

- X. "On the Distal Communication of the Blood-vessels with the Lymphatics; and on a Diaplasmatic System of Vessels." By THOMAS ALBERT CARTER, M.D., M.R.C.P., Physician to the Leamington Hospital and Warwick Dispensary. Communicated by W. S. SAVORY, Esq. Received June 2, 1864.

(Abstract.)

In this paper the author has recorded the results at which he has arrived concerning the distal intercommunication of the hæmal with the lymphatic system by means of injections thrown into blood-vessels; he also describes certain minute vessels and networks of vessels which can be shown by the same means to exist in certain mucous membranes and elsewhere. These he has named diaplasomatics.

The author's attention was first particularly called to the relation which the lymphatics bear to the blood-vessels, by observing that when the latter are fully distended with a very penetrating injection, such injection often finds its way into the lymphatics without the occurrence of ordinary extravasation.

He has thus injected the livers of three human beings and of three pigs from the portal and hepatic vessels, the former (vessels) being filled with Turnbull's blue precipitated in gelatine, and the latter with carmine similarly treated; and in each instance he has found that the injection had gained entrance to the superficial lymphatics.

In sections taken from the surface of the pig's liver, these vessels (which may readily be distinguished from the blood-vessels by their knotted irregular appearance and rapid increase and diminution in size) are observed in many instances to surround a lobule, throwing out loops and prolongations towards its centre. A certain number of these prolongations, both in the human liver and in the pig's, when traced are seen to diminish in size so much as to be considerably less in diameter than the capillaries of the organ, in which they appear to lose themselves or rather originate. Their commencements in this part, it is acknowledged, are extremely difficult to determine by simple inspection, on account of the underlying capillaries being filled with injection of the same colour; but in some instances (as, *e. g.*, where the pigment in the capillaries has faded) the author believes that he has seen the actual anastomoses of the two sets of vessels. The circumstance, however, which renders exact microscopic observation so very difficult, is the one which affords the best evidence of the communication of the two systems, *viz.* that the minutest lymphatics are almost invariably filled with injection of the particular tint seen in the capillaries in close relation to them. Thus if the capillaries be red or blue, or any of the intermediate shades of purple, the smallest lymphatics in the immediate neighbourhood will be of a precisely similar colour; which would appear distinctly to show whence the lymphatics derive their supply of fluid.

A human thyroid body which the author injected with carmine and

gelatine from the blood-vessels, also exhibited a phenomenon similar to that observed in the organs just mentioned.

Sections taken from this gland and examined with the $\frac{1}{4}$ -inch objective, showed that from the capillaries are given off fine processes which break up into a network among the cell-elements of the vesicles, and, furthermore, that this network is in communication with the lymphatics which lie in the intervesicular parts of the gland. In addition to this, however, there are communications between the capillaries and lymphatics in the stroma itself.

The processes which emerge from the capillaries in the stroma of the thyroid as well as in the fibrous tissues of other parts, such as the membrana nictitans of the cat, bear a very strong resemblance to connective-tissue corpuscles; and such the author considers them to be in these parts. But as these tubular processes can be shown by injection to form a plexus in the retina (cat), to be connected with the nuclei of the capillaries, the corpuscles of bone (perch and mouse), and the fusiform bodies found among the fibrillæ of muscle (frog), as well as with the cells of connective tissue and its modifications, it has appeared that the whole of these structures belong to one system of vessels. This system the author has named, provisionally at least, "*Diaplasmatic*," because, on account of the extreme minuteness of its channels, it can only allow of the passage of the liquor sanguinis.

To designate the whole of these minute vessels lymphatics would, he considers, at the present time be somewhat premature, because those of muscular fibre and of bones, and others which will be mentioned immediately, have not been observed to join recognizable lymphatic trunks; and moreover it would seem by no means improbable that some of them may both commence and terminate in the blood-vessels, thus constituting what might be styled an intercapillary plexus; or they may even have a triple connexion, viz. with the arterial capillaries, the lymphatics, and with the venous capillaries or the veins.

The position in which the diaplasmatic network may be most readily demonstrated, both with and without injection, is in the mucous membrane of the palate of the frog or toad. In this part, when the viscid mucus and the ciliated epithelium have been removed, there may be seen with the $\frac{1}{4}$ -inch objective, a very minute granular nucleated network, in each mesh of which is placed a globular nucleated cell. The membrane consists, therefore, of three layers—of a superficial ciliated layer, next of a granular nucleated plasmatic network, and lower still of a basement layer of globular nucleated cells. The processes of the middle granular plexus extend not only in the horizontal direction, but also upwards between the ciliated cells, and downwards between those of the basement layer, where they become continuous with the blood-vessels lying in the fibrous tissue beneath. This connexion with the blood-vessels, the author says, he has been able to make out by means of injection in the palate and œsophagus of the frog and toad, as well as in the mucous membrane of the eyelid of the latter animal.

He has also demonstrated by injection that a network similar to the one just described is present in the web-membrane of the pectoral fin of the perch. The lung of the toad also exhibits a modification of the plasmatic network in the form of extremely fine hollow processes, which either stretch completely across the mesh from capillary to capillary, or terminate in finely pointed or blunt extremities among the epithelia or nuclei which stud the membrane of the air-vesicle.

In the proper epithelial portion of the skin of batrachians or of mammals, the author has not yet been able to prove distinctly that the plexuses are to be found, but he has been so far successful in this direction as to have displayed them satisfactorily in the follicles and bulbs of the whisker hairs of the mole, mouse, and kitten. From certain observations, however, which cannot here be detailed, he thinks it more than probable, not only that plasma-networks are present in the epithelial layer of the batrachian skin, but also in a corresponding part of the human cutis.

With regard to the offices performed by these networks, the author thinks it probable that all those found in the epidermal or mucous tissues are intimately connected with the function of secretion, and in a minor degree also perhaps with that of absorption; while those situated in the deeper parts of the organism, such as muscle and fibrous tissue, are employed in conveying blood-plasma to, and effete matters from, the tissues through which they pass or with which they may be in contact.

XI. "Aërial Tides." By PLINY EARLE CHASE, A.M., S.P.A.S.
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The remarkable coincidence which I have pointed out* between the theoretical effects of rotation and the results of barometrical observations, has led me to extend my researches with a view of defining more precisely some of the most important effects of lunar action on the atmosphere. The popular belief in the influence of the moon on the weather, which antedates all historical records, has received at various times a certain degree of philosophical sanction. Herschel and others have attempted partially to formulate that influence by empirical laws, but the actual character of the lunar wave that is daily rolled over our heads, appears never to have been investigated.

Major-General Sabine has shown that the moon produces a diurnal variation of the barometer, amounting to about .006 of an inch at St. Helena, which is nearly equivalent to $\frac{1}{10}$ of the average daily variation (Phil. Trans. 1847, Art. V.). This would indicate a tidal wave of rather more than 1 ft. for each mile that we ascend above the earth's surface, or from 3 to 6 ft. near the summits of the principal mountain-chains. It is easy to believe that the rolling of such a wave over the broken surface of the earth may

* See Proceedings of Amer. Philos. Soc. vol. ix. p. 283.