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THE HEMITHIGH MICROVASCULAR TRANSFER (COMBINED ANTEROLATERAL THIGH FLAP AND TENSOR FASCIAE LATAE FLAP) FOR A FULL THICKNESS ABDOMINAL WALL RECONSTRUCTION: A CASE REPORT

Cunha-Gomes D., Choudhari C., Bhathena H. M., Kavarana N. M.

Department of Plastic & Reconstructive Surgery, Tata Memorial Hospital, Mumbai, India

SUMMARY

In large, full thickness upper abdominal wall defects a free microvascular tissue transfer is the only option which will enable reconstruction of the structural integrity of the abdominal wall as well as give a good aesthetic appearance.

We present a case in which such a defect was reconstructed by a 29 x 19 cm hemithigh free flap, combining the adjacent vascular territories of the anterolateral thigh flap and the tensor fasciae latae flap based on the lateral circumflex femoral artery.

ZUSAMMENFASSUNG

Die mikrovaskulare Übertragung des hemifemoralen Lappens für die Rekonstruktion der Bauchwand in der vollen Stärke

Cunha-Gomes D., Choudhari C., Bhathena H. M., Kavarana N. M.

Bel den breiten und den die voile Stärke betroffenen Defekten der oberen Bauchwände ist die freie Übertragung des mikrovaskularen Gewebes die einzige Wahl, die fähig ist, die strukturelle Integrität der Bauchwand zu rekonstruieren und zugleich ein gutes ästhetisches Aussehen zu erreichen.

Wir liegen einen Fall vor, der wurde rekonstruiert mithilfe des 29x19 cm großen hemifemoralen freien Lappen kombiniert mit Adergebieten des anterolateralen Schenkellappens und des Lappens Tensor Fasciae latae im Laufe der femoralen Arterie.

Key words: hemithigh free flap, anterolateral thigh flap, tensor fascia latae flap

CASE DETAILS

A 30 year old manual labourer presented with a large recurrent low grade spindle cell tumor situated in the upper anterior abdominal wall (Fig. 1).

He underwent partial thickness surgical excision of the abdominal wall on 2 previous occasions which were reconstructed by skin grafts. A CT scan indicated that the recurrent tumor was within the anterior abdominal wall, involving neither any intra-abdominal structure nor the ribs.

A doppler study of the Lt. thigh was done to identify the cutaneous perforator of the anterolateral thigh flap. In view of the size of the defect and the occupation of the patient a hemithigh free flap (combined anterolateral thigh flap and tensor fasciae latae flap) was chosen for reconstruction.

After a wide excision of the tumor, the defect was measured to be 29 x 19 cm (Fig. 2). The omentum was spread over the defect and sutured to the cut edges of the peritoneum. Over this, a marlex mesh was sutured to the cut edges of the muscles of the anterior abdominal wall.

A flap of similar dimensions as that of the defect was marked on the Lt. thigh extending over the anterolateral, lateral and posteriolateral areas of the thigh. The anterolateral thigh flap was elevated with the deep fascia, its perforator was cored out of the vastus lateralis muscle, and the descending branch of the lateral circumflex femoral artery was dissected. The tensor fasciae latae flap was raised together with it. Its vascular pedicle, the transverse branch of the lateral circumflex femoral artery, was dissected to its origin. The vessels of the two flaps originate from the lateral circumflex femoral artery (Fig. 3).

Fig. 1. Preoperative: A large recurrent abdominal tumor.

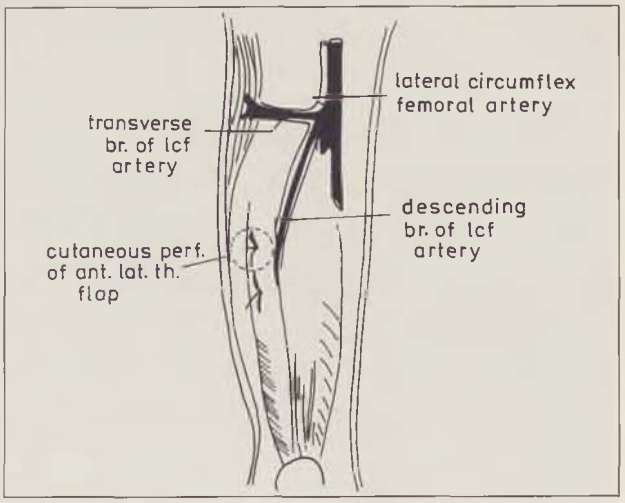

Fig. 3. A line diagram to illustrate the vascular pattern of the flap.

The deep inferior epigastric artery and vein and the rerouted saphenous vein were prepared as donor vessels. The flap was disconnected from the thigh and sutured to the defect. The deep fascia of the thigh flap was sutured to the abdominal muscles in the periphery. The flap was then revascularized by anastomosing the lateral circumflex femoral artery to the deep inferior epigastric artery and the vena commitantes to the deep inferior epigastric vein and the saphenous vein.

Fig. 2. Full thickness defect produced on excision of the tumor.

Fig. 4. Postoperative: 4 months after surgery; apart from the functional integrity of the abdomen, a good aesthetic appearance is obtained.

The flap perfused well in the postoperative phase. The patient was started on orals on the 4th postoperative day. The postoperative photograph taken after 4 months shows a well-healed flap with a good cosmetic appearance (Fig. 4).

DISCUSSION

The primary goals in full thickness abdominal wall reconstruction are restoration of its functional integrity as well as its aesthetic appearance. These defects, especially if situated in the upper abdomen, cannot be covered by local flaps in a single stage. A microvascular transfer is the only solution, whether it is a muscle, myocutaneous or a fasciocutaneous free transfer.

In this case, we used a hemithigh free flap (combined anterolateral thigh flap and tensor fasciae latae flap). This was done to augment the vascularity of the large fasciomyocutaneous flap.

Sasaki et al. reported 4 cases reconstructed by this method (1). They did not use a marlex mesh with their flap but instead coapted the motor nerve of the tensor fasciae latae muscle to an intercostal nerve. Apart from this, the technique used in this case was much the same. In our opinion the marlex mesh helps in abdominal support especially till the fasciae latae adheres to the muscle fringe and is reinnervated through its motor nerve.

The anatomy of the branches of the lateral circumflex femoral artery is inconsistent. The transverse and descending branches may originate from the bifurcation of the lateral circumflex femoral artery in 44 % of patients. The descending branch originates from the profunda femoris vessel and the transverse branch develops from the termination of the lateral circumflex femoral artery in 42 % of patients. The 2 branches originate directly from the femoral artery in 14 % of individuals (2).

Song et al. described the anterolateral thigh flap as a microvascular transfer (2). Much has been written about the nutrient vessel of the flap which courses from the descending branch of the lateral circumflex femoral artery, through the septum between the rectus femoris and the vastus lateralis in the region of the mid thigh (2, 3). Three patterns of its vascular course have been identified, thereby classifying them into septocutaneous perforators, the vertically oriented musculocutaneous perforators and the horizontally oriented musculocutaneous perforators (4). Preoperative doppler assessment and marking of the cutaneous perforator of the anterolateral thigh flap is very helpful (5).

The donor vessels used in this case were the deep inferior epigastric artery and vein and the rerouted great saphenous vein. Another option, easily available in most cases, are the vessels coursing in the omentum.

The only other flap option for such a large defect is the free latissimus dorsi transfer either muscle with graft or myocutaneous free transfer. However the combined anterolateral thigh flap and tensor fasciae latae flap microvascular transfer scores over the latissimus dorsi transfer as it can be harvested simultaneously with excision of the tumor, thereby reducing the time of surgery. Secondly, the patient, a manual labourer, would have had a greater functional deficit if the latissimus dorsi muscle was utilized.

This case highlights the following:

1. A large, full thickness defect of the upper abdomen can be resurfaced in one stage.
2. Using a combined free anterolateral thigh flap and tensor fasciae latae flap the vascularity of the fasciocutaneous flap is improved.
3. The fascia lata and marlex mesh when sutured to normally innervated abdominal muscles reconstitute the functional integrity of the anterior abdominal wall.
4. A good aesthetic appearance of the abdomen results.
5. The donor site is situated over a covered area of the body and the donor site morbidity is not significant.

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Address for correspondence:

Dr. Dean Cunha-Gomes M. S., MCh
Flat 3, Skyscraper - A
Bhulabhai Desai Road
Breach Candy
Mumbai 400 026
INDIA

LETTER TO THE EDITOR: IMPORTANCE OF THE SHORT SAPHENOUS VEIN AS A VEIN GRAFT

Chaudhari C. M., Cunha-Gomes D., Bhatena H. M., Kavarana N. M.

Sir,

Re-exploration of microvascular free flap transfers often requires the use of vein grafts to lengthen the pedicle length after the refashioning of a failing anastomosis, so as to be tension-free. Veins available for the same may be harvested from various sites: the palmar aspect of the wrist, dorsum of the hand, dorsum of the foot and the great saphenous vein. An ideal vein graft should be anatomically constant, valveless, of matching diameter and wall thickness and with a minimal branching pattern. Veins from the palmar aspect of the wrist and the dorsum of the foot satisfy most of these characteristics. We find that patients who have been hospitalised for prolonged periods and have undergone multiple surgeries and frequent venepunctures have thrombosis or recanalisation of most of the superficial veins. A search for a vein graft in these patients is indeed a daunting task. It is in such situations that the short saphenous vein offers a good option.

We encountered such a situation when a microvascular free radial forearm flap done for an upper lip reconstruction following excision of a recurrent sqamous carcinoma required re-exploration and lengthening of the vessels. As the patient was being operated the third time and had received chemotherapy, his superficial veins were either thrombosed or recanalised making them unsuitable as a vein graft. The opposite hand was utilised for venous access, therefore we harvested the short saphenous vein and found it well suited for the purpose.

We propose that the short saphenous vein yields a near-ideal vein graft, it being anatomically constant with a predictable course and branching pattern. The wall thickness is suitable for interposition on the arterial side. The lumen remains constant over long segments. It is never at risk of being traumatised by puncture or canulation. It may be harvested along with a branch for revising and end-to-side anastomosis. A nerve graft of the sural nerve is available through the same incision. The scar is relatively inconspicuous.

We feel that in the above-mentioned category of patients, the short saphenous vein should be considered as a first choice when harvesting a vein graft for the above-mentioned reasons.

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Address for correspondence:

Dr. Chaudhari C. M.
Dept. of Plastic Surgery
Tata Memorial Hospital
Parel, Mumbai 400 012
INDIA

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TUMOR IMPLANTATION AT THE FLAP DONOR SITE: A CASE REPORT

Cunha-Gomes D., Prasad R., Bhathena H. M., Kavarana N. M.

Department of Plastic Surgery, TATA Memorial Hospital, Mumbai, India

SUMMARY

The genesis of cancer and its variable patterns of spread have been theorized and debated upon for decades. Recurrences, both local and metastatic, are dreaded by both the patient as well as the surgeon.

An interesting case of tumor implantation at the flap donor site was noted in a patient who underwent a primary flap reconstruction for cancer of the cheek. The details of the case and theories regarding tumor implantation have been enumerated in this report.

ZUSAMMENFASSUNG

Die Implantation der Geschwulst an die Stelle der Lappenentnahme

Cunha-Gomes D., Prasad R., Bhathena H. M., Kavarana N. M.

