EXPERIMENTAL STUDIES ON ONE-STAGE MULTIPLE HOMOPLASTY

M. Genova, L. Pashev, D. Popova, E. Maleva

Skin homografting in management of extensive wound defects acquires a constantly growing significance in clinical practice recently, particularly in as much severe, almost incompatible with life, deep and extensive burns are concerned. Nevertheless, the fact that homoplastic grafts, following a temporary „take" are rejected shortly thereafter, has discouraged many a surgeon. The problem acquired particular actuality and complexity after considering it in the light of its immunological aspects. Up to the present day, however, the process of homograft rejection remains obscure. The complexity of the problem becomes more salient when lengthening the term of implanted homologous skin viability is endeavoured, and particularly, when explanation is attempted of reports on single, sporadic successes achieved in this respect. There are no reports in literature as yet claiming long-lasting (definitive) „take" of homologous skin, the only exception being that of monozygotic twins. In Bulgaria, at the Burns Department — Institute for First Aid „Pirogov" (*Ranev, Mechkarski*), observations have been made on a young worker, severely burned in an industrial accident, to whom homologous skin was grafted, furnished by four individuals (friends of the affected). Lasting adherence of the skin was achieved for a period longer than one year. The lasting „take" should be interpreted on the ground of some of the existing hypotheses postulated, namely: close genetic structure of the donors and recipient, immunological paralysis, proved as early as 1949 by *Felton*, concurrence of antigens, discovered by *Wiener* and break down of reticuloendothelial system. It is very difficult for the clinician to make the decision alone which one of the listed theoretical explanations is most feasible in a particular case. Here the efforts are required of a complete team of specialists from confining medical sciences. It is quite possible that lasting „take" of transplants from different donors is due to reduced immunological activity on behalf of the host, accounted for by the concurrence existing between the different antigens introduced.

With the present work we aim to prove experimentally the possibility of increasing the percentage of lasting „takes" of homologous skin or of lengthening the term of (postponing) transplant rejection. For the purpose, we resorted to one-stage multiple homoplasty in the treatment of extensive wound defects.

Method

The experiments were carried out on 200 adult albino rats with varying weight; our goal was to avoid isologous homotransplantation and phenomena

