries corresponds with the procedure used currently at our centre treating defects of other etiology, e.g. in the extremities. Our intention is to shift this type of treatment of electrical and deep thermal burns, in collaboration with the burn centre, to the first few days after the injury.

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ACTA CHIRURGIAE PLASTICAE 36, 1, 1994, pp. 24-25

VULVAR MALFORMATION - A CASE REPORT

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SUMMARY

A rare case of vulvar malformation due to lymphatic obstruction as a result of chronic, repeated infections is reported.

ZUSAMMENFASSUNG

Missbildung der Vulva - Kasuistik

G. P. Singh, G. Malhotra, A. Singh, K. J. S. Mander

Ein Fall einer Missbildung der Vulva, bedingt durch Obstruktion der lymphatischen Gefässe, infolge von chronischen wiederholten Infektionen, wird beschrieben.

Key words: vulva, labia minora, lymphedema

Just as there is lymphedema of male genital organs, there can be lymphedema of vulva in females. The cause of this condition is usually not similar to that of lymphedema in male genital organs. Bunkis and Wolfort (1981) had reported a case of vulvar malformation due to cavernous lymphatic malformation.

CASE REPORT

An 18 years old girl reported to our unit with enlargement of labia minora of two years duration. It started with itching in the genital region. Patient attended the dermatology department for six months. The labia minora started gradually increasing to the present size. She was mentally upset as it posed psychological problem and personnel hygiene was difficult. Physical examination under anaesthesia revealed marked asymmetrical protrusion of labia minora. There was excess of tissue overlying the clitoris. There was ulceration at the junction of labia minora with vulva along with leukoplakia of labia minora (Fig. 1). Vaginal and uretheral openings were present at normal site. Secondary sex characters were well developed. She was investigated thoroughly and all her investigations, which included midnight blood samples for micro-filariae, peripheral smear for eosinophilia, VDRL, Barr bodies and hormonal profile, were found to be normal.

The operative procedure was done with the patient in lithotomy position. Labia minora were totally excised along with the vitiligenous patches (Fig. 2). Lining to the anterior and posterior forchettes was provided from the local tissues and clitoris was reconstructed (Fig. 3).

Microscopic examination revealed subepidermal stromal oedema, lymphedema, congestion, infiltration by inflammatory cells consisting mainly of lymphocytes, plasma cells and very few eosinophills along with focal collection of cells.

Fig. 1: Preoperative photograph showing vulvar hypertrophy.

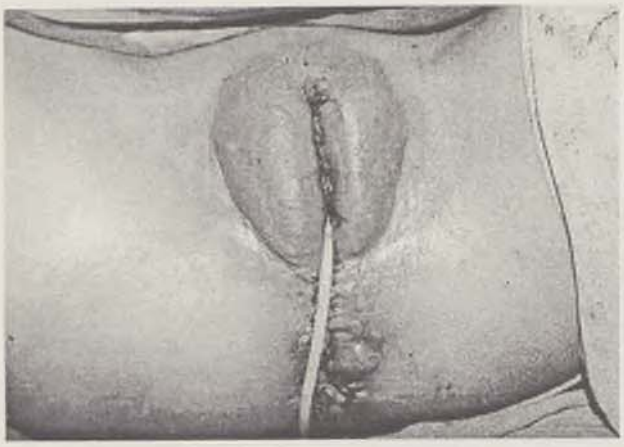

Fig. 2: Immediate postoperative photograph showing excised labia minora and reconstructed clitoris.

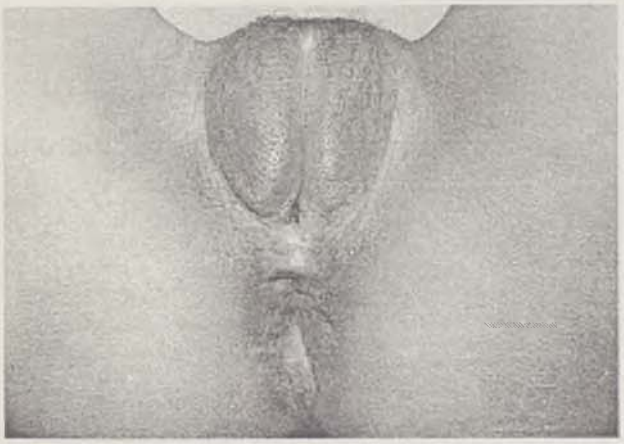

Fig. 3: Late postoperative photograph showing the final outcome.