Jahrelang wird die Entstehung des Krebs und seine verschiedenen Verbreitungsmodelle diskutiert. Die Rezidiven sowohl lokalen als auch metastatischen erschrecken den Patienten und auch den Chirurgen. Wir notierten einen interessanten Fall der Implantation der Geschwulst an der Stelle der Lappenentnahme bei einem Patienten mit Gesichtskrebs, der sich der primären Rekonstruktion mithilfe dieses Lappens unterzogen hatte. Im diesen Bericht sind die Details dieses Falles und die Theorie dieser Implantation angeführt.

Key words: flap donor site, tumor implantation

Tumor implantation in the flap donor site occurs very infrequently for the number of cases undergoing primary reconstruction. In the past 12 months we have reconstructed over 250 patients using interpolated composite and microvascular tissue transfers. There has been only one patient who has developed tumor implantation at the flap donor site. The details of the case and existing theories regarding the mechanism of tumor implantation are cited.

CASE DETAILS

A 55-year-old male presented with a large squamous cell tumor of the Lt. buccal mucosa involving the skin. He underwent a hemimandibulectomy and composite resection of the tumor with a radical neck dissection. Primary reconstruction was carried out in the form of a pectoralis major myocutaneous flap for the lining defect and a deltopectoral flap for the skin defect. After 3 weeks the deltopectoral flap was divided and insetted. One month later, the patient was administered 60 Gy local irradiation to the head and neck region.

Fig. 1. Photograph of the patient who underwent a primary reconstruction with a pectoralis major myocutaneous flap and deltopectoral flap and developed a tumor implantation at the donor flap site.

He came for the first follow-up 4 months after radiotherapy due to economic reasons and the fact that he was residing in a village very far from Mumbai. He presented with a mass in the region of the clavicle and upper chest fixed to the underlying ribs (Fig. 1). A biopsy proved it to be a squamous cell carcinoma. There was no evidence of local recurrence in the oral cavity or in the neck. Distant organ metastasis was not evident either.

In view of the advanced state of the recurrent tumor at the flap donor site, the patient was advised to undergo chemotherapy and radiotherapy.

DISCUSSION

In a literature search, only 8 cases have been reported in which tumor implantation has occurred at the flap donor site. Ellison has reported 3 cases (1), Robbins 2 cases (2) and Kroll, Badellino and Mahaffey have reported one case each (3, 4, 5). This raises a number of questions as to the mechanism of tumor implantation and their validity.

Does implantation occur at the time of surgery or after reconstruction (7)? In other words, is tumor implantation at the base of the regional flap (in this case, the deltopectoral flap) the result of intraoperative seeding or later via the newly created lymphatic and vascular pathways (4)? The latter is more likely and can occur in several ways. It can occur via the deltopectoral flap pedicle while it is still attached to the face, or by direct infiltration of the pedicle, which is manifested when transferred back to the chest. Another mode could be the lympho-vascular pathways of the underlying pectoralis major flap pedicle.

If so, logically, apart from the chest recurrence a local recurrence should be manifested at the same time. It can be argued however, that local postoperative radiation may have taken care of the local recurrence.

Intraoperative seeding of the tumor and creation of new tissue planes have been attributed as the cause of this manner of tumor implantation. Arons, on the contrary, found no correlation between wound washing results and local or distant recurrence (6). Adequate precautions of a thorough wound wash and change of instruments and drapes after excision and before reconstruction are part of the surgical protocol followed at our institute.

There is a subset of patients who have bulky tumors, who undergo excision and primary reconstruction and later develop local recurrences at the flap - mucosal border. Inspite of there being lympho-vascular channels set up via a regional flap reconstruction (e.g. the pectoralis major musculo-vascular pedicle), we do not find tumor implantation a common occurrence.

Surgical stress, causing immunosuppression, has been reported to increase the chances of tumor implantation (3).

It is a relief to note that the incidence of tumor implantation is not significantly high. In light of this, primary reconstructions are justified (3). However, the cause of tumor implantation at the flap donor site and its appropriate prevention does leave some food for thought.

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Address for correspondence:

Dr. Dean Cunha-Gomes
Flat 3, Skyscraper - A
Breach Candy
Mumbai 400 026
India

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OUR EXPERIENCE WITH THE USE OF THE TEMPORAL MUSCLE IN FACIAL SURGERY

Kozák J.[1], *Voska P.*[2]

[1] Department of Maxillofacial Surgery, University Hospital Motol, 2nd Faculty of Medicine, Charles University, Prague, Czech Republic
[2] Central Military Hospital, Prague, Czech Republic

SUMMARY

The authors present their experience with the use of the temporal muscle in reconstruction of defects after exenteration of the orbit, palate, filling of the spaces after extirpation of extensive tumours in the infratemporal area and area of the anterior cranial fossa. They operated a total of 25 patients where they used part of the temporal muscle or the whole muscle. None of the operated patients, although two had a ligature of the external carotid artery, developed necrosis or inflammatory complications during incorporation of the transferred muscle. The procedure can be considered a reliable method in the reconstruction of the face and cranial base.

ZUSAMMENFASSUNG

Neue Erfahrungen mit Anwendung M. temporalis in der Gesichtschirurgie

Kozák J., Voska P.

Die Autoren beschreiben ihre Erfahrungen mit Anwendung M. temporalis bei der Rekonstruktion der Defekte nach der Exenteration der Augenhöhle, des Gaumens und der Ausfüllung des toten Gebietes nach der Exstirpation der ausgedehnten Tumoren im infratemporalen Gebiet und im Gebiet der vordere Schädelgrube. Wir haben insgesamt 25 Patienten operiert, bei denen wir einen Teil oder den ganzen M. temporalis angewandt haben. Bei keinem von den operierten Patienten, obwohl bei zwei von ihnen das Unterband a. carotis externa durchgeführt wurde, kam zur Nekrose oder zur entzüntbaren Komplikationen bei der Heilung des transponierten Muskels. Der muß für ein zuverlässiges Mittel bei der Gesichts- und Schädelbasisrekonstruktion gehalten werden.

Key words: temporal muscle, reconstruction, exenteration of the orbit, palatal defects, cranial base

The temporal muscle is a muscle with multiple uses in maxillofacial surgery. For the first time it was used by Golovin (9) in 1898 to fill the dead space after exenteration of the orbit, Rambo (14) used it in 1958 to cover a defect in the region of the middle ear and mastoid. Wise and Baker (8) used it in 1968 to support the circumference of the orbit after its surgical removal. Its multiple uses are demonstrated also by Freeman, 1988 (8), in reanimation of paretic faces. Reconstruction after orbitomaxillary resection was recommended by Bakamjian and Souther in 1975 (4). Already then with the aid of this muscle a palatal defect was closed. The temporal region comprises two vascular areas which permit the separate use of the temporoparietal fascial flap and temporal muscle. In the submitted paper we wish to discuss the use of the temporal muscle during reconstruction in the facial area and oral cavity.

The anatomy of the muscle is nowadays well known and was the subject of repeated anatomical studies. The muscle is deeper than the temporoparietal fascia and is separated from it by an indifferent avascular layer. The muscle has two broad insertions facing each other, on the temporal bone from the linea temporalis inferior to the infratemporal crest. The superficial insertion is one the deep temporal fascia. The muscle is inserted into a coronoid process and anterior portion of the condyloid process of the mandible.

According to Mathes and Nahai (12) the vascular supply is ensured by the deep temporal artery, the branch of the maxillary artery. This artery is divided into the anterior and posterior branch which supply the muscle. According to Nakajim (13) and others the vascular supply is ensured via the deep and middle temporal artery. The anterior part of the muscle is supplied by the anterior and posterior deep temporal artery. The posterior portion of the muscle is supplied by the muscular branch of the middle temporal artery, a branch of the superficial temporal artery (Fig. 1).

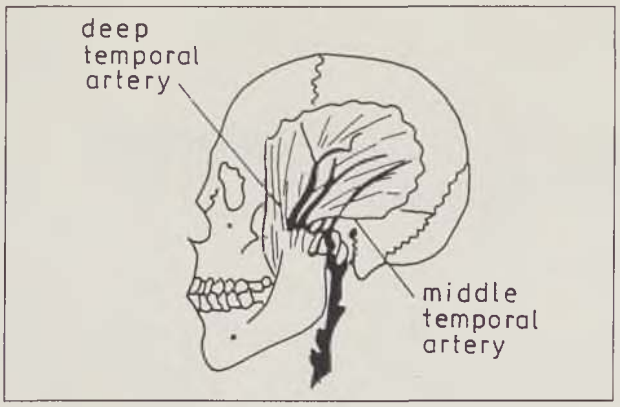


Fig. 1. Anatomical scheme of the arterial nutrition of the temporal muscle.

These deep and middle temporal arteries are in the lower part of the muscle and form a dense network extending as far as the temporal line. The muscle can be lifted and rotated into the defect near the orbit, area of the ear but also into the oral cavity and used for reconstruction of the palate, upper lip and oral floor.

MATERIAL AND METHODS

In our departments we operated between 1990 and 1998 25 patients. This number comprised 16 men and 9 women aged 4 to 65 years.

The preoperative diagnosis is presented in Table 1.

Table 1. Diagnoses before surgery - numbers

Injury	4
Osteoradionecrosis	1
Spinocellular carcinoma	3
Meningioma	3
Basocellular carcinoma	4
Fibrosarcoma	1
Ameloblastoma	2
Adenocystocarcinoma	2
Neurofibroma	5
Total	25

Primary reconstruction was implemented in 12 patients. In 17 patients only the anterior portion of the muscle was used, in six patients the whole muscle. In two patients the relatively thick muscle could be divided in a sagittal plane and only the external portion of the muscle with the fascia was used. In two patients we ligatured already during the primary reconstruction the external carotid artery without a negative impact on the results of reconstruction.

A flap was used for reconstruction after exenteration of the orbit in six patients, for filling dead spaces after removal of tumours in the area of the infratemporal fossa in six patients, to create barriers between the anterior and median cranial fossa and external environment in five instances. It was used for intraoral reconstruction in a palatal defect caused by injury in three patients, after oncological ablation operations with a palatal defect in three patients. In one female patient the palatal defect was reconstructed after osteoradionecrosis and in one male patient we reconstructed a defect of the upper lip after an injury. In seven cases of intraoral reconstruction the muscle was allowed to epithelize spontaneously.

Mobilization of the muscle depends on the position of the defect which is to be reconstructed. The muscle is accessible from a preauricular incision which is drawn out in a cranial direction. If the patient has a bicoronary incision, during elimination of a tumour in the area of the anterior cranial fossa, this incision is used. In any case the muscle is released from the zygomatic arch. If it is used for intraoral reconstruction in the area of the palate or upper lip, the zygomatic arch is cut and the muscle is carefully released from the coronoid process. The preparation must be careful to avoid damage of supplying arteries. In intraoral reconstructions the flap is rotated in a ventral direction. If the flap is drawn into the mouth, it is fixed and the zygomatic arch is returned and fixed by means of a wire, miniplate or PDS suture. When along with rotation of the flap adequate bulging occurs, it is not essential to return the bone and the symmetry in the area of the facial bone is preserved. A possible prolapse in the temporal area was resolved by mobilization of the posterior portion of the muscle and its shift in a ventral direction (17x), by implantation of a corium graft from the abdomen (2x) and by silicone implantation (4x). In two patients no adjustment was made.

