THE USE OF THE FAT-CUTANEOUS NECK FLAP IN RECONSTRUCTION OF THE FACE INJURED BY BURNS

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SUMMARY. The face is a part of the body that is frequently affected by burn injury. Post-burn scar sequelae in this area often result in invalidity and psychological upsets for the patients. The methods of plastic surgery widely employed have their drawbacks. In particular, it is very important for surgical reconstruction of the face to find plastic material with the same properties: texture, colour, thickness, and natural elasticity. For this purpose, at the Division of Plastic and Reconstructive Surgery, A.V. Vishnevsky Institute of Surgery, Russian Academy of Medical Science, we use the fat-cutaneous neck flap mobilized according to the anatomical distribution of the vessels. We describe some typical clinical situations and possible variants of plastic surgery using the neck flap, based on the experience of surgical treatment in 248 patients. It is our opinion that application of the neck flap is preferable to other reconstructive techniques in the lower part of the face in patients with preserved skin in the neck and anterior surface of the chest.

Introduction

Scar lesions of face are among the most frequent and severe of burn sequelae, making up about 30% of localizations of burn scars. Functional and cosmetic disturbances caused by face scars often result in invalidity and psychological upsets. For this reason, surgical rehabilitation of such patients becomes an important medical task.[1]

The normal methods used in plastic surgery - local tissues, autografts, expander dermatension, transfer of fasciocutaneous flaps, and free flaps with microvascular anastomoses - present some drawbacks which may lead to inadequate elimination of scar deformities and defects or to the application of plastic material having an inappropriate structure.[2-9] Restored skin cover must have the same properties as natural face skin, including colour, thickness, elasticity, and texture. In our view the most appropriate plastic material for the face that suits these requirements is neck skin. The purpose of this article is to demonstrate clinical experience of surgical reconstruction in the lower part of face by the fat-cutaneous neck flap.

Material and methods

We have performed reconstructive operations using the neck flap in 248 patients with post-burn sequelae in the lower part of the face.

Depending on the depth of the post-burn sequelae we divided them into two types - type 1 = post-burn scar deformities; type 2 = post-burn soft tissue defects. Type 1 sequelae are caused only by skin lesions, while type 2 sequelae are caused by lesions of skin and deeper anatomical structures. Most of the patients (239 out of 248, i.e. 96.5 %) had scar lesions of the skin; deep lesions of the soft tissue were observed in only nine patients (3.5%).

For a more complete definition of the location and extent of scar lesions in the lower part of the face, we divided them according to location into three zones: right mandibular, left mandibular, and mental areas. Lesions involving only one area we defined as local, while lesions involving two or three areas we defined as extensive. Finally, we divided post-burn scar lesions of the lower part of the face into the following three variants:

1. local or one-sided scar lesions with or without involvement of part of the chin and lips;
2. extensive scar lesions involving part of the chin and lips;
3. extensive scar lesions with preserved chin and lips.

For these types of lesions we used different methods of replacement and adaptation of neck flap.

The blood supply of the anterior surface of the neck is provided by two sources: main (axial vessel) and additional (perforators). The beginning of the axial vessel/skin branch of the superficial artery of the neck (a. superficialis colli) projects at the site of the junction of the external jugular vein with m. sternocleidomastoideus. The axial vessel divides and forms a vascular network in the skin and subcutaneous fat of the anterior surface of the neck. An additional source is represented by 3-5 perforators. Perforators are skin branches of the upper arteries of the thyroid gland and facial arteries. They penetrate the subcutaneous muscle of the neck (m. platysma) and after division in the skin they finally connect with the vessel system of the axial arteries. The venous outflow passes into the external jugular veins.[10]

These anatomical data defined the borders for mobi-

lization of the flap with preserved axial vessels from the lateral surfaces of the neck and the anterior surface of the chest. The flap includes skin and subcutaneous fat. Our observations have found that elasticity and the possibility of replacing the flap to the face are restricted by m. platysma and fibrous connections, when fixing the flap in the subclavian and sternum areas. For this reason, the technique of mobilization is performed in the following way: we mobilize the flap along the superficial fascia, covering m. platysma to 5-6 cm below the clavicle; if this is followed by careful splitting of subcutaneous fat along the superficial fascia, bleeding is not significant and is completely stopped by vigorous pressure under the flap using wads of gauze. After mobilization of the fat-cutaneous layer and its replacement on the face, we define borders for safe excision of scars. In most cases one stage was sufficient to remove a scar strip in the lower part of face 5-7 cm wide, approximately to the level of the corners of the mouth or the joints of the mandible. After scar excision we replace the neck tissue on the face and fix it to the upper margin of the operative wound with two lines of cosmetic sutures. The space under the flap is usually divided from the margin of the mandible into two parts. For this reason, drainage by a single vacuum system is performed for both parts of the space to prevent formation of haematomas both on the neck and on the face.