DISCUSSION

The hypertrophy of the vulvar structures is due to interference with lymphatic, venous return and chronic inflammatory processes. The various causes of the lymphedema of the vulva are as such, repeated and chronic infections, syphilis, filariasis, leprosy, congenital etc. But the most important cause is idiopathic (McCarthy, 1990). In this case the history is suggestive that repeated infections due to itching led to the obstruction of the lymphatic drainage of the vulva which finally led to this malformation. Other endocrinopathies present with systemic symptoms (Novak and Woodruff, 1979) and congenital lymphedema presents at an early age (Tindall, 1987). Repeated examinations of nocturnal peripheral smears were found to be negative for microfilariae and it is suggestive that the cause of vulvar malformation was chronic repeated infection or idiopathic. Bunkis and Wolfort (1981) have reported a case of vulvar malformation due to lymphangioma. Goel (1986) has reported 29 cases of elephantiasis of male genitalia. No female has been reported in his series.

Khanna (1970) has also reported a series of 28 cases of elephantiasis of male genitalia and there was no female case reported in his series.

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RELATION BETWEEN LINGUAL NERVE, SUBMANDIBULAR GLAND DUCT AND MANDIBULAR BODY IN THE SUBLINGUAL SPACE

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SUMMARY

It was shown that the crossing of the duct of the submandibular gland and of the lingual nerve appeared constantly in the close vicinity of the upper surface of the posterior portion of the mylohyoid muscle closely to the inner surface of the mandible within the range of the third permanent molar. In the lateral view the nerve/duct crossing is projected on the external mandibular surface distally from the retrotrigonal triangle into the rounded region where the mandibular body and mandibular branch are fused.

ZUSAMMENFASSUNG

Beziehungen zwischen dem lingualen Nerv dem submandibularen Ductus und dem mandibularen Körper in der sublingualen Gegend

I. Klepáček, R. Škulec

Es wurde gezeigt daß die Überkreuzung des Ductus der submandibularen Drüse mit dem lingualen Nerv sich regelmassig in dichter Nähe der oberen Oberfläche des hinteren Teiles des M. mylohyoideus in der Nähe der inneren Oberfläche des Unterkiefers in der Gegend des dritten permanenten Molars. In lateraler Projektion lag die Überkreuzung Nerv/Ductus an der äusseren Oberfläche des Unterkiefers, in distaler Richtung von dem retrotrigonalen Dreieck in die rundförmige Gegend der Fusion des mandibularen Körpers mit dem mandibularen Ast.

Key words: submandibular gland duct, lingual nerve, crossing

Our investigations showed that the deep dissection of sublingual space from the submandibular region changed the topographic relations between the submandibular gland duct and the lingual nerve (Fig. 1). Therefore, the relationships of both structures to the surrounding tissues was described differently in modern textbooks and atlases (e.g. Sobotta, 1983; McMinn and Hutchings, 1988; Rohen and Yokochi, 1988; Williams and Warwick, 1989).

In our study the relation of the crossing of the nerve with the duct towards the mandible was

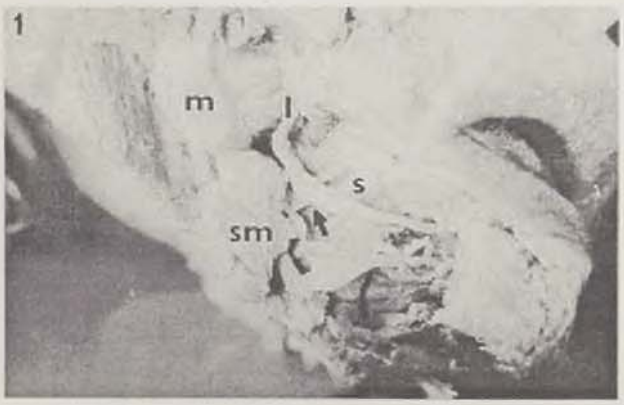

Fig. 1: Deep dissection of the lingual nerve (l) and of the submandibular duct (s) in the sublingual space. The portion of mandible (m) has been removed to display the nerve/duct crossing (arrow). The submandibular gland is displaced in caudal direction.

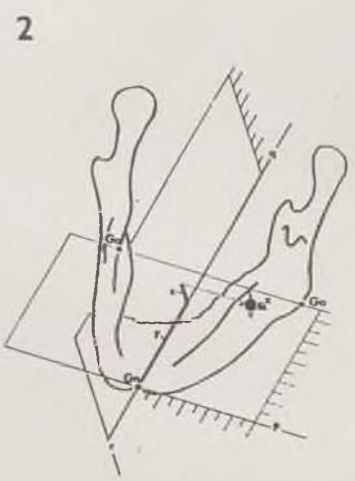

Fig. 2: Scheme of a 3-dimensional system for the determination of the nerve/duct crossing in the sublingual space. The three lines (p, q, r) running parallel with anatomical planes pass through the Gnathion (Gn) and Gonion (Go) points. The abscissae (x, y, z) illustrate observed distances.

examined in constant lateral view (as exhibited on X-ray films oriented according to the Reid's horizontal line) and the projection of the nerve/duct crossing on the external mandibular surface was described with the use of a 3-dimensional system represented by three lines p, q, r, crossing the anthropometric points on the mandible (Fig. 2).