RESULTS

In all operated patients the transferred flap was incorporated without any problem. In one patient we observed traumatization of the flap in the mouth by the opposite dental arch. In six instances where an external defect was covered by the flap the muscle was covered by a dermal skin graft which was incorporated without any problem. In flaps used to cover dead spaces after removal of tumours or creation of barriers between the intra- and extracranial environment we were unable to follow the vitality of flaps but none of these patients developed inflammatory changes suggesting necrosis of the flap and subsequent inflammatory changes. Flaps used for reconstruction in the oral cavity were left without a dermal cover and epithelization was completed within 4-5 weeks. None of the patients had problems when opening the mouth or during mastication. In three patients where a tumour was extirpated from the area of the cranial fossa and infratemporal fossa irreversible damage of the r. frontalis of the facial nerve occurred. The patients were followed up after different intervals depending

Fig. 2. Maxillary defects after osteoradionecrosis.

CASE-RECORDS

Case 1: A 63-year-old female patient treated on account of carcinoma of the nasal floor after repeated excisions and subsequent irradiation with a dose of 65 Gy. After a three-year interval she developed osteoradionecrosis of the irradiated alveolus and ventral part of the maxilla with multiple mucosal defects. Necrotic portions of the maxilla were removed, from preauricular sections the temporal muscles were mobilized. After osteotomy of both zygomatic arches the muscles were drawn after previous tunnelling into the mouth where they were fixed by stitches in the median line. The zygomatic arches were returned and fixed by a miniplate. The postoperative course was safeguarded by broad spectrum antibiotics and after four weeks there was complete epithelization of the transferred muscles. The defect in the area of the nasal floor was resolved by a shift of an-islet-like skin flap (Figs 2-5).

Fig. 3. Elevated temporal flap from left side.

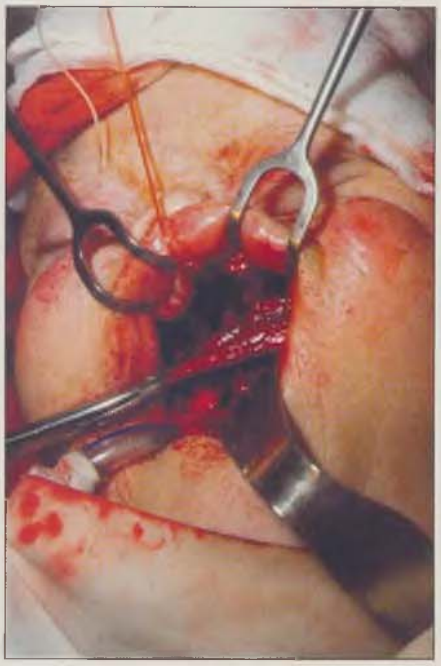


Fig. 4. Protraction of the flap into mouth.

Case 2: A 65-year-old man treated in another department on account of an adenocystic carcinoma of the orbit on the right side, where exenteration of the orbit was performed. After eight months he developed a relapse in the area of the external wall and top of the orbit. At the author's department a revision was performed associated with

Fig. 5. Condition after incorporation and epithelization of the flaps.

whether posttraumatic changes were involved or elimination of a tumour. In two patients with meningiomas and one patient with a basilioma a relapse of the basic disease occurred.

Fig. 6. CT after exenteration of right orbit and relapse of carcinoma.

Fig. 7. Condition after reoperation, mobilization of temporal muscle and its shift into the defect.

complete removal of the lateral wall and top of the orbit.

To cover the denuded dura mater the homolateral temporal muscle was mobilized which, after rotation, filled the cavity. Part of the muscle was covered on the outside by a free skin flap which was incorporated without any problems (Figs 6-8).

Case 3: A 35-year-old man with suicidal intention who shot himself in the face and suffered major losses of the facial skeleton and soft facial tissues as well as bilateral amaurosis.

The patients was subjected to several reconstruction operations. After closure of the defect which extended over the whole hard palate both temporal muscles were used, which were lifted from a bicoronary incision, were drawn after temporary severing of the zygomatic arches into the mouth and fixed by non-absorbable sutures. The postoperative course was without complications and after four weeks complete epithelization of the transferred muscles was recorded (Figs 9-11).

Fig. 8. Patient 10 days after operation with incorporated skin graft.

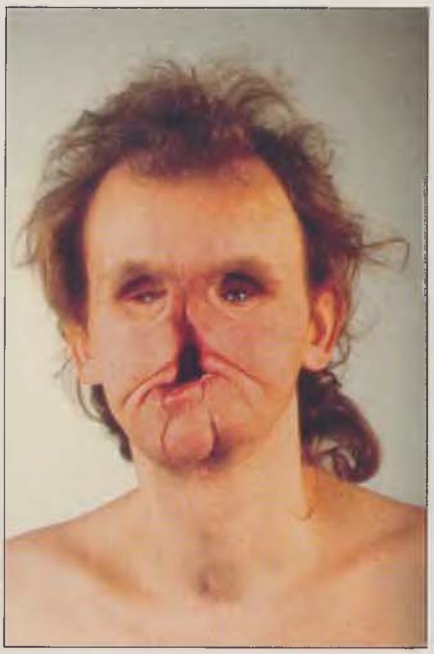
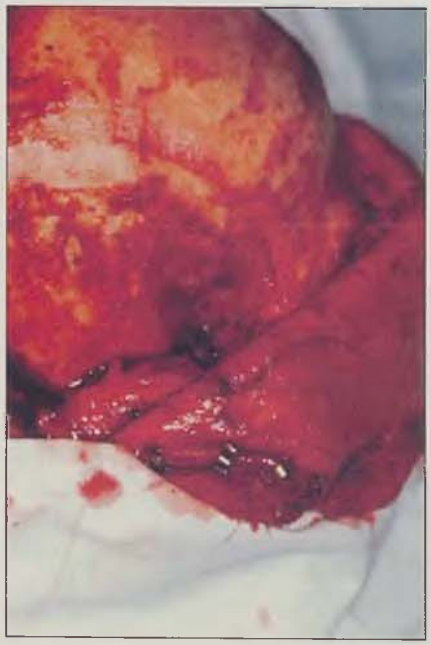
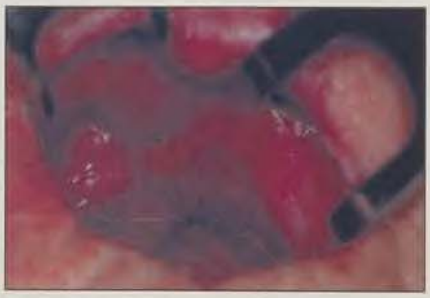


Fig. 9. Patient after gunshot injury of face, among others with a defect extending over the whole hard palate.





↑ Fig. 11. Condition four weeks after surgery with closure of defect and epithelization of muscle.

←
Fig. 10. Temporal muscles from bicoronary section drawn into mouth

DISCUSSION

In the submitted paper we demonstrated our experience with the use of the temporal muscle for reconstruction of defects of varying origin in the facial area and oral cavity. The muscle is able to ensure an adequate volume of well vascularized tissues which can be also innervated.

The flap is very useful for reconstructive surgery in the maxillofacial area and in particular for closing large maxillary defects (Wal, 17). The muscle can serve also for reconstruction of soft facial tissues (Serra, 15).

Muscle transfer has many advantages. Dissection of the muscle is relatively easy and no disfiguring scar or defect remains. The vascular supply of the muscle is despite rotation sufficient to preserve its vitality. However, the vascular stalks must not be damaged. In case of an aesthetic

reconstruction the temporal muscle can ensure a satisfactory symmetry by filling the defect of the cheek or upper lip (Wal, 16). Scars after this procedure are practically invisible as compared with other reconstructive procedures such as local, tubulized or free flaps. The transferred muscle has minimal signs of atrophy as compared with transferred adipose tissue, dermis or fasciae.

Reconstruction of palatal defects and other defects in the area of the oral cavity deserve special attention. Many authors confirm the possibility of transfer of vascularized muscle into the oral cavity without any cover and allowing it to epithelize. Annain and Yetman (2) provide evidence that epithelium formed on the transferred muscle was under the microscope difficult to differentiate from normal mucosa. All patients had a certain degree of fibrosis and muscle contracture. Wolff (19) draws attention to the fact that all muscles are epithelized by the mucosa and subject to a certain degree of atrophy. Cheung (7) reports complete epithelization of the muscle only after 6-8 weeks. In our patients these time intervals were shorter and varied between 4 and 5 weeks.

CONCLUSION

The temporal muscle is suited for reconstruction operations in the facial area. It has a very good vitality, even when the external carotid artery was ligatured, or even in case of its extreme rotation into the oral cavity. It is suitable for repair of soft tissue defects of the face, palate, lateral wall of the oral cavity or its floor. It is an excellent means to fill defects of the orbit after exenteration, for filling dead spaces after removal of tumours in the area of the infratemporal fossa and cranial base. When used in the oral cavity epithelization of the flap surface is very rapid and thus covering by a skin graft is not necessary.

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Address for correspondence:

Jiří Kozák
Vítězné nám. 14
160 00 Prague 6
Czech Republic

LÉKAŘSKÁ KNIHOVNA

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RECONSTRUCTION OF ELBOW FLEXION BY TRANSPOSITION OF PEDICLED LONG HEAD OF TRICEPS BRACHII MUSCLE

Haninec P.[1], *Szeder V.*[2]

[1] Department of Neurosurgery, Hospital Královské Vinohrady,
3rd Faculty of Medicine, Charles University, Prague, Czech Republic
[2] Department of Anatomy, 1st Faculty of Medicine, Charles University, Prague, Czech Republic

SUMMARY

A new technique of restored flexion in the elbow joint in an inveterate injury of the brachial plexus is described. The insertion of the long head of the triceps brachii muscle was transferred with an intact nervous and vascular supply to the anterior brachial region and sutured above the radial tuberosity with the insertion tendon of the biceps brachii muscle. The muscle strength three months after surgery according to the muscle test was 4-. Flexion in the elbow joint was possible up to 85°. Extension in the elbow joint was preserved, the muscle strength was 3. Anatomical investigation revealed that the mean length of the nerve of the long head of the triceps was 5.5 cm, the number of terminal branches was 3-4, 70 % of the vascular supply was from the brachial artery, the length of the vascular bundle was 3.6 cm. In 33 % there was an additional neurovascular hilus which was 2-3 cm distally from the main hilus. The investigation confirms that the neurovascular pedicle of the long head of the triceps brachii muscle is sufficiently mobile and damage by traction during transposition of the insertion tendon is therefore not likely. Transfer of the long head of the triceps brachii muscle in inveterate injuries of the brachial plexus is a suitable alternative for reconstruction of nerves or transfer of other muscles to restore flexion in the elbow joint.

ZUSAMMENFASSUNG

Die Rekonstruktion der Ellbogenflexion durch die Transposition des Stiellappens des langen Kopfes M. triceps brachii

Haninec P., Szeder V.

Die neue Technik der Rekonstruktion der Flexion im Ellbogengelenk wird anhand der alten Verletzung plexus brachialis beschrieben. Die Ranke des langen Kopfes m. triceps wurde mit der untakten Nerven- und Aderversorgung in die Regio brachii anterior übertragen und sie wurde über Tuberositas radii mit der Rankensehne m. biceps brachii zusammengenäht. Die Muskelstärke 3 Monate nach der Operation war dem Muskeltest nach 4-. Die Flexion im Ellbogengelenk war möglich bis 85°. Die Extension im Ellbogengelenk blieb erhalten, die Musklestärke war 3. Die anatomische Studie zeigte, daß die durchschnittliche Länge des Nerven des langen Kopfes Triceps 5,5 cm war, die Zahl der Endzweigen war 3-4, die Aderversorgung erfolgte zu 70 % aus dem a. brachialis und die Länge des Aderbündels war 3,6 cm. Zu 33 % war das zusätzliche nerven-aderliche Hilus erhalten, der 2-3 cm distal vom Haupthilus lokalisiert wurde. Die Studie bestätigt, daß der nerven-aderliche Stiel des langen Kopfes m. triceps genug mobil ist und seine Beschädigung durch den Zug im Laufe der Transposition der Rankensehne ist deswegen unwahrscheinlich. Die Übertragung des langen Kopfes m. triceps brachii bei alten Verletzungen plexus brachialis stellt eine geeignete Alternative zur Nervenrekonstruktion oder zur Übertragung anderer Muskein zur Erneurung der Flexion im Ellbogengelenk dar.

