

Medical Matters.

THE HEALING OF WOUNDS.



Dr. Stuart McGuire, of Richmond, Virginia, Professor of Principles of Surgery and Clinical Surgery, and President University College of Medicine, has the following interesting note on the healing of wounds in the *Virginia Semi-Monthly*:—

The details of the process of repair in a wound can best be studied under the headings granulation, vascularisation, cicatrisation and epidermisation. We will take them up in order.

1. *Granulation*.—This is the process by which new cells are formed to replace tissue lost by accident or disease. All wounds heal by the production of new cells or granulation tissue. If the surfaces of the wound are clean cut and held in close opposition one to the other, the amount of new material necessary to effect vital union is little, the time taken for healing is short and the resulting cicatrix is small. If the surfaces of the wound are not brought into close relationship, the amount of new material necessary to fill in the gap is large, the time taken for union to occur is long and the resulting cicatrix is large. The process of granulation, however, is exactly the same in each; the only difference being the number of new cells formed and the length of time necessary to form them. Healthy granulations are small, firm, and pink, and their surface is only moistened with a viscid colourless fluid. If infection occurs they become pale and flabby, and their surface may be covered with a membrane or bathed in a purulent discharge. The layer of granulations on the surface of a wound becomes about one-sixteenth of an inch in thickness and then proliferation and the formation of new cells will be arrested unless an additional blood supply is furnished.

2. *Vascularisation*.—This is the process by which new cells are formed to nourish the growing granulation cells. At first an increased supply of blood is furnished to the part by the plugging of the cut ends of the capillaries with thrombi and their dilatation from intra-vascular pressure. Later this is not sufficient and new vessels are formed to convey nourishment to the granulation cells. As Dr. Senn puts it, vessel formation and tissue proliferation must be initiated simultaneously and keep pace with each other until the necessary amount of granulation tissue has been produced. The new blood vessels formed by the process of vascularisation

come from the nearest pre-existing blood vessels. A bud appears on the wall of a capillary and increases in size until it is a triangular mass and finally it is transformed into a finger-like projection. It becomes excavated at its base and blood enters from the vessel to which it is attached. When two such formations are contiguous they join each other by the inoculation of their tips and a capillary loop results. This loop, uniting with other loops, permeates the new cells and conveys nutrition which enables them to continue their proliferation. Each loop as it projects towards the surface is covered with embryonal cells and gives a velvety appearance to the layer of granulations. These new vessels are but temporary in existence, and are obliterated with the final healing of the wound.

3. *Cicatrisation*.—This is the process by which embryonal cells or granulation tissue develop into mature cells endowed with the characteristics of their parents—in other words, the transformation of embryonal cells from fibroblasts into connective tissue; the embryonal cells from sarcoblasts into muscular tissue; the embryonal cells from neuroblasts into nerve tissue, &c. If as is rarely the case the formative cells of the various tissues have vegetative or reproductive capacity sufficient to produce enough embryonal cells to repair the defect produced in their respective structures, then on the completion of cicatrisation there will be complete anatomical and physiological restoration of the injured part. If, however, as is usually the case, nearly all of the embryonal cells which constitute the granulation tissue originate from the fibroblasts, then on completion of cicatrisation there will be substitution in the cicatrix of connective tissue for the normal structure of the part, or a condition known as metaplasia. The fact that almost all cicatrices are composed largely of connective tissue, together with the well-known contractility of this element, will explain why a scar contracts. The contraction of connective tissue in the healing of a wound is useful, inasmuch as it draws the divided surfaces nearer together, makes the external evidence of the injury less, and obliterates by constriction the newly-formed blood vessels. This is seen in the every-day observation of a scar becoming smaller and whiter with time. The contraction, however, sometimes goes so far as to prove a source of danger, as it may result in deformity of limb if the region of a joint is involved, may cause pain by pinching a nerve, or may produce stricture by diminishing the lumen of some duct or canal.

4. *Epidermisation*.—This is the process by

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