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Studies on Homoio Transplantation of Skin Flaps.

PHINEAS RABINOVITCH. (Introduced by W. D. Collier.)

From the Department of Surgery, St. Louis University School of Medicine.

It has been our aim in this work: (1) To study the development of circulation in homoio transplantation of skin flaps, and (2) to determine the fate of the flap when the circulation has been established.

Guinea pigs were used for our experiments. Skin flaps 2½" x 1½" were raised from flank and lateral wall of chest of one animal (Animal A) and applied to defect on back of other animal (Animal B). Entire thickness of skin was used. A flap thus applied from animal A would receive its blood supply from animal A until vascular communications had been established with B. The 2 animals were kept together, strapped with adhesive. At 24-hour intervals, for 14 days, animals were killed and sections including flap, adjoining skin, and underlying tissues of B, were removed for microscopic examination. Three such series of experiments were followed. Related and unrelated animals were used, and blood matching was done, before and after operation.

The microscopic examination of the tissues at different stages of union reveals the following: Immediately after the flap was placed upon its new bed, a fibrin network is formed which seals it in place, and later by contraction, pulls the 2 raw surfaces together. After 24 hours, granulations begin to sprout out from the host and invade the flap, and are associated with moderate leucocytic infiltration. The flap produces a much less active reaction. By the 4th day there is complete absorption of fibrin and hemorrhage, and complete granulation healing of the line of suture. Different animals show variations in union and in reaction, but in all sections complete union is seen on beginning of the 5th day. From 4 to 8 days both host and flap show healthy tissues and granulation, and

capillaries are seen communicating between host and flap. On the 9th and 10th day (sometimes the 8th) overlying epithelium of the flap shows desquamation of its superficial layers, in some places even to the degree of complete erosion of its surface. Collagen fibers lose their identity on the side of the flap. This tissue becomes edematous, infiltrated with leucocytes and shows capillary hemorrhages particularly along the line of fusion. The vessels from the host to the flap still show anatomical continuity, but do show hemorrhagic exudation. After we have determined the exact length of time it takes for complete establishment of circulation we next decided to study the progress of the flap, after separation of the animals, at the end of 1 to 2 weeks. It was noted that while the animals were united, one of the animals showed progressive emaciation, anemia and weakness, beginning about the 6th or 7th day, and usually one of them died if not separated. Death of the other animal sometimes followed several days later.

In all our experiments, although complete circulation has been established in the transplanted flap, death of the flap seems to take place sooner or later in one of 2 ways: Either by drying or crumpling of the graft or acute moist gangrene. When B is stronger than A the flap dies by acute moist gangrene. This happens on the 1st or 2nd day after separation, but when B was the weaker, the flap appeared normal for from 6 to 16 days. Then, however, the following changes were noted. At first the edges became cyanosed, the borders curl up toward the center, the entire flap is gradually converted into a dry, rough, elevated mass, and then cast off, usually completing the process of separation of dead from living tissue in 6 days. Animal B very often died later, but when alive it never brought about a strong reaction at the point of transplantation. After separation of the animals, if B were the weaker, it showed increasing appetite, became stronger, and then threw off the flap with greater reaction, moist gangrene.

It is evident that there are factors other than vascularization on which the vitality of the flap depends. The higher the organism is developed the more complicated are its cells and the more difficult it is to overcome its biological and biochemical peculiarities. Variations in conditions of existence, especially variations of biological and biochemical peculiarities, and dissimilar function between the cells of the flap and the host determine the fate of the transplanted tissue.