Key words: triceps brachii muscle, transposition, brachial plexus, palsy

Treatment of the paralyzed biceps brachii muscle can be approached in several ways. If the patient is seen in time - i.e. within cca one year in case of an infraclavicular injury of the brachial plexus, and within six months in avulsions of the roots of C5, C6 (Akasaka et al., 1991; Kline, 1991, 1995) -, it is possible either to suture the affected nerve or to implement reinnervation from other motor nerves (Narakas, 1981, 1988; Samardzic et al., 1992; Narakas and Bonnard, 1995; Haninec et al., 1989, 1997, 1998a,b). However, if the operation was not performed within this period or if a severe myogenic lesion of the biceps brachii muscle is involved, it is possible to transfer instead of the paralyzed biceps brachii muscle another muscle with preserved neuromuscular supply. The first to be described and applied was the technique of the proximal transfer of the flexors of the forearm (Steindler, 1918). Other possibilities include unipolar or bipolar transfer of the

latissimus dorsi muscle (Axer et al., 1973; Akasaka et al., 1991; Berger et al., 1994, 1997; Hirayama et al., 1994; Haninec and Smrčka, 1998), unipolar or bipolar transfer pectoralis major muscle (Holtman, 1975), transfer of the triceps brachii muscle (Bunnel, 1951; Carroll, 1952; Carroll and Hill, 1970; van Turnhout, 1997; Strafun, 1998), transfer of the sternocleidomastoideus muscle (Carrol, 1962) or pectoralis minor muscle (Spira, 1957). In the submitted work the authors describe a new technique of transfer of the insertion of the long head of the triceps brachii muscle to the insertion of the biceps brachii muscle to restore flexion in the elbow joint.

ANATOMICAL INVESTIGATION, MATERIAL, METHOD AND RESULTS

The anatomical investigation was implemented at the Department of Anatomy, First Medical Faculty, Charles University, Prague, on 10 cadavers. The upper extremities were fixed using a mixture of formaldehyde and ethanol. The muscles and their neurovascular supply were dissected macroscopically and photographs were taken for documentation. In each upper extremity the length of the long head of the triceps brachii was assessed as well as the distance of its nerve from the insertion of the axillary nerve and from the acromion. The length of the nerve and of the vascular bundle were measured. The number of terminal branches was counted. The origin of the neurovascular supply was investigated as well as the presence of an additional hilus and topographic relations of the neurovascular bundle (Fig. 1). The anatomical investigation revealed that the mean length of the long head of the triceps brachii muscle was 25.6 cm, the mean length of its nerve was 5.5 cm, the number of terminal branches was 3-4, 70 % of the vascular supply was from the brachial artery, the length of the vascular bundle was 3.6 cm. In 33 % an additional neurovascular hilus was present which was 2-3 cm distally from the main hilus. Detailed results of the observations are summarized in Tables 1 and 2.

Practising the surgical technique was implemented on all 10 extremities with a dissected neurovascular supply of the long heads of the triceps brachii muscle. The long head was isolated from the medial and lateral head. In the area of the common insertion tendon the medial portion of the tendon connected with the long head was released from the remainder of the common insertion and separated from the olecranon ulnae. The distal insertion of the mobilized long head of the biceps brachii muscle was then transferred to

Fig. 1. Anatomical preparation of the long head of the triceps brachii muscle: A nerve hilus with four branches is apparent, the arrow indicates the arterial supply of the muscle originated from the brachial artery. The heavy arrow indicates an additional neurovascular hilus.

Table 1. Nerve supply of the long head of triceps muscle

	length of the long head	distance of the nerve from the acromion	distance of the nerve from the axillary nerve	length of the nerve	number of the terminal branches
1.	32 cm	11.2 cm	6.5 cm	6 cm	3
2.	27 cm	10.4 cm	4.5 cm	6 cm	3
3.	28 cm	10.6 cm	6.1 cm	6 cm	4
4.	28 cm	10.8 cm	6.0 cm	6 cm	3
5.	32 cm	11.4 cm	5.2 cm	5 cm	4
6.	28 cm	10.6 cm	4.8 cm	6 cm	3
7.	24 cm	9.2 cm	6.8 cm	4 cm	3
8.	24 cm	9.5 cm	6.2 cm	5 cm	4
9.	29 cm	10.8 cm	7.0 cm	5 cm	3
10.	24 cm	9.1 cm	4.5 cm	6 cm	3
∅	**27.6 cm**	**10.4 cm**	**5.8 cm**	**5.5 cm**	**7**

Note: The nerve to the long head of triceps is the first muscular branch of the radial nerve.

Table 2. Blood vessel supply of the long head of triceps muscle

	blood vessels entry to the long head	the origin of the artery	length of the blood vessels	additional neuro--vascular hillum
1.	with the nerve	brachial artery	3.2 cm	-
2.	with the nerve	ramus deltoideus	3.0 cm	-
3.	with the nerve	brachial artery	3.0 cm	2 cm distally, length 3 cm
4.	with the nerve	deep brachial artery	3.4 cm	-
5.	with the nerve	brachial artery	3.8 cm	-
6.	with the nerve	brachial artery	3.1 cm	-
7.	with the nerve	brachial artery	4.5 cm	-
8.	with the nerve	brachial artery	3.3 cm	-
9.	with the nerve	brachial artery	4.2 cm	3 cm distally, length 3 cm
10.	with the nerve	ramus deltoideus	4.5 cm	3 cm distally, length 3 cm
∅	**with the nerve**	**brachial artery in 70 %**	**3.6 cm**	**in 30 %**

Note: The long head of the triceps muscle has in 33 % an additional neuro-vascular hillum. The origin of the additional artery is from the deep brachial artery.

Fig. 2. Practising surgical technique: The distal part of the long head of the triceps brachii muscle (arrow) is shifted to the insertion of the biceps brachii muscle.

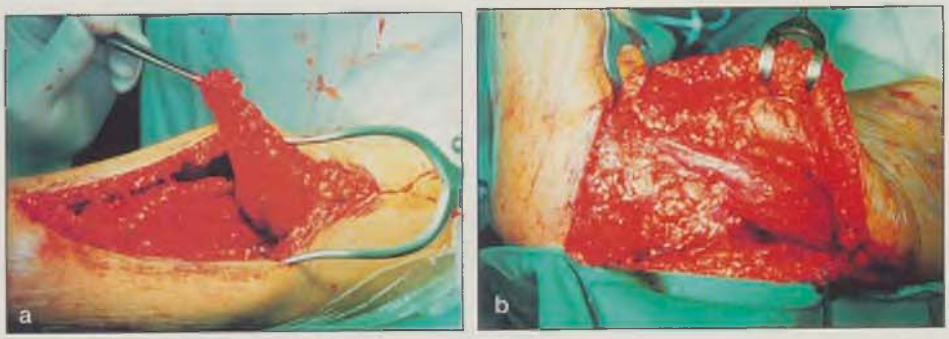

Fig. 3. Operation: The mobilized long head of the triceps brachii muscle (a) and suture of its distal aponeurosis to the insertion of the biceps brachii muscle (b).

Fig. 4a,b. Range of resulting flexion in elbow joint three months after surgery.

the anterior cubital region and sutured to the insertion tendon of the biceps brachii muscle closely above the radial tuberosity (Fig. 2).

CLINICAL MATERIAL, METHOD AND RESULTS

For evaluation of the results the authors used Janda's muscle test (1996) with a range from 0-5. A man aged 45 years suffered 20 years ago a tractional injury of the right arm. Three years previously thermocoagulation at the dorsal root entry zone of C5-C8 was performed. During operation avulsion of the anterior and posterior roots C5, C6, avulsion of the posterior roots C7, C8 was found. Part of the fila radicularia of the anterior root C7 was preserved, similarly as the fila radicularia of the anterior root of C8. During the postoperative period gradually the muscle strength of the triceps brachii muscle improved to level 4-. The assessed electrophysiological activity corresponded to the function of root C7, C8. In the latissimus dorsi muscle no function or electrophysiological activity was detected. The only suitable muscle for restoration of flexion in the elbow joint was the triceps brachii muscle. The incision was made in the distal half of the posterior side of the arm along the outer margin of the long head of the triceps brachii muscle and proceeded on the inner side of the arm and then again laterally to the palpable insertion of the biceps brachii muscle. After severing of the fascia the distal half of the long head was mobilized and the insertion tendon was separated from the other two heads. Closely above the olecranon ulnae the insertion was severed (Fig. 3a). The distal portion of the released aponeurosis was sutured closely above the radial tuberosity to the insertion tendon of the biceps brachii muscle (Fig. 3b). The rehabilitation programme was divided into two periods: 1. during the first two months exercises with exclusion of gravitation were made, 2. after the second month the scope of extension was increased, into flexion beyond 90° and against gravitation and during the third month also with a load. Three months after surgery there was satisfactory flexion in the elbow joint with a range of 20-85°. The muscle strength was 4- (Fig. 4a,b).

DISCUSSION

In avulsion of the roots in the region of the brachial plexus the primary therapeutic method is a reconstruction-reinnervation operation. In these operations to the functionally important

nerves, primary or secondary fascicles of the brachial plexus, the roots of which were damaged by injury nerves, or nerve roots from less important regions are sutured (Narakas, 1981, 1988; Kline, 1991; Samardzic et al., 1992; Chuang et al., 1993a,b,c; Kline and Hudson, 1995; Narakas and Bonnard, 1995; Haninec et al., 1997, 1998a,b). The success rate of these operations is according to Friedman's analysis of the literature (1991) about 50%. Samardzic et al. (1992) report successful outcomes in 56-65%, while Narakas and Bonnard (1995) using the intercostal nerves report success in 57 % and when using the accessory nerve or cervical motor branches in 75 % (the mobility of the patients was according to the muscle test better than 2+). The effectiveness of reinnervation operations when using the phrenic nerve in 164 patients was 84.6% (Gu et al., 1990; Gu and Ma, 1996). The disadvantage of all these operations is only a partially restored mobility of the upper extremity and a high percentage of unsuccessful operations. The prerequisite of success is to indicate the patients for surgery within 6 months after the injury (Akasaka et al., 1991).

Another method of choice, which is usually reserved for inveterate injuries of the brachial plexus when reinnervation is not possible due to fibrous changes in the muscle, is transfer of muscle grafts with a preserved neurovascular pedicle into the affected area. Thus it is possible by a shift of the latissimus dorsi muscle to the site of the denervated or damaged biceps brachii muscle to restore flexion in the elbow joint (Kubáček et al., 1987; Akasaka et al., 1991; Hirayama et al., 1994; Haninec and Smrčka, 1998). Other used transposition techniques are a proximal transposition of the forearm flexors (Steindler, 1918), unipolar and bipolar transposition of the pectoralis major muscle (Holtmann, 1975), transposition of the triceps brachii muscle (Bunnel, 1951; Carroll, 1952; Carroll and Hill, 1970), transfer of the sternocleidomastoideus muscle (Carrol, 1962) or the pectoralis minor muscle (Spira, 1957).