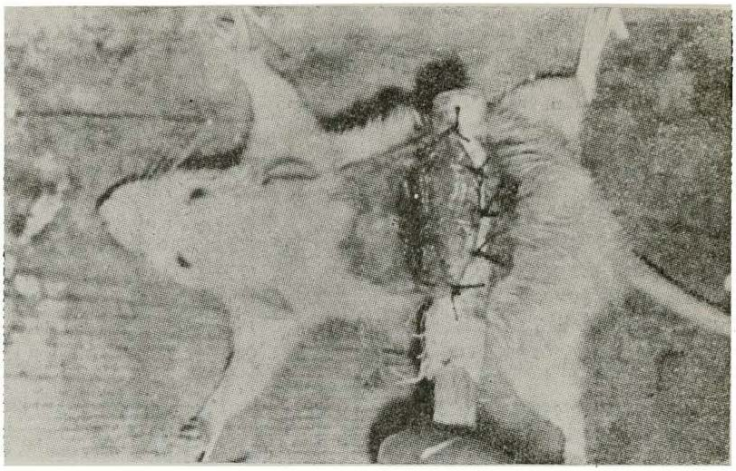

Fig. 1. Cutting the transplant

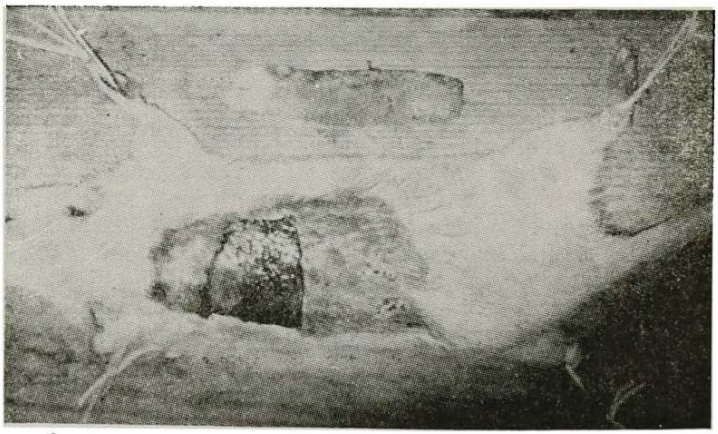

Fig. 2. The area prepared for receiving transplantation

labelled as acquired immunological tollerance of Burnet and Medawar. During experimentation strict asepsis was not observed, providing identical conditions for all experiments. The skin was cut after preliminary depilation, from the back of the test animals with sizes 6 : 4 cm with scalpel or special wooden roller, in full thickness. Initially, the removed pieces (flaps)

were fixed by means of silk sutures, but subsequently, we began fixing them with vitaminized vaseline ointment, gauze and plaster cast dressing only. The first check examination of the wound was made on the third posttransplantation day, and subsequently dressings were made every 2—3 days,

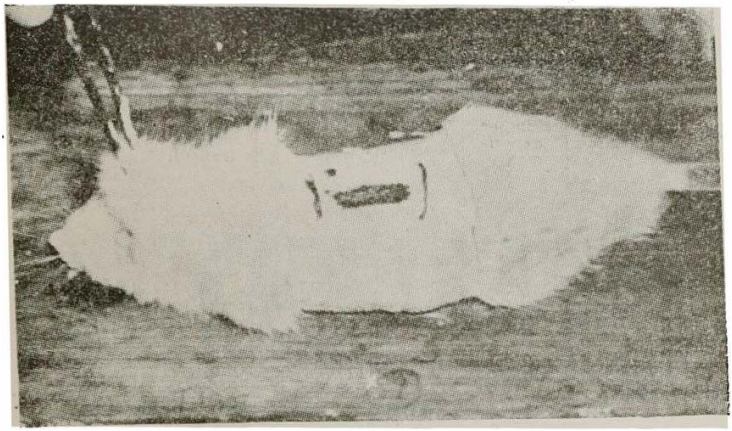

Fig. 3. Plaster-cast dressing for post-transplantation fixation

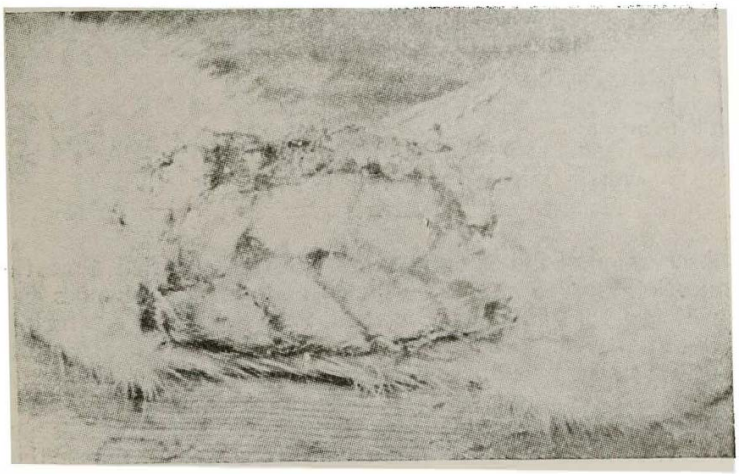

Fig. 4. A good „take" of 8 pieces (flaps) from 8 different rats

always resorting to general ether anesthesia. The photographs hereby enclosed illustrate the method of graft prelevation, its fixation and one case with good „take" of full-thickness whole grafts.

The experimental animals were divided into 4 groups: I group — 50 rats, each grafted four times with skin obtained from different donors (one-stage multiple homoplasty); II group — controls — also 50 rats, which received

similarly 4 grafts, but this time obtained from the same donor (one-stage simple homoplasty); III group — 50 rats to which 8 pieces were grafted per rat, taken from 8 different donors and IV group — controls — 50 rats with 8 pieces grafted, prelevated from the same donor.

