THE METHOD OF MICROGRAFTING IN THE TREATMENT OF LARGE AREA FULL-THICKNESS BURNS

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SUMMARY. A method is proposed for the treatment of large area full-thickness burns (over 40% total body surface area). The preparation of small grafts, called microstamps, is described together with the method of their application to the wound surfaces. The various advantages of the method are defined: use of a small area autograft (some sq. cm), possibility of a large coefficient of distribution up to 1:9, possibility of combination with other methods, use of small donor sites from which it is not possible to take full skin grafts, and good final results.

Introduction

A basic method in the operative treatment of large bums is the use of small skin amografts to cover large wound areas. This is performed using various methods of enlargement of the graft area. A number of methods have been elaborated for the perforation and enlargement of such grafts. In 1968 Hermans was the first to try to cover a wound with a skin graft of smaller area than the wound. The aim was to cover as much as possible of the wound area (depending on the coefficient of perforation) with skin grafts that were as small as possible. The method became increasingly popular over the years. Various devices are used for perforation of the skin autografts - Tanner dermatome, Zimmer dermatome, Bioplast dermatome,perforation of the donor site, and modified and handmade devices.
In 1958 Meek presented the Humeca dermatome for the preparation of small skin autografts of several sq. cm, a technique he called "micrografting". Kreis and Vloemans developed the method clinically at the Red Cross Hospital, Beverwijk, Holland. Today micrografting is used in various centres all over Europe. In Bulgaria the method has been adopted only at the SIEM Pirogov Centre. We apply the method in burns of more than 40% TBSA.

Working experience

We cut the skin autografts using a special Humeca dermatome which ensures that the stamps are of equal size and that the distance between them is accurately defined. The skin grafts are cut in pieces measuring 4.2 x 4.2 sq. cm and placed on a special cork base. A separate small part can also be added on top of this until the whole area of the cork base is filled. An electric mechanism with 13 knives is used to cut the graft; the distance between the cuts is 3 mm. After the first insertion of the graft under the knives it is rotated 90° and inserted under them again.
Small marks of 3 x 3 mm are thus made. After cutting, the micromarks are

sprayed with a special glue (Leucospray) and glued to a gauze. Depending on the indications we use a distribution coefficient of 1:4, 1:6, or 1:9. After adhesion of the marks to the gauze, the gauze, which is crimped, is extended on all sides, and the extension previously set by the gauze net is achieved. We place the previously prepared micromarks on the wound surface. The aluminium foil is removed from the back of the gauze and the wound is dressed as usual.

After five days the dressings are removed and the gauze is spread over with silver sulphadiazine. The day after the gauze is soft, it is removed from the wound surface. The grafts are cleaned and future steps are considered. In patients subjected to early surgical necrectomy, the wound surface and the grafts are covered with a skin allograft perforated 1:1.5 (sandwich method). Epithelialization of the marks begins under the skin allograft. The dressings are changed in two or three days. If the marks are put over a granulating wound surface they can be covered with a skin allo- or xenograft. If there is a lack of such grafts the wound can be covered with ointment dressings. These are exchanged every other day. As in the Chinese marks method (which we also use), epithelialization begins from the mark edge up to full epithelialization of the wound.

The figures below illustrate the case of 16-yr-old patient surgically treated using this method. The patient was burned in 65% TBSA in the back, chest, arms, and legs. He was in thermal shock and had inhaled smoke. The agent was flame. The patient was transferred to our centre 14 h after the accident. On days 3, 5, and 7 we performed early surgical excision of necrotic tissue in the legs, chest, and belly in 32% TBSA, leaving 14% disseminated necrotic tissues. The wound surfaces were covered with micrografts in five surgical steps every third to fifth day. The total donor site area was 14%. The donor sites were large because of the need to change some of the marks in subsequent surgical stages. During treatment the patient developed generalized bacterial infection, which was appropriately treated. On day 79 he was discharged in good health (Figs. 1-8). The area of the skin autografts performed in this patient was less than 2% TBSA and the blood loss from the donor sites was no more than 300-400 ml. In the third operation on a separate site we left the gauze until day 7-9. We do this only when the grafting is good and there is no local infection or exudation. After removing the gauze we observe initial epithelialization between the marks. It is important to bear in mind that in certain conditions removal of the gauze can be postponed until later than the time normally proposed. The advantage of this is that the sterile milieu is left undisturbed, some of the marks remain stable, and the allograft is not necessarily used to cover the wound surfaces.

Fig. 1 - Patient with 65% TBSA burns immediately after accident. Front.

Fig. 2 - Patient with 65% TBSA burns immediately after accident. Back.

Fig. 3 - Both thighs after surgical necrectomy.

Fig. 4 - Thighs covered with microskin grafts.

