

ON THE
ARRANGEMENT OF THE INTERMEDIATE VESSELS
ON
SURFACES SECRETING PUS;
WITH
A NOTE REGARDING THE VASCULARITY OF ARTICULAR CARTILAGES.

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THE mode in which granulations are formed and receive their vascular supply, a process so necessary in the repair of suppurating cavities and breaches of surface occasioned by injury or other causes, is a subject certainly well deserving of the best attention of all who pursue the medical profession.

The success of a surgeon, more especially, will very much depend upon his careful discrimination of the various appearances of granulating surfaces, and upon the management which their various states may from time to time demand; for it is well known to those engaged in the practice of the profession, that there can be no surer index of the condition of a patient's system, than that derived from a careful examination of the aspect of a suppurating surface, and of the secretion which it furnishes.

That the granular deposit of lymph on surfaces exposed and unprotected by integument, is speedily supplied by blood-vessels, nerves, and absorbents, admits of no doubt, and is easily demonstrated by the examination and treatment of any healing ulcer.

It is proposed, very shortly, to describe the arrangement of the intermediate vessels on granulations, as they appear in the cysts of abscesses, and on open sores.

Mr. Hunter, the greatest authority, even to this day, on the subject, states that granulations do not appear on the internal surface of abscesses until they have been opened, and their cavities thus exposed to the influence of the atmosphere. In this view he has been supported by Dr. John Thomson, in his admirable, and now, it is to be regretted, very scarce work on Inflammation. Dr. Thomson appears to have investigated this part of his subject with the greatest possible care and attention.

It will appear, on careful examination, that the abscess is coated on the interior and free surface by a layer of lymph of greater or less thickness, as may be; generally, about one-tenth of an inch. This layer is first of all deposited in a fluid state, and consists of the liquor sanguinis, or fibrine in a state of solution, as separated from the blood. It is exuded in the form of minute transparent drops, which being spontaneously coagulable, gradually become milky and consistent. The granules appear first of all to become coagulated on the surface, and the interior of the drop, as it were, remains for a time

fluid and transparent. A sort of minutely granular or tuberculated surface externally, cellular internally, is thus formed.

This layer, with which the purulent deposit is in immediate contact, by and by becomes more consistent, and acquires a yellowish white colour. It lies upon a highly vascular membrane, to which it adheres more or less intimately, according to the duration of the process. The vessels in this tissue are curiously interlaced, anastomosing freely with each other, so as to form a very fine and delicate net-work.

There seems to be in this lymph, from the first, an impulse, as it were, towards organization ; and after a very short time it becomes permeated by minute blood-vessels, which admit our fine injections. The diameter of the vessels was most frequently $\frac{1}{2000}$ th of an inch. The extreme sizes being $\frac{1}{4000}$ th and $\frac{1}{1333}$ rd ; and the following intermediate measurements were obtained, viz., $\frac{1}{3000}$ th, $\frac{1}{2000}$ th, $\frac{1}{1600}$ th, and $\frac{1}{1500}$ th of an inch.

These capillaries project into the new and adventitious membrane from that underneath it ; often, in straight parallel lines. Their arrangement in the granules on the free surface is, however, distinctly looped and tortuous ; and these loops communicate with each other, as shown in the very beautiful sketch which my friend, John Dalrymple, with much pains, has made for me under the microscope. The specimen is represented as magnified about four hundred diameters.—Plate I. fig. 1.

Which is the pyogenic membrane of authors, and so much talked about? Is it the very vascular base on which the lymph rests, or the adventitious false membrane?

The deposit of lymph in the greater number of situations and circumstances precedes the secretion of pus; and when this layer becomes organized, and the vessels assume the curiously convoluted and looped arrangement shown above, there can be no doubt but that the office of secretion is performed there.

The resemblance to the looping of vessels in healthy secreting surfaces cannot escape those who have devoted themselves to minute anatomical investigation. The surface of the skin, of the mucous linings, of the synovial sheaths, &c., present very much this vascular arrangement.

It is not unreasonable to suppose that morbid secretions may be furnished by capillary vessels similarly disposed.

It comes to be a question, how these looped vessels are produced. It is not easy to imagine that they are mere elongations of the original capillaries of the part, which have been dilated and relaxed. The deposit, as already remarked, seems to have an internal impulse towards organization.

Mr. Hunter has stated his suspicion that new parts have the power of making vessels and red blood, independently of the original circulation; and this view has been confirmed by the experiments of Kaltenbrunner and other observers on the cold-blooded

animals, the frog and mud-fish. Further investigations are required to elucidate this subject as concerns man and other warm-blooded animals.