It is possible to transfer also a free muscular graft (e.g. the gracilis muscle) and provide it with a suitable motor nerve (Doi et al., 1991, 1995, 1997, 1998). When flexion in the elbow joint was restored by means of the triceps brachii muscle either the whole muscle was used (Carroll, 1952) or the medial head (Hoang, 1989). The operation suggested by the authors is a new technical solution which makes it possible to restore flexion in the elbow joint and to preserve extension. The operation is very simple and not time consuming. It is only a minor burden for the patient. If it is necessary to restore abduction in the shoulder joint, the deltoid muscle can be reconstructed by transposition of the upper (pars clavicularis) part of the pectoralis major muscle or upper part of the trapezius muscle instead of the insertion of the deltoid muscle (Čihák and Eiselt, 1962; Hou and Tai, 1991). The anatomical investigation confirms that the neurovascular pedicle of the long head of the triceps brachii muscle is sufficiently mobile. Its damage by traction during transposition of the insertion tendon is therefore unlikely. The assembled morphometric data in this study are consistent with previous anatomical studies concerned with the triceps brachii muscle and its neurovascular supply (Linnel, 1921; Bryce, 1923; Holelacque, 1927; Brash, 1955). The results of reconstruction of the musculocutaneous nerve at a suitable time after injury are better from the aspect of restored flexion in the elbow joint, as compared with transposition of tendons (Chuang, 1993b). The authors assume that transposition of the long head of the triceps brachii muscle in inveterate injuries of the brachial plexus is a suitable alternative in the reconstruction of nerves or transposition of other muscles to restore flexion in the elbow joint.

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Address for correspondence:

Pavel Haninec
Department of Neurosurgery
3rd Faculty of Medicine
Hospital Královské Vinohrady
Šrobárova 50
100 34 Prague 10
Czech Republic

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TIME TRENDS IN INCIDENCE OF HYPERTROPHIC SCARRING IN CHILDREN TREATED FOR BURNS

Dedovič Z.[1], *Koupilová I.*[2], *Brychta P.*[1]

[1] Centre of Burns and Reconstructive Surgery, Bohunice Teaching Hospital, Masaryk University, Brno, Czech Republic
[2] Department of Social Medicine, Faculty of Medicine, Masaryk University, Brno, Czech Republic

SUMMARY

Control of burn-scar hypertrophy remains a priority program in the care of burned children. We analysed data from 779 clinical notes of children aged from 0 to 15 years who were hospitalised at the Burn Centre in Brno between 1991 and 1996.

The occurrence of hypertrophic scarring in burn-injured children was studied by monitoring two periods separately, the first period from 1991 to 1993 and the second period with better clinical advantages from 1994 to 1996 using outpatients' records. The incidence of scar hypertrophy was at least 32 % in both periods. However, the occurrence of hypertrophic scarring in these two periods did not appear to have been influenced by changes in clinical practice.

ZUSAMMENFASSUNG

Die Zeittrends beim Vorkommen der hypertrophischen Narbung bei Kindern, die nach der Verbrennung behandelt werden

Dedovič Z., Koupilová I., Brychta P.

Die Behandlung der hypertrophischen Verbrennungsnarbe bleibt ein Prioritätsprogramm in der Behandlung des verletzten Kindes. Wir analysierten die Vermerke aus 779 Krankheitsbeschreibungen der Kinder im Alter vom 0 bis 15 Jahren, die im Verbrennungszentrum in Brno in den Jahren 1991-1996 hospitalisiert wurden.

Das Vorkommen der hypertrophischen Narbung bei den Kindern mit Brandwunden wurde geteilt im Verlauf von 2 Perioden verfolgt. Die erste Periode war von 1991 bis 1993, und die zweite mit besseren klinischen Vorteilen war von 1994 bis 1996. In der zweiten Periode wurden auch ambulante Vormerke der Patienten benutzt. Das Vorkommen der hypertrophischen Narbung war in den beiden Perioden am wenigsten 32 %. Also das Vorkommen der hypertrophischen Narbung scheint nicht durch die Änderungen in der klinischen Praxis beeinflußt zu sein.

Key words: hypertrophic scar, incidence of hypertrophy, outpatients' records

The survival of the patients with major burns with the help of modern medicine leaves the legacy of the extensive repair process in the form of large scars and severe contracture formation leading to deformity and dysfunction. These effects are amplified in hypertrophic scarring, which is a pathological form frequently following burns (1, 3).

In the first instance prevention of scarring is the main goal. However, good early management helps to minimise the undesirable effects of scarring. The best results occur when wounds heal rapidly and spontaneously, which clearly implies relatively little skin damage. However, the best results still depend on the provision of a good healing environment with dressing and the prevention of infection (11, 13).

Hypertrophic scars are red, thickened, hard and pruritic as compared with normal scars. They develop between 3 and 12 months following the injury and persist for 1 to 2 years before they finally mature. The timing is very variable in maturation of the scars which become pale, flat, soft and asymptomatic (8, 12). This condition is generally treated using either physical therapy or injection of steroid derivatives. Physical therapy is usually carried out by application of pressure to the scars using either pressure garments (costumes made from elastic materials or improvised from elastic support tubing) (17, 18). The term „contact media„ is used to describe a material which by its contact with a burn scar will reduce the maturation time of the scar and improve its cosmetic appearance (14, 15, 16, 17).

At the Centre of Burns and Reconstructive Surgery in Brno 128 children on average are hospitalised annually. Out of them, more than 40 % are with moderate and major burns. During the six-year period from 1991 to 1996 various clinical changes have happened in clinical practice, with earlier excision and a higher number of surgical procedures occurring in the treatment of burned patients in our Centre. The use of keratinocytes in healing deep dermal burns has been introduced and the model of the rehabilitation programme has been changed accordingly. In the early years of the study (1991-1993) no garments and contact pressure media were available. A period with better clinical advantages was observed from 1994 to 1996. The most significant possible influences upon the outcome among these changes were an increased proportion of children receiving autografts for the repair of wounds and the introduction of pressure garment therapy for the treatment of the healed wounds after discharge from the Burn Centre.

The aim of every scar management program is to achieve such results as are both functional and cosmetically acceptable with respect to both children's and parents' emotional stability. The aim of this study is to evaluate time trends in the incidence of hypertrophic scarring in children treated for burns. Data were analysed by age, gender, type and severity of injuries.

PATIENTS AND METHODS

We analysed data in all children treated for burns at the Centre of Burns and Reconstructive Surgery in Brno in 1991 to 1996. The time trends in the occurrence of hypertrophic scarring were analysed by gender, age, type of injury and size of the affected area. In the analysis, we used two age groups (0 - 5 years and 6 - 15 years), four categories of injury defined by the mechanism (scald, fire, contact, and electric or chemical aetiology) and three categories of the size of affected area (< 5 %, 5 - 10 %, more than 10 %). Also, we used their outpatients' records after they were discharged from the hospital. We were monitoring separately two periods, the first period from 1991 to 1993 and the second period with better clinical advantages from 1994 to 1996. The trends in the incidence of hypertrophic scars in children treated with keratinocytes were analysed separately (years 1994 to 1996 only).

The proportions of injuries that resulted in scars are given as percentages. The statistical significance of differences in the proportion of injuries resulting in scars was evaluated by a chi-square test or a test for linear trend, as appropriate. The p-values for the tests of statistical significance are reported for all results, p-values > 0.05 are denoted as „non-significant„. The analyses were performed using Epi-Info statistical package.

RESULTS

There were 779 children treated for burns at the Centre of Burns and Reconstructive Surgery in Brno in 1991 to 1996. The age of children ranged from 0 to 15 years. A majority of the children (73 %) were younger than 6 years. There were 491 boys (63 %) and 288 girls in the sample.

There are no significant differences in the number of children hospitalised in each year analysed (Fig. 1). The average annual number of children hospitalised in our centre was 128. Most of them were hospitalised in the year 1992: 145, the fewest were admitted in 1996: 118. The majority of children, 75 to 80 %, suffered from scalds. Fire ranked second as the cause of burns. There are no significant differences in the proportion of burn causes in the two periods under study (Fig. 2).

When we obtained the occurrence of hypertrophic scarring by period and type of injury, we found out that there were differences in the frequency of scars: the most common were fire burn scars, less common were scald scars and those from other burns (Fig. 3).

The incidence of hypertrophic scarring by the two periods studied and by age can be seen in Fig. 4. In spite of the fact that 73 % of the hospitalised children are from 0 to 5 years of age, scars occur more frequently in older children, as they suffer from more severe injuries than the younger ones according to our previous studies (4, 5).

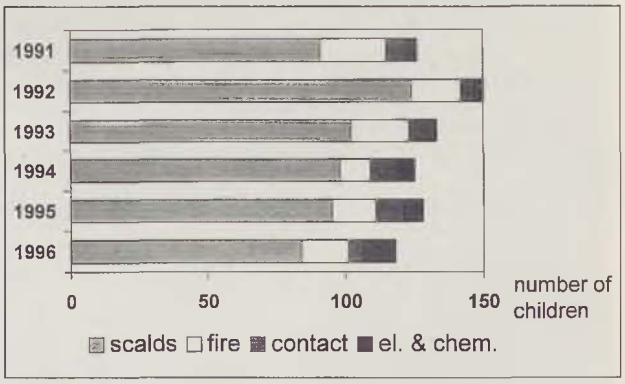

Fig. 1. Children admitted by type of injury.

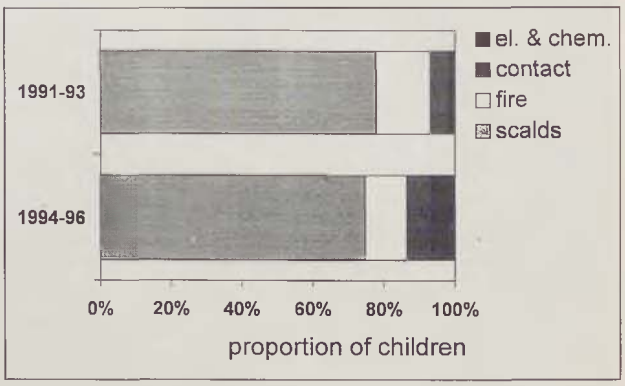

Fig. 2. Children admitted by type of injury in the two periods.

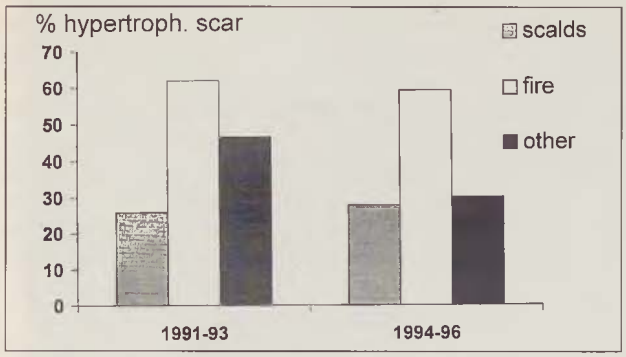

Fig. 3. Hypertrophic scarring by period and type of injury.