The experimental material is illustrated in tables I and II.

Table 1

One-stage multiple homoplasty on 100 rats

	Type of transplantation	Number experiments	Transplants accreted	%	Take whole transpl.	%	Take island transpl.	%
1	Grafted 4 transplants from 4 different rats	50	35	70	21	60	14	40
2	Grafted 8 transplants from 8 different rats	50	39	78	26	66,6	13	33,4
	Total	100	74	74	47	63,5	27	36,5

Table 2

One-stage simple homoplasty on 100 rats

	Type of transplantation	Number experiments	Transplants accreted	%	Take of whole transplantation	%	Take of island transplantation	%
1	Grafted 4 transplants obtained from 1 rat	50	27	54	5	18,5	22	81,5
2	Grafted 8 transplant-obtained from 1 rat.	50	26	52	13	50	13	50
	Total	100	53	53	18	34	35	66

The observation of the experimental animals revealed that the onset of graft rejection (proved merely on the ground of colour changes and drying of grafts) in nearly all animals occurred on the 3—4th day, which could be explained with the fact that during this period the plasmatic nutrition of the homograft is still existant with supply of humoral antibodies, whereas cellular antibodies have not yet fully penetrated the organism. The average term in instances with complete rejection of the homografts is up to the 17—20-th day. A lasting „take" of homografts, as illustrated in the tables, group I, is obtained in 70% of the cases, against 54% in the controls (for durably accreted transplant that one is considered which has been maintained up to 100 days). This percentage grows to 78% in the III group against 52% in the control IV group. It is worth mentioning that accreted grafts in multiple homoplasty are qualitatively superior, namely: we achieved „take" of whole transplants in 63,5% and only in 36,5% the „take" was partial (in the form of epithelial islands). Reversed proportion is noted in one-stage simple homoplasty, in which whole transplants have accreted in 34% and island grafts — in 66%.

Inferences

1. Multiple one-stage homoplasty in treatment of extensive wound defects in experiment, yields encouraging results insofar percentage of lasting „take" is concerned of the graft.

2. The more numerous the different donors, the higher the percentage of instances of durably accreted grafts and superior the quality of „take".

3. The mechanism of this phenomenon could be possibly explained with the so-called antigen concurrence.

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ЭКСПЕРИМЕНТАЛЬНЫЕ НАБЛЮДЕНИЯ ОДНОМОМЕНТНОЙ МНОЖЕСТВЕННОЙ ГОМОПЛАСТИКИ ПРИ ЛЕЧЕНИИ ОБШИРНЫХ РАНЕВЫХ ДЕФЕКТОВ

М. Генова, Л. Пашев, Д. Попова, Е. Малева

РЕЗЮМЕ

Работа экспериментального характера с целью проверки возможностей удлинения срока отделения гомотрансплантата или продолжительного приживления гомотрансплантата посредством одномоментной пересадки нескольких кожных гомотрансплантатов, взятых от различных доноров. Опыты проведены на 200 крысах, разделенных на 4 группы: I группа — 50 крыс, которым пересажено по 4 трансплантата, взятых от различных доноров; II группа — 50 крыс, которым тоже пересажено по 4 трансплантата, но взятых от одного донара (контрольная группа); III группа — 50 крыс, которым пересажено по 8 гомотрансплантатов

от различных донаров и IV группа — 50 крыс с пересадкой 8 трансплантатов от одного донара. Опыты убедительно доказывают, что при одномоментной множественной гомотрансплантации кожи достигается значительное удлинение срока отторжения трансплантата, а в некоторых случаях и продолжительное удерживание эпителия, и увеличения процента приживления целых трансплантатов. Для объяснения этого факта авторы допускают существование т. н. конкуренции антигенов.