Fig. 1 - Right-sided scar deformity and defect of face involving part of chin and lips**.**

Fig. 1a - Pre-operative view, borders marked of scar excision and flap mobilization.

Fig. 1b - Result of reconstruction by neck flap.

Fig. 2 - Extensive scar deformity of lower part of face involving part of chin and lips.

Fig. 2a - Pre-operative basal view.

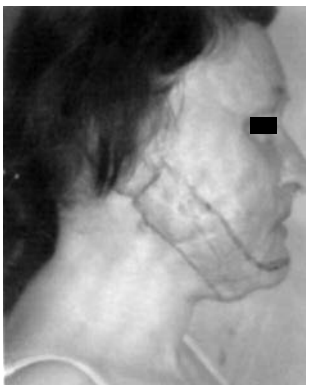

Fig. 2b - Pre-operative right profile view.

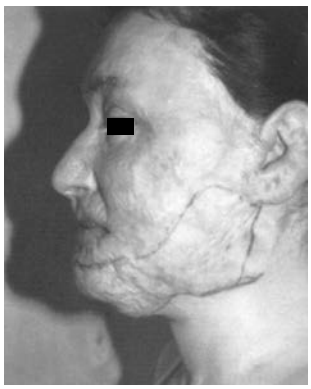

Fig. 2c - Pre-operative left profile view.

Fig. 2d - Mobilized fat-cutaneous neck flap.

Fig. 2e - Post-operative frontal view.

Fig. 2f - Post-operative right profile view.

Fig. 2g - Post-operative left profile view.

Reconstructive operation for one-sided scar lesions in the lower part of face involving part of the chin and lips. This operation requires distribution of mobilized neck flap according to the shape of the face wound (*Fig. 1a*). We perform the incision along the lower margin of scars in the mandibular area, continue it on the chin to the midline of the neck or slightly longer, and turn it down across the submandibular area approximately at the level of the middle length of the neck. Mobilization of the flap is performed using technique described above. As a large flap is needed to close the wound on the face adequately, we usually continue mobilization in the lower part of neck, the subclavian areas, and the manubrium of the sternum areas. Although reconstruction is required for only one side of the face, we perform mobilization of the flap symmetrically both on the neck and on the chest to achieve better distribution of tissue and to prevent the formation of folds and disfigurements on the face. We then excise the scars on the face and release the lips and corner of the mouth from stretching by scars. The mobilized flap has two angles: the upper angle we orientate at the ala of the nose, and the lower angle of the flap at the lower lip. Between these angles we dissect the margin of the flap at the level of the mouth aperture slot and replace both parts to embrace the corner of the mouth. The length of the dissection depends on the severity of the lip lesions: the larger the part of flap needed to restore the lips, the longer the dissection of the flap (*Fig. 1b*).

Reconstructive operation for extensive scar lesions in the lower part of the face involving part of the chin and lips (*Figs. 2a,b,c*). The peculiarity of this plastic operation is the length of the operative wound on the face, which exceeds the width of the mobilized tissue on the neck, particularly in patients with a thin neck. Therefore, if the operation simultaneously replaces neck tissue mobilized to the face, the blood supply above the chin may be crucially reduced owing to the severe strain, which may lead to necrosis. In this situation we include skin of the postauricular area in the neck flap (*Fig. 2d*). This allows us to replace tissue in the face and form the chin without stretching. The mobilized layer is dissected along the midline of the neck and both parts of the flap are replaced on the cheeks. The middle part of the flap is transferred to the chin and fixed at the base of the lower lip (*Figs. 2e,f,g*).

Reconstructive operation for extensive scar lesions in the lower part of the face with preserved chin and lips (*Figs. 3a,b,c*). This type of scar lesion is highly indicated for plastic surgery using a neck flap because its replacement needs only equal traction upwards without any strain on the flap in a transversal direction. The incision is performed along the lower margin of the scars, very often from one ear to the other or from one angle of the mandible

Fig. 3 - Extensive scar deformity of lower part of face with preserved chin and lips.

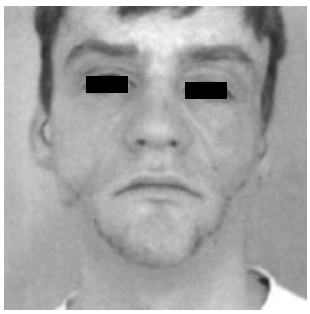

Fig. 3a - Pre-operative basal view.

Fig. 3b - Pre-operative right profile view.

Fig. 3c - Pre-operative left profile view.

Fig. 3d - Mobilized neck flap**.**

Fig. 3e - Post-operative frontal view.