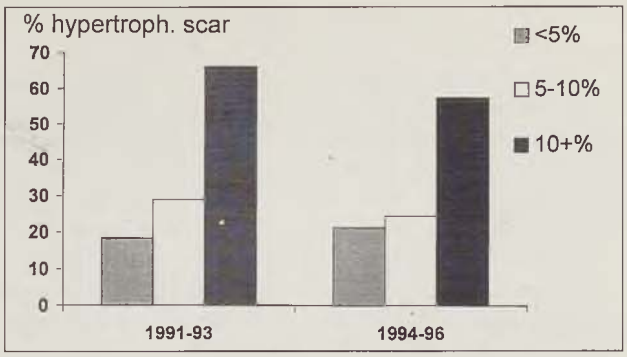

Fig. 6. Hypertrophic scarring by period and burned body surface.

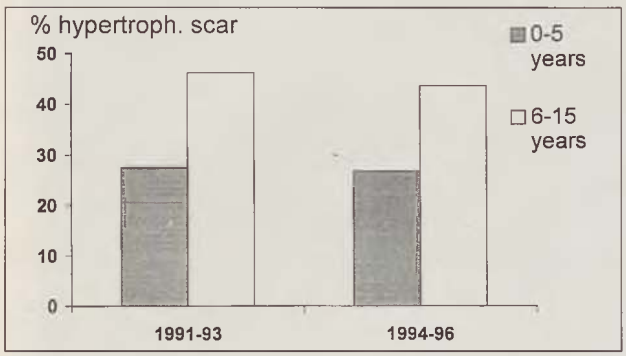

Fig. 4. Hypertrophic scarring by period and age.

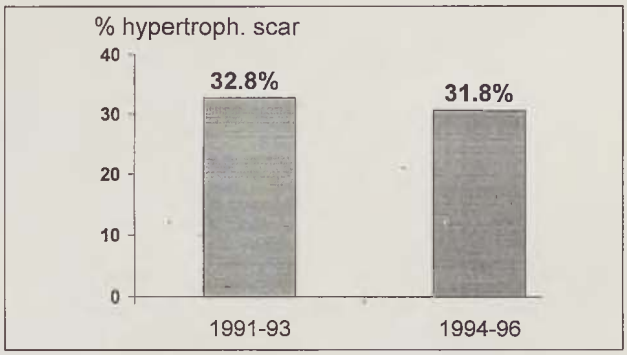

Fig. 7. Hypertrophic scarring by period, overall results.

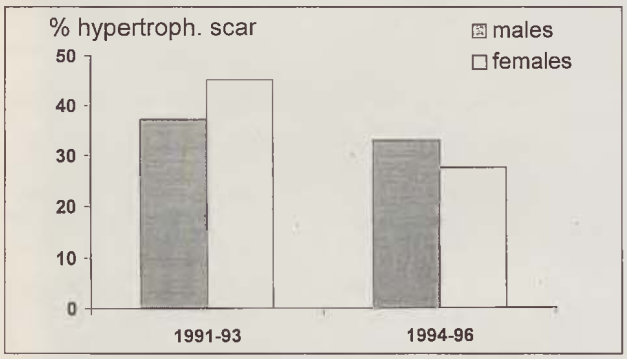

Fig. 5. Hypertrophic scarring by period and gender.

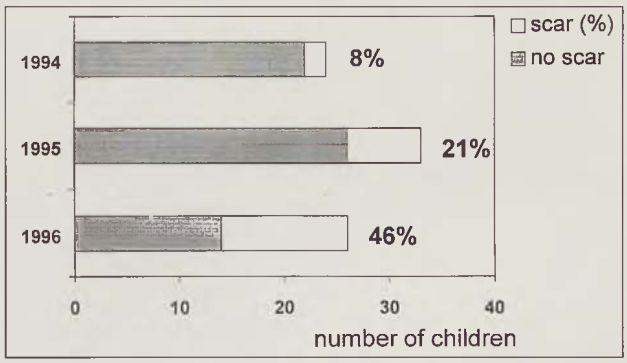

Fig. 8. Hypertrophic scars in children treated with keratinocytes.

There is no change in the occurrence of scarring between these two age groups in the two monitored periods.

In the period between 1991 and 1993 the occurrence of scarring was somewhat more frequent in females (Fig. 5). There are no significant differences in the proportion of scarring between female and male patients in these two periods.

Fig. 6 shows that there are differences in the frequency of scars by the area affected; the greater the area, the more likely are the scars. Also, there is little improvement in patients with a greater proportion of body surface affected in the period from 1994 to 1996.

Fig. 7 represents the results of overall changes from 1991 to 1993 and 1994 to 1996. We can see a slight improvement in scarring in the period from 1994 to 1996, but on the whole there are no significant changes in the frequency of scars between the two periods studied.

Time trends during the years 1994 through 1996 in the incidence of hypertrophic scarring in children with deep dermal burns only, who were treated with keratinocytes, can be seen in Fig. 8. Some long-term studies in the literature report on decreased scar formation in patients treated with keratinocytes. In our centre we were using this method in the period from 1994 to 1996 in 83 children (24 in the year 1994, 33 in 1995, and 26 patients in 1996) (2, 20). The scar incidence in 1994, 1995 and 1996 was 8 %, 21 % and 46 % respectively. It is a statistically significant trend that scars get more and more common.

DISCUSSION

The problem of hypertrophic scarring is severe from the point of view of the patient, the parent, and the clinician. The condition remains a difficult problem without a reliable and satisfactory method for its alleviation. Methods to evaluate the treatment of the scars are not amenable to measurement to give a simple demonstration of efficiency (6). A good early management program may help to minimise undesirable effects of scarring. Unfortunately, our burn-scar management program was developed rather slowly because, on the one hand, there were not enough domestic garments and, on the other, there was no qualified person who would be in charge of them. The present study reinforces this observation and demonstrates that substantial changes in clinical practice, including the introduction of pressure garment therapy, various contact media, low-energy laser and others fail to show any influence upon the incidence of scarring or the need for secondary scar correction. There is no guarantee that the child and parents will comply with the advice given to wear the garment (19). Consequently, the measurement of the successfulness of the anti-scar therapy is quite difficult (10, 20, 21). Sometimes it may be jeopardised by:

- insufficient motivation of the parents;
- wearing no garments on the newly healed surface;
- heat rash reaction;
- inadequacy of garments in the course of rapid growth of the children;
- difficulties in pressure therapy in various areas, e.g. shoulders, neck, joints, fingers and toes.

Other changes in clinical practice involving early excision, increasing number of autografts, and use of keratinocytes in healing wounds did not result in any evident improvement in statistically significant changes in the frequency of burn-scars between the period from 1991 to 1993 and that from 1994 to 1996. Some suggestions of improvements can be seen in the data, but they are not statistically significant. Age, gender, type of injury, and area of injury are related to the prognosis of burns. Do we have ever more severe cases from one year to another or do we need a more rigorous rehabilitation program during the first few months after the discharge of the burned patient?

The objective of improving the outcome of burn injury through the amelioration of the effects of hypertrophic scar development, and eventually prevention of its occurrence perhaps represents the most challenging problem facing burn care workers at the present time.

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Address for correspondence:

Zlata Dedovič
Centre of Burns and Reconstructive Surgery
Bohunice Teaching Hospital, Masaryk University
Jihlavská 20
639 00 Brno
Czech Republic

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BURN INJURY RESULTING IN MUTILATION IN CHILDHOOD

Štolbová V., Brož L.

Burn Center Prague, Charles University Hospital Královské Vinohrady, Prague, Czech Republic

SUMMARY

We present 3 cases of boys aged 5, 11 and 12 years who sustained very deep burn injury of their extremities. Their future lives were extremely limited. All the 3 boys had a strong emotional reaction to the injury. Two of them sustained amputation of upper extremities as a result from electrical injury, the youngest boy survived without the feet and with mutilated fingers on his hands. To encourage their survival and sense of life we admitted their mothers. Our aim was not only to secure psychological support to the patients but also to prepare the family to accept the sequelae of the injury. This accompaniment in the ward was very useful for both. The mothers were able to watch the progress in the treatment. In this way they were involved in the future care and they coped with the problems from a realistic point of view. The mothers helped the boys with physiotherapy under supervision. All the families were well prepared for discharge of their boys from the hospital without any fear of the following care.

The significance of the family member influence upon the patient's resocialization we saw in early acceptance of the child to the society.

ZUSAMMENFASSUNG

Die Verletzungen der Verbrannten, die in die Mutilation in der Kindheit münden

Štolbová V., Brož L.

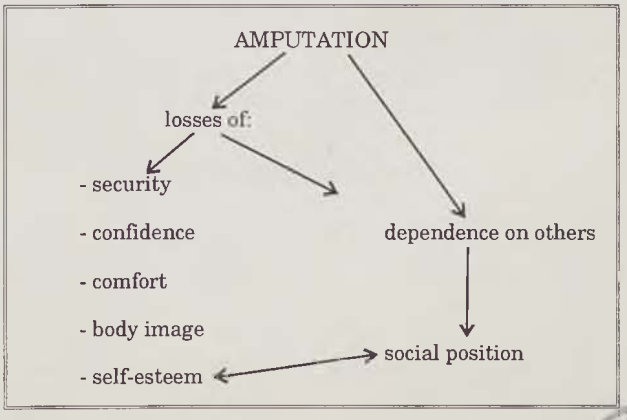
Wir liegen 3 Fälle von Jungen im Alter von 5, 11 und 12 Jahre vor, die eine sehr tiefe Brandwunde ihrer Extremitäten erlitten. Ihr künftiges Leben war außerordentlich beschränkt. Alle 3 Jungen hatten eine außerordentlich emotional starke Reaktion auf ihre Verletzung. Zwei von ihnen erlitten Amputation der oberen Extremitäten als Ergebnis der Stromverletzung, der jüngste Junge überlebte ohne Fußsohlen und mit den mutilierenden Fingern an seiner Hand. Um ihr Überleben und den Sinn ihres Leben zu unterstützen, nahmen wir ihre Mütter auf. Unsere Hilfe lag nicht nur in Sicherung der psychologischen Betreung der Patienten, sondern auch in Vorbereitung der Familie auf die Hinnahme der Verletzungsfolgen. Diese Begleitung in der Pflege war sehr nützlich. Die Mütter waren fähig die Fortschritte in der Behandlung zu beobachten. Auf dieser Weise waren sie fähig, sich in die künftige Behandlung einzugliedern und sich mit den Problemen der Realität auseinanderzusetzen. Die Mütter halfen den Jungen mit der Psychotherapie unter der Aufsicht. Alle Familien waren gut vorbereitet auf die Entlassung der Jungen aus dem Krankenhaus, ohne Sorgen vor der folgenden Behandlung. Die Bedeutung des Familieneinflußes auf die Resozialisation des Patienten sehen wir in der frühen Eingliederung des Kindes in die Gesellschaft.

Key words: mutilation in childhood, burn injury, eletrical burn

When persons sustain an extensive burn, they suffer not only from physical trauma, but also experience serious emotional derangement, especially, when we consider burns in childhood and when the injury involves loss of extremities, it is even more tragic. Within a period of minutes, the independent individual becomes dependent on others. This type of injury cripples the small patients together with their family.

Amputation results in a loss of joints and surrounding tissue, loss of muscle power and balance, loss of ability to sense a position, and loss of the sense of touch. These physiological losses affect the patient's sense of security, confidence, comfort, body image and self-esteem (Tab. 1). Within a couple of hours the person faces a drastic change of life. It takes a long time to accept and to learn how to use the prosthesis and to return to a useful and independent life.