In solutions of continuity repair takes place, as has been well known since the time of John Hunter, by the deposit of plastic matter ; and this layer, as that distinguished pathologist has shown, is speedily supplied by blood-vessels. On a careful examination of a portion of injected ulcer, more particularly in a profile view of it, it will be found that the secreting vessels are arranged in a precisely similar manner to those in granular deposits of lymph. This might have been expected, and so might the slight difference in appearance. These vessels on exposed surfaces are disposed in exactly the same fashion ; but they are also enormously and irregularly dilated—varicose in fact, as here exhibited.—Plate I. fig. 2.

This is, without doubt, attributable to want of support from the natural elastic covering, and in a great measure also, to the affected part being often kept in a position unfavourable to the ready return of blood.

In neglected ulcers the vessels of the granulations are, in fact, often distended to bursting ; and great quantities of blood frequently escape from the surface of such ulcers in consequence. The dark colour of the sore, the bloody and gleety discharge, very soon show to the surgeon of experience in hospital practice whether or not the patient obeys the injunction to keep the limb elevated. Soon also, does he

discover whether or not, any trick is attempted by ligation or otherwise, to interrupt the progress of cure.

The purulent secretion cannot be poured out from open mouths, as they are not seen to exist, but is probably transuded through the coats of the looped, tortuous and dilated capillaries, and is possibly changed in appearance afterwards, in the same manner in which lymph is previously separated from the blood, and escapes through the coats of the inflamed vessels.

I have been encouraged to offer these remarks to the Society from finding that many vague and incorrect notions respecting the nature of the membrane secreting purulent matter are generally entertained; and from ascertaining also, that no correct delineations of the vessels of lymph or granulations have been published. That of Pauli gives but a very incorrect notion of the proper appearance.

It represents a flat tuberculated surface with a sort of net-work spread upon it. Those which I have ventured to present are correctly delineated from profile sections of the cyst of an abscess and ulcer.

I might have given other views from my own injections, and also, through the kindness of my colleague, Dr. Sharpey, of a very successful injection by Professor Pockels of Brunswick. This specimen has been described by Dr. Allen Thomson in his excellent paper on the formation of new blood-vessels.

This is also a flat piece of ulcerated surface, but it shows the peculiar arrangement very much better than the plate given by Pauli.

As regards cicatrix, it may be remarked, that the

vessels speedily contract. They are arranged in a reticular fashion, but, after a time, the net-work is not nearly so full as in the surrounding skin.

Occasionally, an approach to the papillary arrangement seems to be attempted, as seen in good sections after successful injections.

I may, I trust, be pardoned for offering a few practical deductions from the preceding observations; and first of all, the mischievous effects of squeezing together the sides of suppurating cavities may be noticed.

By this proceeding, adopted through a blind and thoughtless observance of the bad practice of others, the lymphatic coating is separated from its vascular base; the circulation of the part is unnecessarily excited; bloody and often putrid secretion is poured out; and the general health in consequence disturbed. If a sufficient opening is made in a dependent position, the accumulated secretion is rapidly enough discharged; and the walls of the cavity come together and coalesce through the natural elasticity and action of the parts.

As regards ulcers, the paramount advantage of an elevated position of the affected part must be sufficiently obvious. The rapid disappearance of congestive swelling, and of inflammation by an observance of this practice alone, in many cases, must make apparent the good effects of favouring the return of blood.

The larger veins, previously varicose and overdistended, become collapsed, and almost disappear.

The same effect upon the varicose capillaries in the solution of continuity necessarily follows ; the colour of the sore is speedily altered for the better, the painful feelings abate, and the nature of the discharge is ameliorated. Until this is the case, and as long as over-action, to any degree exists, soothing and relaxing applications are advantageous ; exudation of lymph and plentiful secretion of pus are thus encouraged.

These are followed by mild astringents and stimulants, by which the dilated and weakened condition of the coats of the vessels may be supposed to be amended.

The discharge is thus moderated, and the granulations prevented in a manner, from becoming exuberant. The beneficial effects of uniform support can also be well understood.

The admirable papers on Diseases of the Joints, by our distinguished President, and also by Messrs. Mayo and Key, read before this Society, and published in their Transactions, leave, it may well be supposed, very little further to be said on the subject.

Having, however, succeeded in injecting minutely, some limbs removed on account of articular disease, I venture to present a few observations, the result of an attentive examination of parts of them under the microscope.

A question, it is well known, has been agitated, as to whether articular cartilage is extravascular or

not ; Cruveilhier, Velpeau, and Key, espousing the former doctrine, and maintaining that it is a mere epidermic crust, endowed with no organic life, and hence unsusceptible of disease.

Sir B. Brodie and Mr. Mayo support the opposite opinion. Sir B. Brodie supports his views by argument principally, and by observation of vessels containing red blood, extending from a diseased bone into cartilage covering it. Mr. Mayo notices the same circumstance, and refers to preparations, now in the museum of King's College, London, and of which he has given representations in the nineteenth volume of the Society's Transactions. These specimens I have examined with great care, but so far as I can observe, they exhibit nothing at all satisfactory on the subject.