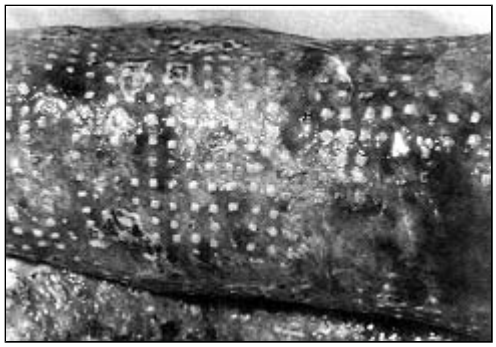

Fig. 5 - Microskin grafts on 5th day after operation. Detail of graft island covered wound.

Fig. 6 - Micrograft covered with allografts.

Fig. 7 - Final results after 4 years. Front.

Fig. 8 - Final results after 4 years. Back.

Discussion

In extensive burns covering more than 30% T13SA, whole autografts can be used only in 18% of surgically treated patients and donor sites are limited.' If donor sites are used, the treatment continues for several months, with numerous operations - a period during which the patient may develop a severe catabolic syndrome, organ insufficiency, and generalized infection, which can be fatal. The micromark method is a development and an improvement in the methodology of the treatment of extensive burns, thanks to a different combination of small autografts. Shvets8 and Kreis9 recommend the method for the treatment of burns in 45-75% TBSA and indicate a perforation of the graft over 1:4. Kreis2 observed over 90% healing of the marks in 16 patients with extensive burns. On day 6 post-surgery Zermani observed 93% healing in micromarks and 80% in perforated mesh autografts. We use the method in burns of over 40% TBSA." We followed the Chinese method until 1996 but our manual preparation of the application of the marks was not sufficiently accurate." With the micromark method, the distribution achieved corresponds exactly to that planned, whereas with the mesh graft technique the coefficient is smaller (20-45%), depending on the kind of perforation .Z~"'3 The method can be used together with other mesh graft techniques. The microtechnique combined with allograft ensures better results, especially if removal of the necrotic tissues is performed early. This technique obviates the application of tissue cultures.

We believe, like many other researchers, that the micromark method presents the following advantages:

- simplicity and effectiveness; possibility of combination with other methods, e.g. mesh graft and tissue cultures
- small size (up to some sq. cm). Autografts are used, which is why the method is called the micromark method. This is very important in large burn areas with many wounds and a lack of donor sites
- necessity of a small area (some sq. cm) of donor sites from which we are not obliged to take whole autografts
- the surgical operation is not very traumatic and bleeding from donor sites is limited owing to the reduced operative volumes
- possibility of a large coefficient of distribution (up to 1:9). This ensures a single moment for coverage together with the epithelialization process, which reduces the risk of local and general infection and organ insufficiency
- the gauze supporting the marks helps to place and fix them in points of difficult access, such as the armpit and gluteal fold
- the graft's effective distribution is the same as its theoretical distribution. This is important in the planning of operative volumes and donor sites
- the operative technique reduces the number of donor site areas, which is important in very extensive burns. The donor site can be some sq. cm without any definite effect on the results
- easy orientation of the sides (upper side, epidermal; lower side, dermal) of the marks because they are fixed to the gauze. In large distributions of the cut and perforation (over 1:6), especially on second use of donor sites in extensive burns, orientation of the graft sides is very difficult and wrong

positioning leads to failure

- the marks can be placed on prepared places, which are ready to receive a skin autograft
- epithelialization between the marks occurs at smaller distances than with all other grafting methods (mesh grafts, Chinese method). This leads to rapid wound coverage
- the marks rarely drop off during wound dressing. This would compromise the method, as happens when wide perforated mesh grafts detach from a wound
- in the event of failure caused by an infectious complication, only some of the marks are affected and the epithelialization process in other sites surrounding other marks continues successfully work with the method is easy and a large wound area is covered with a small donor site
- working time is shortened owing to the use of technical devices (machine, dressing, glue, etc.)
- the patients' faster healing shortens the period of treatment and reduces the cost of hospital stay
- functional results after treatment are similar to those with mesh grafts; aesthetic results are better with the
- micromark method. There is no great difference between the scars and those observed with other methods"'S one disadvantage of the method is the loss of marks due to their small size. But this in no way affects the method as a choice of treatment.

Conclusion

The Meek micrografting method is suitable in the treatment of burns in over 40% TBSA. Its application saves the lives of patients in whom other operative methods do not have positive results. The method is recommended when for various reasons other methods are impossible (tissue cultures). The late results of the micromark method are good.

RESUME. L'Auteur présente une méthode pour le traitement de brûlures de grande étendue (> 40% de la surface corporelle). Il décrit la préparation de ce qu'il définit les microtimbres, comme aussi la méthode d'application sur les brûlures. Cette méthode offre une série d'avantages: l'emploi d'autogreffes de dimensions limitées (quelques cm^2), possibilité d'un coefficient de distribution élevé jusqu'à 1:9, possibilité d'association à d'autres méthodes, emploi de sites donneurs que l'on ne peut pas utiliser pour des greffes cutanées à toute épaisseur, et bons résultats finals du traitement.

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