Tab. 1. Losses resulting from amputation



LÉKAŘSKÁ KNIHOVNA

Tab. 2. Schedule of care for patients with amputation

- describing the amputation to: children / parents
- recognizing and managing phantom limb pain
- using a prosthesis
- adjusting to changes in mobility
- adjusting to changes in body image
- planing the goals in future life

Both the patient and family are continuously prepared for the amputation and are assisted in coping process associated with loss and change in body image (Tab. 2). The children require intensive support from the next of kin mainly in the time after this intervention. The patient and the family must be given time to express their fear and concerns and to ask questions.

A person has to want a prosthesis and be motivated to learn how to function with it.

The most important duty of the surgeons is to save the patient's function as much as possible, but with respect to prevention of sepsis.

Tab. 3. Emotional reaction to amputation

patient ⟷ family
denial
shock
anger
depression
acceptance
—
capitalizing on remaining strengths and abilities

Because many of the emotional disturbances are mediated by means of reaction of close members of the family, it is very important to watch each other reactions to the fact of amputation. The patient's reaction is mostly affected by the response of the family. Sometimes the patient is able to cope with the stress of the disability but another family member breaks down. Some circumstances may also make the patient to exert some limited testing to determine just how much of aggression and dependency will be tolerated by the family or by the nursing staff (Tab. 3).

CASE REPORTS

Case 1 (Fig. 1): This 12-year-old boy sustained high voltage electrical burns. He touched scaffold, which was built up around the electrical post near the place of his house, where the children usually spent their leisure time. The post was not detached.

Fig. 1. Case 1: 12-year-old boy - high voltage electrical burns.

Figs 2, 3. Case 1: Burns located on both upper extremities.

The boy suffered burns covering 17 % T.B.S.A. located on the both upper extremities (Figs 2, 3) and on the dorsum of the right foot (Fig. 4). The extremities were very deeply damaged including bones requiring amputation which was carried out on his right upper extremity 8 cm

Fig. 4. Case 1: Burns located on the right foot.

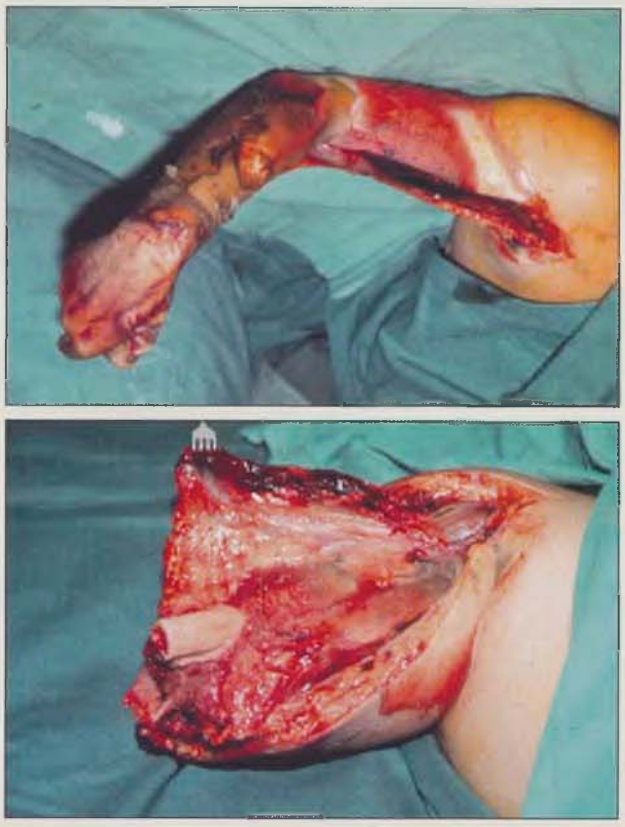
Fig. 5. Case 1: Amputation of right upper extremity 8 cm below the acromion.

Fig. 6. Case 1: The left upper extremity was total amputated.

below the acromion (Fig. 5) and his left upper extremity was totally amputated (Fig. 6) in the head of the humerus. The exit of the electrical current damaged the forth finger on his right foot. From the admission to our Burn Centre we have seen strong emotional reaction related to the attention on his personality.

Mother of this boy was admitted to the ward, but during her staying in the hospital the boy was reacting time by time with anger to her presence. The mother was a very patient woman, who encouraged and secured him. She was preparing the boy to be discharged back home. She represented a bridge between the boy, his damage and the rest of the family - the father, who failed, and the younger brother. Mother was coping with the reality of the mutilation: she helped the boy with the physiotherapy under supervision and her considerate behaviour helped the boy to overcome the return back home without any fear of acceptance by the background and without any frustration.

At the present time the boy underestimates the dangers caused by the instability of the body. He is fully involved in an active life, but he is solving his tension by aggression towards his brother, sometimes. We have recommended his mother to send him to the burn camp to improve his behaviour. As far as we know, the camp was useful and the boy was involved in daily camp activity, he swimmed, played football, volley-ball and was undertaking all social activities without aggressive reaction towards others. Most of the time he stays without the cosmetical prosthesis, waiting for the myoprosthesis.



Figs 7, 8. Case 2: 11-year-old boy - electrical burns, amputation on right upper extremity.

Case 2 was an 11-year-old boy, who sustained the same type of electrical injury. He was burned when he touched railway overhead cables. The extent of burns covered 13 % T.B.S.A.

The amputation of his right upper extremity was necessary (Figs 7, 8). Defects on both upper extremities were covered by free flaps, using musculus latissimus dorsi and musculus serratus anterior. On his left foot the fourth and the fifth

Figs 9, 10. Case 2: Pes equinovarus foot corrected by orthopedists (following the treatment).

finger was amputated. Pes equinovarus foot was corrected following the treatment of orthopedists (Figs 9, 10).

This boy reacts with a different type of response in comparison with the first patient. He withdraws from any communication, his reactions being psychosomatic with full imagination of his limitations in the future. His mother helped him in the same way as in the previous case, but we were not able persuade him to visit the burn camp. Because he was premorbid introvert, it will take more time to find the acceptance for his damage.

Case 3 was a 5-year-old boy, who suffered burns from red-hot ashes, which caused burns on 62 % of T.B.S.A. The treatment was complicated by long time arteficial ventilation, septic state and hypoxic encephalopathy. His mother was admitted to the ward, but after following 2 days she had to be discharged because of too strong negative emotional reaction of her son. Her presence, at that time, was a disadvantage for the treatment and would have hurt his condition under

Fig. 11. Case 3: 5-year-old boy suffered burns from red-hot asher involving 62 % of T.B.S.A.

arteficial ventilation. The mother was disappointed regarding child's reaction, although we had prepared her for this possibility.

Although we were affraid of her next approach and care it was surprising how well she managed to mobilise his preserved abilities and was performing exercises that he could do in respect of his limitation.

There was no problem with their discharge home, both of them were looking forward to it. Physical and psychical condition of the boy were fully satisfactory on the day of discharge (Fig. 11).

CONCLUSION

We would like to stress, that even when the mutilation in childhood crippled the children physically, there existed many ways of daily activities in which the individual can be successful, appreciated by others and find the sense of life.

More than 45year experience of the Prague Burn Center confirm the necessity of developing psychic defense mechanisms in burn patients and all medical and paramedical staff has the duty to stimulate them. A general philosophy practiced by the comprehensive burn team is to maintain contact with the patient and his family, sometimes for lifetime, which depends upon the integrated cooperation and communication of all members.

Address for correspondence:

Vlasta Štolbová
Šrobárova 50
100 34 Prague 10
Czech Republic

SOUHRNY

Mikrovaskulární přenos hemifemorálního laloku pro rekonstrukci abdominální stěny v plné tloušťce

Cunha-Gomes D., Choudhari C., Bhathena H. M., Kavarana N. M.

U širokých a plnou tloušťku kůže postihujících defektů horní břišní stěny je volný přenos mikrovaskulární tkáně jedinou volbou, která je schopna rekonstruovat strukturální integritu břišní stěny a rovněž docílit dobrého estetického vzhledu.

Předkládáme případ, který byl rekonstruován pomocí 29x19 cm velkého hemifemorálního volného laloku, kombinovaného s cévními oblastmi anterolaterálního stehenního laloku a laloku tensor fasciae latae v průběhu femorální arterie.

Implantace nádoru do místa odběru laloku

Cunha-Gomes D., Prasad R., Bhathena H. M., Kavarana N. M.

Vznik rakoviny a její různé modely šíření jsou diskutovány po desetiletí. Recidiv, jak lokálních, tak metastatických, se obávají pacient i chirurg.

Zaznamenali jsme zajímavý případ implantace tumoru do místa odebraného laloku u pacienta s rakovinou tváře po primární rekonstrukci pomocí tohoto laloku. Ve zprávě jsou uvedeny detaily tohoto případu a teorie této implantace.

Naše zkušenosti s využitím m. temporalis v chirurgii obličeje

Kozák J., Voska P.

Autoři uvádějí své zkušenosti s využitím m. temporalis při rekonstrukci defektů po exenteraci očnice, patra, vyplnění mrtvých prostor po exstirpaci rozsáhlých tumorů v infratemporální oblasti a v oblasti přední jámy lebeční. Operovali celkem 25 pacientů, u kterých použili část nebo celý m. temporalis. U žádného z operovaných pacientů, i když dva měli provedený podvaz a. carotis externa, nedošlo k nekróze nebo zánětlivým komplikacím při hojení transponovaného svalu. Ten je nutné považovat za spolehlivý prostředek v rekonstrukci obličeje a báze lebeční.

Rekonstrukce flexe v lokti transpozicí stopkovaného laloku dlouhé hlavy m. triceps brachii

Haninec P., Szeder V.

Nová technika obnovy flexe v loketním kloubu je popsána u zastaralého poranění plexus brachialis. Úpon dlouhé hlavy m. triceps brachii byl přenesen s intaktním nervovým a cévním zásobením do regio brachii anterior a sešit nad tuberositas radii s úponovou šlachou m. biceps brachii. Svalová síla 3 měsíce po operaci byla dle svalového testu 4-. Flexe v loketním kloubu byla možná do 85°. Extenze v loketním kloubu zůstala zachována, svalová síla byla 3. Anatomická studie ukázala, že průměrná délka nervu dlouhé hlavy tricepsu byla 5,5 cm, počet konečných větví byl 3 - 4, cévní zásobení bylo v 70 % z a. brachialis, délka cévního svazku byla 3,6 cm. Ve 33 % byl přítomen přídatný nervově-cévní hilus, který byl lokalizován 2 - 3 cm distálně od hlavního hilu. Studie potvrzuje, že nervově-cévní stopka dlouhé hlavy m. triceps brachii je dostatečně mobilní a její poškození tahem v průběhu transpozice úponové šlachy je proto nepravděpodobná. Přenos dlouhé hlavy m. triceps brachii u zastaralých poranění plexus brachialis představuje vhodnou alternativu k rekonstrukci nervů či přenesení jiných svalů k obnovení flexe v loketním kloubu.

Časové trendy výskytu hypertrofického jizvení u dětí léčených pro popálení

Dedovič Z., Koupilová I., Brychta P.

Úprava popáleninové hypertrofické jizvy zůstává prioritním programem v péči o popálené dítě. Analyzovali jsme záznamy ze 779 chorobopisů dětí od 0 do 15 let, které byly hospitalizovány v Popáleninovém centru v Brně v letech 1991 - 1996.

Výskyt hypertrofického jizvení u popálených dětí byl studován odděleně v průběhu dvou období: první období od roku 1991 do roku 1993 a druhé období s lepšími klinickými podmínkami od roku 1994 do roku 1996, využívající ambulantní záznamy pacientů. Výskyt hypertrofického jizvení byl v obou obdobích nejméně 32 %. Výskyt hypertrofického jizvení se tedy nezdál být ovlivněn změnami v klinické praxi.

