

## SOME PECULIARITIES OF SKIN HOMOTRANSPLANTATION IN SMALL LABORATORY ANIMALS

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A convenient object for the study of problems of tissue incompatibility arising during transplantation of organs and tissues is homotransplantation of the skin in laboratory animals.

Methods of free grafting of the skin in man are widely discussed in the literature [1-3, 5, 10]. Transplantation of the skin in laboratory animals has certain differences from free skin grafting in man, which are due to the special features of the structure of the skin in animals. Nevertheless, problems of transplantation of the skin in laboratory animals have been examined very inadequately [9, 11]; in particular there is no description of a single operative technique, on which depends, to a large extent, the fact that the results obtained by different workers during homotransplantation are dissimilar. We shall describe the operation of transplantation of the skin in rats, believing that this will help to secure standardization of the method of free grafting of the skin in laboratory animals.

Auto- and homoplastic transplantation of the skin were performed by the same method, so that one description of the method will suffice. On the day before operation the hair was clipped in the region of the operative field from an area much larger than the flap to be transplanted, so that the fur would not fall into the wound during the operation. We did not shave the skin, since the scabs which form at the site of injury to the epithelium make it difficult to assess the state of the transplantates later on. On the day of operation the operative field was twice treated with 70° alcohol. The operation was performed under sterile conditions and under ether anesthesia. Full thickness skin flaps were used for transplantation. The subcutaneous and muscle layer acted as base of the wound.

Lightly with a scalpel the border of the chosen area of the donor's skin was marked out, and the same done with the recipient. Next, the edges of the cut skin were seized with forceps of hemostats and, lifting the flap steadily, the skin was separated with a scalpel or scissors from the underlying subcutaneous and muscular layer. The skin is more easily separated in the direction from head to tail (Fig. 1). If care is used in separating the skin and no injury is caused to the subcutaneous and muscular layer, the whole operation may be carried out almost bloodlessly. Only pinpoint hemorrhages were observed from the divided vertical branches joining the superficial and deep vascular plexuses. If the subcutaneous and muscular layer were injured during operation, careful hemostasis was secured to prevent hematoma formation and detachment of the graft. After separation of the graft and preparation of the bed, the skin flap was transferred to the recipient and placed so that the direction of growth of the hair on the graft was opposite to or perpendicular to the direction of growth of the surrounding hair. Thanks to this, the transplantate was readily identified from the surrounding tissue. The graft was fixed to the skin with a continuous suture.

Particular attention must be drawn to the fact that no underlying tissue from the subcutaneous and muscular layer must be left on the graft, otherwise the survival of the transplanted tissue is jeopardized. This can be seen



Fig. 1. Separation of the flap during free grafting of the skin in a rabbit. 1) Separated skin flap; 2) underlying subcutaneous and muscular layer .

#### Results of Skin Transplantation

Survival of transplantates	Transplantates			
	with subcutaneous muscular layer		without subcutaneous muscular layer	
	in rats	in rabbits	in rats	in rabbits
Survived	0	2 (partially)	30	20
Did not survive	11	8	0	0

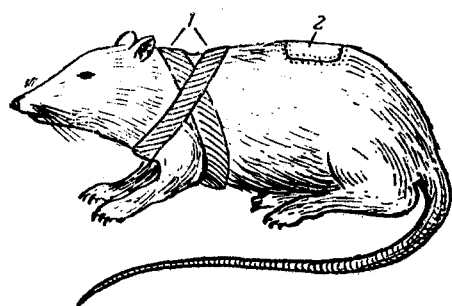


Fig. 2. Scheme of the application of the plaster bandage. 1) Plaster bandage; 2) transplantate.

from the table, in which are shown the results of auto-transplantation of the skin, depending on whether the subcutaneous muscular tissue was left on the graft or was removed from it.

To obtain better fitting of the graft to the underlying tissue, the skin flap was cut slightly smaller than the wound surface of the recipient, for this ensured slight stretching of the graft. In addition a pressure dressing was often placed over the transplantate, and fixed to the surrounding skin with silk ligatures. The sutures were taken out on the 10th-12th day after operation. In order to prevent the animals (especially the recipient rats) from biting the grafts, a light crossed plaster bandage was applied to the recipients in the region of the neck and chest, which restricted the movements of the head and body of the animal (Fig. 2).

The viability of the auto- and homotransplanted was assessed by their clinical condition (consideration was paid to the color, consistency, mobility, character of growth of the hair of the transplanted skin flaps), and also by the state of vascularization of the transplanted by the capillaroscopy method [4, 12, 13] and by making incisions in the graft..

For capillaroscopy the animal was fixed to the bench. An area of the transplantate, free from pigmented areas (or dark colored hair), which greatly interfere with the capillaroscopic examination, was shaved. The hair growing on the graft was trimmed. Next, in order to make the skin more transparent, a few drops of liquid mineral oil were placed on the graft, cedarwood, clove or bone oil may also be used [6, 10]. From 10 to 15 minutes afterwards the examination was carried out by means of a binocular loupe MBS-2 or an ordinary capillarscope, mounted on a universal physiological stand. The capillaroscopic examination was made at intervals of 1-2 days after the 2nd-4th days after the transplantation. Disturbance of the circulation in the transplanted skin flap was regarded as an indication of death of the transplantate.

In order to assess the state of the circulation in the transplanted skin flap by the incision method, superficial epidermal scarification, 0.3-0.5 cm in length, was carried out with a razor on the graft. When the circulation in the graft was functioning, the incision was quickly filled with blood flowing from the divided vessels.

#### SUMMARY

A technique of free skin grafting in small laboratory animals is depicted along with various methods of evaluating the condition of the transplantates.

Skin transplantates devoid of subcutaneous muscular layer are recommended.

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