Fig. 3f - Post-operative right profile view.

Fig. 3g - Post-operative left profile view.

to the other. Mobilization of the neck flap is performed according to the technique described (*Fig. 3d*). To improve further distribution of the tissue we dissect the flap along the midline of the neck at 4-6-8 cm and replace both parts of the flap around the preserved chin on the left and right cheeks. This division of the upper part of flap into two parts facilitates further mobilization on the anterior surface of the chest. For good aesthetic results in this reconstructive surgery it is very important to pay special attention to the location of corners and the aperture of the mouth and to the symmetrical distribution of replaced tissue on the operative wound (*Figs. 3e,f,g*).

Results of reconstructive operations. Marginal necrosis measuring up to 0.5 cm resulting from ischaemia and overstrain of the distal part of the neck flap was observed in five patients (2%). This complication did not require reoperation because all these little wounds healed by second intention with limited scarring and acceptable aesthetic results.

Follow-up results (6 months to 10 years) were observed in 170 patients (68.5%). All these had a good postoperative aesthetic and functional outcome. Replaced neck skin on the face had a natural colour, texture, elasticity, and thickness and was similar to other parts of the face. The neck-submandibular angle and neck contour were not significantly different from the natural condition.

Conclusion

In conclusion we express the opinion that surgical reconstruction using the neck flap is indicated in all cases of scar lesions of the lower part of the face if skin in the neck and frontal surface of the chest is preserved.

RÉSUMÉ. Le visage est une partie du corps fréquemment intéressée par les brûlures. Les séquelles cicatricielles dues aux brûlures dans cette zone du corps portent souvent à l'invalidité et à des problèmes psychologiques pour les patients. Les méthodes de la chirurgie plastique communément employées peuvent présenter des désavantages. En particulier, il est très important, dans la reconstruction chirurgicale du visage, de trouver du matériau plastique qui possède les mêmes propriétés: texture, couleur, épaisseur et élasticité naturelle. Dans ce but les Auteurs, à la Division de Chirurgie Plastique et Reconstructrice, Institut de Chirurgie A.V. Vishnevsky, Académie Russe de la Science Médicale, utilisent le lambeau du cou gras-cutané selon la distribution anatomique des vaisseaux. Ils décrivent certaines situations cliniques typiques et des variantes possibles de la chirurgie plastique avec l'emploi du lambeau du cou, sur la base de leurs expériences acquises au cours du traitement chirurgical de 248 patients. Selon l'opinion des Auteurs, l'application du lambeau du cou est préférable aux autres techniques reconstructrices de la partie inférieure du visage dans les patients qui conservent de la peau dans le cou et la surface antérieure de la cage thoracique.

BIBLIOGRAPHY

1. Ye E.M.: Psychological morbidity in patients with facial and neck burns. Burns, 24: 646-8, 1998.
2. Fan J.: Tissue expansion of a tube flap during the last transferring stage in reconstructions of the face and neck. Scand. J. Plast. Reconstr. Hand Surgery, 32: 229-32, 1998.
3. Fan J.: A new technique of scarless expanded forehead flap for reconstructive surgery. Plast. Reconstr. Surgery, 106: 777-85, 2000.
4. Foyatier J.L., Comparin J.P., Latarjet J., Delay E.: Repair of sequelae of facial burns by cervical cutaneous expansion. Ann. Chir. Plast. Esthet., 38: 27-33, 1993.
5. Haddad-Tame J.L., Chavez-Abraham V., Rodrigues D., Reynoso-Campo R.: Reconstruction of the aesthetic units of the face with microsurgery: Experience in five years. Microsurgery, 20: 211-5, 2000.
6. Hoekstra K., Hudson D.A., Smith A.W.: The use of pedicled expanded flaps for aesthetic resurfacing of the burned face. Ann. Plast. Surgery, 45: 1-6, 2000.
7. Hyakusoku H., Takizawa Y., Murakami M., Gao J.H.: Versatility of the free or pedicled superficial cervical artery skin flaps in head and neck burns. Burns, 19: 168-73, 1993.
8. MacLennan S.E., Kitzmiller W.J., Mertens D., Warden G.D., Neale H.W.: Scalp autografts and hair transfer to the face in the burned child. Plast. Reconstr. Surgery, 102: 1865-8, 1998.
9. Woo S.H., Seul J.H.: Pre-expanded arterialised venous free flaps for burn contracture of the cervicofacial region. Br. J. Plast. Surgery, 54: 390-5, 2001.
10. Ostrovsky N.V.: Anatomical and surgical substantiation of methods by flap plastic for post-burn sequels. Abstract of Doctor of Medicine dissertation, Saratov, 37, 1995.

This paper was received on 19 April 2005.

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