Popáleninový úraz s následkem mutilací v dětském věku

Štolbová V., Brož L.

Uvádíme tři případy chlapců ve věku 5, 11 a 12 let, kteří utrpěli velmi hluboké popálení končetin. Jejich budoucí život byl extrémně omezen. U všech tří chlapců byla silná emocionální reakce na úraz. U dvou z nich byly nutné amputace horních končetin jako následek poranění elektrickým proudem. Nejmladší přežil úraz bez nohou a s mutilujícím poraněním prstů rukou. K podpoře jejich přežití a smyslu života jsme přijali do nemocnice jejich matky. Naším záměrem bylo nejen zabezpečení psychologické podpory pacientů, ale i příprava rodiny na následky poranění. Tento doprovod v nemocnici byl užitečný pro všechny. Matky pozorovaly pokroky v léčbě a byly schopny se realisticky vypořádat s problémy budoucí péče. Pod odborným dohledem pomáhaly matky chlapcům s rehabilitací. Všechny rodiny byly dobře připraveny na přijetí svých chlapců po propuštění a neměly obavy z následné péče. Významný vliv členů rodiny na resocializaci pacientů byl patrný v jejich brzkém opětovném zařazení do společnosti.

BOOK REVIEW

ADVANCES IN TISSUE BANKING, vol. 1, 2

Phillips G. O., von Versen R., Strong D. M., Nather A.

World Scientific Publishing Co. Pte. Ltd.
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This two volume publication is, no doubt, the first comprehensively conceived interdisciplinary work on the problem of modern tissue banking. Rapid development of tissue banking was recorded only in recent years. Both volumes of the reviewed publication are unique because they assemble articles by distinquished specialists in different areas of tissue banking, based on contemporary scientific knowledge. Clinical experience, methodical approaches, immunological aspects, methods of sterilization, legislative matters and other rules pertaining to safe administration by recipients - all this, incl. special sections pertaining to collection and storage of different tissue and cellular elements is discussed in great detail - by European specialists (EATB), as well as by American ones (AATB) and others.

In volume two I was particularly interested in the article devoted to the memory of late Kennet W. Sell, the founder and pioneer of modern tissue banking in the USA. After reading the chapter of particular interest to me, i.e. on skin covers and other substituents, I was very pleased to find that even our department with a very limited staff collects, cultivates and stores on a short-term as well as long-term basis, considerable amounts of dermal tissue as compared with some of the quoted numbers.

I am convinced that not only new techniques, surgical procedures, but in particular investigations in the sphere of cell biology, will lead to advances in this discipline. Collaboration and contacts of different banks are an important moment for acquiring new methods, experience, and also a means for achieving a certain unification and standardization of some procedures.

I am convinced that the reviewed publication is a fundamental work, a book for specialists in tissue banking as well as for doctors engaged in surgical and non-surgical disciplines. It is beyond doubt a great contribution to this sphere of knowledge and the authors deserve due appreciation.

Dagmar Vogtová, M. D.

ANNALS OF BURNS AND FIRE DISASTERS

Official publication of The Mediterranean Club for Burns and Fire Disasters (MBC)

WHO COLLABORATING CENTRE

VOLUME XII NUMBER 1 MARCH 1999

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EDITORS **M. MASELLIS M.D.**
S.W.A. GUNN M.D.

c/o Secretariat of The Mediterranean Club for Burns and Fire Disasters - Divisione di Chirurgia Plastica e Terapia delle Ustioni Ospedale Civico - Via C. Lazzaro - 90127 Palermo, Italy

AWARD OF THE G. WHITAKER INTERNATIONAL BURNS PRIZE

PALERMO, ITALY, FOR 1999

In the course of a meeting held on April 17th 1999 at the seat of the G. Whitaker Foundation, Palermo, after examining the scientific activity in the field of research, teaching, clinical organization, prevention and cooperation among the nations, presented by various candidates, in the light of the consideration guiding the analysis of the high level of the candidates, the Adjudicating Committee unanimously decided to award the prize for 1999 to: **Prof. Dr. John William Davies,** former Director of Research Department of Royal Infirmary and West of Scotland Regional Burns Unit in Glasgow, Scotland.

The prize is awarded with the following motivation:

„Since 1956 Dr. John William Davies has concentrated his activity in the field of the aetiology and physiology of the burns disease.

In particular he has helped to demonstrate how of the reduction of the plasma mass circulating during the shock phase causes direct damage to the cardiac fibre, and that the massive destruction of erythrocytes by the burn agent determines a reduction in the amount of oxygen transported.

He has considered the question of the different resuscitatory capacities of various infusion liquids and has suggested that they should be used in the successive phases of the burn disease in relation to the sodium balance on the basis of the quantities administred and excreted, principally in the urine.

He has also investigated the metabolic aspects of the successive phases of the burn disease in relation to the extent of the burned body area and to calorie losses with regard to ambient temperature.

The results of his researches have made a considerable contribution to the modern clinical and therapeutic approach to the burn disease.

He was appointed Editor-in-Chief of the journal BURNS by the International Society for Burn Injuries (ISBI), and in his 13 years in this capacity made outstanding contributions to the diffusion throughout the world of scientific knowledge on aspects of the physiology, clinical treatment, therapy, and rehabilitation of burns patients.

His scientific and clinical activity has been carried out in prestigious hospitals such as the Accident Hospital in Birmingham, England, and in the Royal Infirmary in association with the West of Scotland Regional Burns Unit in Glasgow, Scotland, with the publication of more than 80 scientific papers and a volume of 650 pages entitled Physiopathological Responses to Burning Injuries.

Dr. John William Davies received the Everett Evans Lecturer Prize from the American Burns Association in Chicago and the A. B. Wallace Memorial Lecturer Prize from the British Burns Association.

He is a Founder Member of the International Society for Burn Injuries and of the British Burns Association."

The official prize-giving of the prestigious award will be held in September 1999 in Palermo at the seat of the G. Whitaker Foundation in the presence of the authorities and of representatives of the academic, scientific and cultural world.

G. WHITAKER INTERNATIONAL BURNS PRIZE - PALERMO, Italy

Under the patronage of the Authorities of the Sicilian Region for 2000

By law n. 57 of June 14th 1983 the Sicilian Assembly authorized the President of the Region to grant the „Giuseppe Whitaker Foundation", a non profit-making organisation under the patronage of the Accademia dei Lincei with seat in Palermo, an annual contribution for the establishment of a „G. Whitaker International Burns Prize" aimed at recognising the activity of the most qualified experts from all countries in the field of burns pathology and treatment.

The amount of the prize is fixed at twenty million Italian Lire. The prize will be awarded every year by the month of June in Palermo at the seat of the G. Whitaker Foundation.

The Adjudicating Committee is composed of the President of the Foundation, the President of the Sicilian Region, the Representative of the Accademia dei Lincei within the G. Whitaker Foundation, the Dean of the Faculty of Medicine and Surgery, three experts in the field of prevention, pathology, therapy and functional recovery of burns, the winner of the prize awarded in the previous year and a legal expert nominated in agreement with the President of the Region as a guarantee of the respect for the scientific purpose which the legislators intended to achieve when establishing the prize.

Anyone who considers himself to be qualified to compete for the award may send by **January 31st 2000** his detailed curriculum vitae to: Michele Masellis, M. D., Secretary-Member of the Scientific Committee G. Whitaker Foundation, Via Dante 167, 90141 Palermo, Italy.

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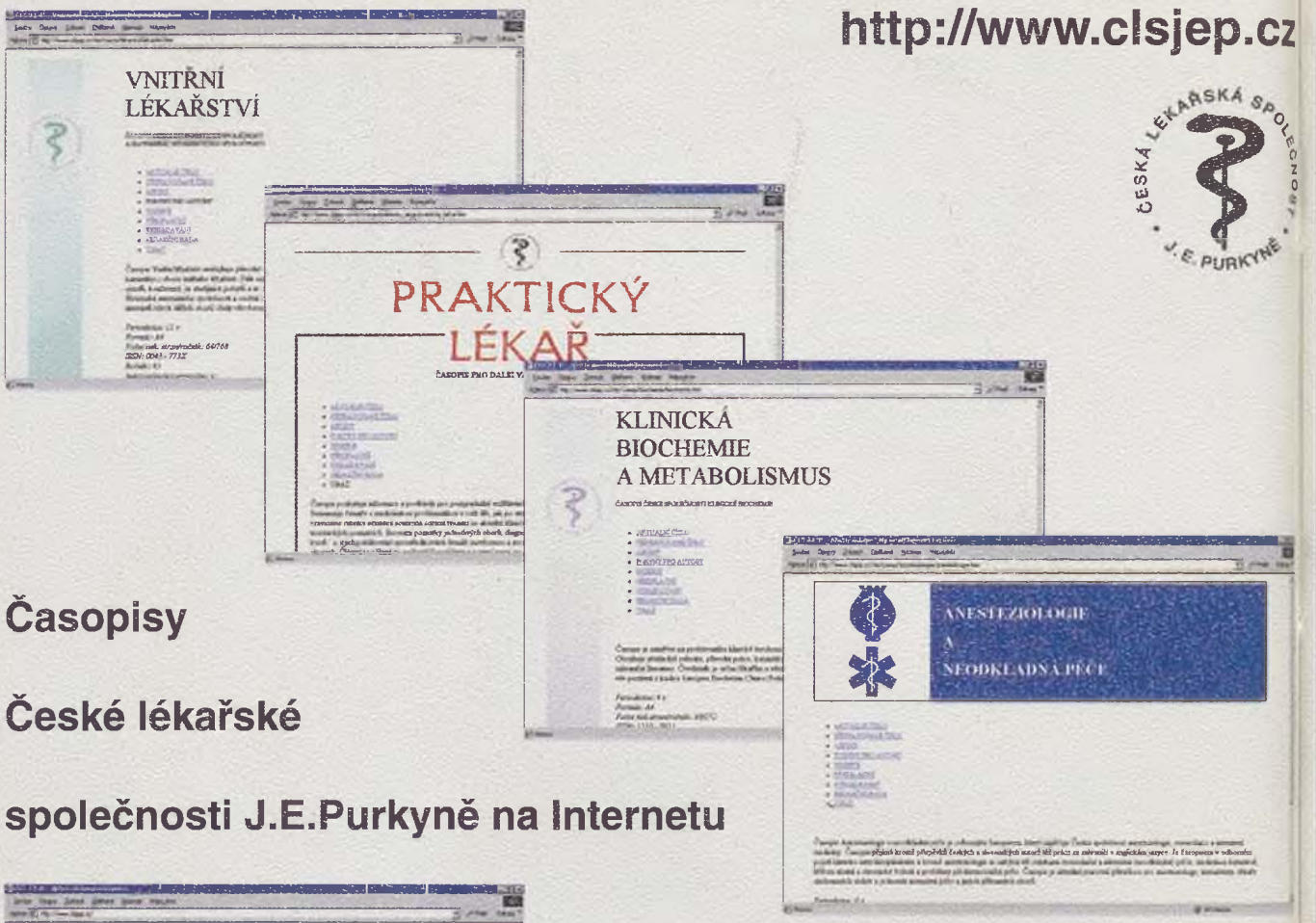

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Štěpánská 18, 110 00 Praha 1, Tel.:02 – 2223 0702, fax:02 - 2223 0708, e-mail:info@euronet.cz