EXPERIMENTAL MODEL FOR ASSESSING WOUND PREPARATION FOR SKIN AUTOGRAFTING

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Free skin autografting is a method of surgical treatment of extensive wounds. The efficacy of this method is determined by the degree of survival of the autografted skin which, in turn, depends on the state of the bed receiving it. The more rapidly and frequently the wound surface is prepared for grafting, the greater the chances are that the skin autograft will take. In clinical practice various methods, previously developed under experimental conditions, are used to prepare the wound surface for skin autografting [1, 3, 4]. To assess the efficacy of the different methods, an experimental model of free skin autografting is used, as follows: after infliction of various wounds (including burns) and preparation of the wound surface for skin autografting by methods to be tested, until cleansing of the wound is complete, a skin autograft of the required size is transplanted from the donor area of the animal to the prepared wound surface [2, 3]. However, it is difficult to conduct research on such a model, because the results obtained by it are not standardized and it is difficult to draw general conclusions from them. Moreover the experiments take place over a long period of time, they use many animals, and they necessitate treatment on the additional wounds formed when the skin autograft is taken from the donor area; all these factors involve additional time and expense, and they adversely affect the main end results, for each animal is subjected to trauma twice.

To reduce the time taken in the experiments and to reduce wastage, while obtaining standard and "pure" results, a new method of creating a simplified model of skin autografting was developed in experiments on 20 rabbits and 40 male albino rats. The method is as follows. After removal of the hair on the required region of the animal's body (the cervical region in rats, the lateral part of the lumbar region in rabbits), under local anesthesia and observing the rules of asepsis and antisepsis, two symmetrical semilunar incisions were made, with their concave sides facing one another (Fig. 1:1), with a distance of 1 cm between the incisions, and with a ratio of the length of the incision to the radius of its curvature of 1:1.5. Next, in the area between the two incisions, the layer of skin with the underlying areolar tissue was separated from the underlying muscular layer (Fig. 1:2). The slight bleeding was stopped by pressure over a gauze pad. A piece of fluorine plastic sheet, with lattice structure and semilunar edges, corresponding to the area of the detached piece of skin, and lifting it through a distance of 1.5 cm above the wound formed beneath it, was introduced into the cavity thus formed (Fig. 1:3).

Thus without disturbing the blood supply to the detached area of skin (the conventional skin autograft), a model of a wound with an area of 600 mm^2 was obtained beneath it (Fig. 1:4). Treatment of the wound surface with trypsin, solutions of hydrogen peroxide and antiseptics, 5% methyluracil ointment, and three layers of collagen sponge, began 2 days after the operation. Granulation tissue (i.e., complete cleansing of the wound surface) was formed on the 5th day, after which the piece of fluorine plastic was removed from beneath the area of skin, which was lowered on to the cleansed wound surface (Fig. 1:5), fixed around the edges by four interrupted sutures, and covered by a bandage.

The method of skin autografting described in the literature was used as the control on 10 rabbits as follows: in the same region as in the experiment, after removal of the hair, an area of skin together with the subcutaneous areolar tissue, oval in shape and with an

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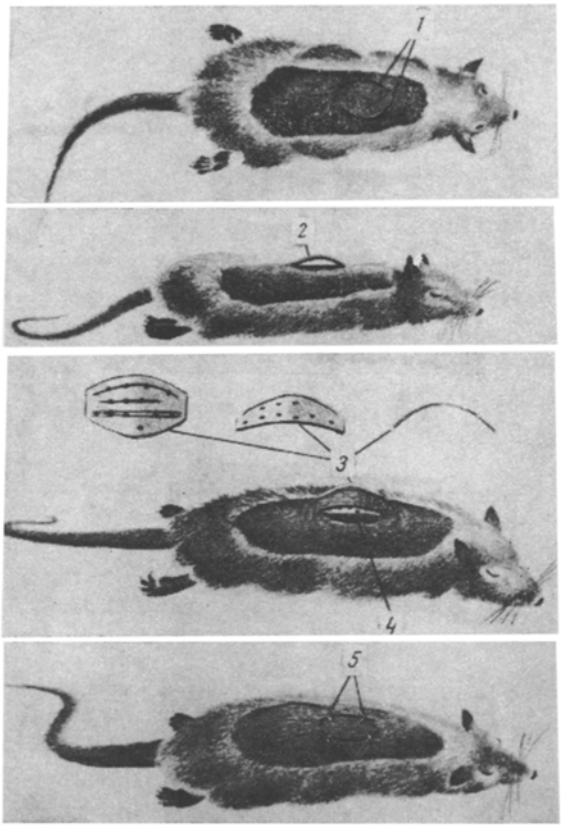

Fig. 1. Scheme showing stages of preparation of wound surface for skin autografting. 1) Line of incision; 2) detached area of skin (conventional skin autograft); 3) fluorine plastic sheet with lattice construction; 4) wound beneath plastic; 5) general view of skin graft at end of experiment.

area of 600 mm^2, was removed under local anesthesia with observance of the rules of asepsis and antisepsis. Preparation of the wound surface for skin autografting began 2 days after wounding: primary surgical toilet, irrigation with hydrogen peroxide and solutions of antiseptics and enzymes, followed by application of a sterile dressing with collagen sponge. On the appearance of granulations (after 12 days) on the contralateral side a skin graft corresponding in area to the wound was excised, and after a few perforating incisions had been made in it, it was applied to the prepared wound surface and fixed at the edges with six interrupted sutures. The donor wounds were treated by the usual methods.

Analysis of the results showed that in the experimental series all the autografts took on all the rabbits. The postoperative course was uncomplicated and the wounds healed by first intention without any complications. By the 10th-15th days the autograft was indistinguishable drom intact skin morphologically. In the control, the skin autograft transplanted to the wound surface dried up during the first days after the operation, shrank, and was partially or completely rejected as a primary scab after 5-10 days in eight rabbits was a partial take of the graft obtained (at the sides). After rejection, the wounds healed under a scab. The time taken for complete healing was 23 days. Consequently the final duration of the experiments in the control series averaged 47 days. With the suggested model, however, this period was reduced to only 22 days.

Positive results also were obtained in the experiments on rats. Thus the duration of the experiments was 17 days in the experimental and 24 days in the control series.

The method of creating a model of skin autografting described above thus enables the duration of the experiment to be greatly reduced (by 33 to 50%), the number of animals required to be reduced by 75-80%, and also a considerable reduction in the cost of keeping the animals and supplying dressings, a matter of great practical importance.

The simplicity of this suggested method and the economics it provides enables it to be recommended for widespread introduction in the future into experimental surgery for evaluation of the efficacy of methods under development for preparation of the wound surface for skin autografting resulting in great saving of time and expense.

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