Nine toothless and three toothed heads (both the right and left sides) were dissected. The abscissae x, y, z found on the p, q, r lines were measured.

The nerve/duct crossing appeared constantly in the vicinity of the upper surface of the posterior portion of the mylohyoid muscle closely to the inner surface of the apex of the third lower molar socket. The mean distance of the nerve/duct crossing was 9 mm from the inner surface of the mandible within the range of the third permanent molars (z), 42 mm from the Gnathion point (y) and 8 mm from the lower mandibular margine (x). Relevant differences between the right and left localization were not observed. In the lateral view the nerve/duct crossing is projected on the external mandibular surface distally from the retrotrigonal triangle into the rounded region where the mandibular body and mandibular branch are fused (Fig. 3). Irrespective of reduction of the lateral molar sockets in a toothless mandible, the nerve/duct crossing is not projected on the upper mandibular margine (Fig. 3). The described findings can be used in oral surgery, especially during osteoplastic procedures performed in the area of the third lower molar.

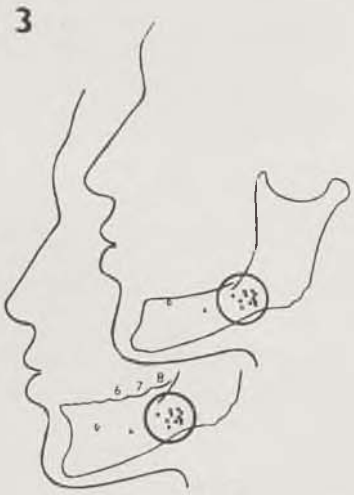

Fig. 3: Projection of the nerve/duct crossing (black points) on the external mandibular surface. The upper scheme illustrates the situation in a toothless mandible, the lower scheme illustrates the situation in a toothed mandible.

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Congress Secretariat:

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VII. Supportive care in bone marrow transplantation
VIII. Psychological support, quality of life, nursing

LANGUAGE: English

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Resümees in Englisch: vorhanden

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ACTA CHIRURGIAE PLASTICAE

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Announcements:

4th INTERNATIONAL MUSCLE SYMPOSIUM

4th International Muscle Symposium takes place on March 23rd - 25th, 1995 in Zurich, Switzerland.

Topics of the scientific program:

- Basic and experimental research on muscle transplantation.
- Factors with influence on regeneration.
- Morphology and choice of muscle transplants.
- Neurotization of the muscle.
- Neuromuscular recontructions in the paralyzed face.
- Functional muscle transplantation in extremities.
- Reconstruction of sphincter muscle function.
- Functional electrostimulation of muscles.
- Documentation of muscular function and evaluation of functional results.
- New indications for functional muscle transplantation.
- Free papers.

Language:

The official language of the Congress will be English.

Local organizing Committee:

Chairman: Manfred Frey, M.D.
Secretary: Pietro Giovanoli, M.D.

Congress Secretariat:

Pietro Giovanoli, M.D.
Division of Hand-, Plastic and Reconstructive Surgery
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Rämistrasse 100
CH-8091 Zurich, Switzerland
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International Symposium under the auspices of the Multinational Association of Supportive Care in Cancer

SUPPORTIVE CARE IN HEMATOLOGICAL ONCOLOGY

September 28 - October 1, 1994, PRAGUE, Czech Republic

The Symposium will consist of 8 sessions with invited lectures and corresponding poster sessions. The following topics have been selected:

I. Infections in immunocompromized hosts
II. The role of cytokines in supportive care
III. Blood coagulation disorders in cancer patients
IV. Problems of nutrition in cancer patients
V. Care in pediatric hematology and oncology
VI. Chemotherapy side effects and management of pain
VII. Supportive care in bone marrow transplantation
VIII. Psychological support, quality of life, nursing

LANGUAGE: English

SYMPOSIUM SECRETARIAT:

Supportive Care in Hematological Oncology
Czech Medical Association J.E.Purkyně
P.O.Box 88, Sokolská 31
120 26 Prague 2, Czech Republic
Tel.: +422 / 29 68 89, 29 72 71, fax: +422 / 29 46 10, 24 21 68 36

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No. 2, 1994

CONTENTS

SCOPE AND LIMITATIONS

Acta Chirurgiae Plasticae is an international journal with a long-standing tradition respected by the professional public worldwide. It is published in English four times per year. The journal contains clinical, experimental and theoretic studies from the discipline of plastic, reconstructive and aesthetic surgery, surgery of the hand, craniofacial surgery, treatment of burns and allied surgical disciplines (traumatology, orthopaedics, gynaecology etc.). In the journal you will also find reviews, case-histories, innovations, comments, reports from study trips and congresses, reviews of books and various announcements.

ACTA CHIRURGIAE PLASTICAE

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