There is some injection on the edge of the cartilage of the condyle of the femur, in one of the preparations, and a shred of lymph is adherent, apparently at one point, to the surface of the cartilage. Vessels filled with injection may or may not exist in the cartilage, but this can only be ascertained by having thin slices made, and putting these under a good glass.

I have been enabled to demonstrate the existence of vessels, most undeniably, in the articular cartilage of several diseased joints, and present a sketch of one portion, Plate I. fig. 3. It will be observed that the vessels run straight, in parallel lines, from the injected membrane of the bone. Many of these are joined at their further extremity in the cartilage,

thus forming long loops. The possibility of cartilage being acted upon, nourished, absorbed, and repaired, by its own vessels, must thus be admitted. In fact, in many of the specimens in my possession, lymph is deposited on the surface of ulcerated cartilage, and injected vessels can be traced, passing into this lymph.

Under circumstances favourable for it, solutions of continuity in cartilage appear to be repaired, without, however, much reproduction of the tissue.

It would appear that ulcerative absorption of cartilage occurs in three forms :—

First. In consequence of disease of synovial membrane, which becomes much swollen, and to which processes of adventitious tissue are super-added, the cartilage is removed where it is encroached and pressed upon. The prolongations of the membrane, in a highly injected state, as well described by Mr. Key, fit most accurately to every crevice of the breach of surface in the cartilage. At first there is no union of the surfaces, the membrane being merely accurately adapted and closely applied to the ulcerated surface. Frequently, however, as the disease advances, adhesions form betwixt the vessels of the synovial membrane, and those proceeding from the medullary web. An adhesion of considerable length is thus often formed betwixt the synovial surface, and the articulating end of the bone.

Second. Absorption of cartilage seems often to arise from swelling and intense vascularity of the

tissue connecting it to the bone. This cellular tissue is scarcely demonstrable in the healthy condition of parts, any more than is the vascularity of the articular cartilage; but it becomes most remarkably developed in a state of disease. The cartilage is in consequence loosened and thinned; at first, apparently, by interstitial absorption. Then it becomes perforated, and an ulcer, of greater or less extent, with thin undermined edges, is presented. In consequence of disease of the interposed tissue, the cartilage is sometimes thinned, and ultimately detached in flakes; forming, in fact, sequestra of the tissue.

Third. Lastly, cartilage still firmly adherent to the subjacent bone, is permeated by vessels communicating with those of the bone, and ulceration proceeds from the free surface. The cartilage, very often previously swollen and softened, is gradually and irregularly thinned: the bone is exposed, and is finally acted upon also, by ulcerative absorption. The ulcerated surface is generally coated by a layer of organized lymph. More than one form of the ulcerative process may sometimes be observed in the same articulation.

Fig. 1

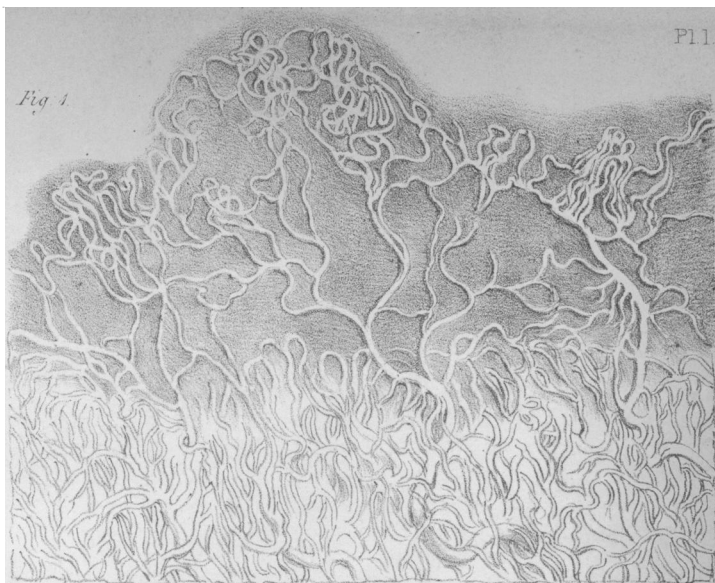


Fig. 2

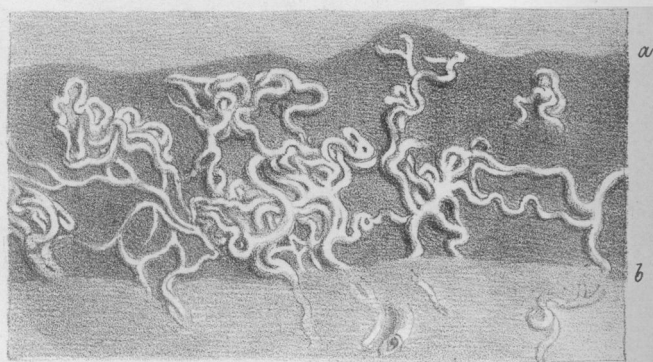


Fig. 3

