

MORBID CHANGES IN THE CORTEX CEREBRI IN A CASE OF TUBERCULAR MENINGITIS AS SHOWN BY THE FRESH METHOD OF EX- AMINATION.

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THE changes described in the pia mater and cerebral cortex by the authorities below-mentioned¹ were presumably seen in sections from brain prepared by some hardening re-agent, because in their descriptions, no mention is made—so far as I can ascertain—of certain morbid appearances which are quite obtrusive in fresh sections (æther-frozen brain, aniline blue-black). In hardened sections such appearances might well be entirely absent, or at any rate so highly distorted as to earn only partial recognition.² It may therefore, be desirable to refer to certain changes which fresh sections clearly show, drawing attention merely incidentally to the morbid conditions which the authors mentioned have described.

An increase of the connective-tissue elements (accountable for the abnormal degree of coloration seen) is noticeable throughout the cortex in these sections, being especially remarkable in the peripheral layer. Small round cells are numerous there, as is stated by Rindfleisch, and by Ziegler, who says "the disease of the pia mater extends to the cortex as a diffuse cellular inflammation." But a far more striking feature of the peripheral layer, and one which these writers do not describe, is the other element of the connective-tissue—the "flask-shaped" cell.³ Whereas, in healthy sections the cells so named are barely visible, in the

¹ Rindfleisch, Rokitansky, Cornil and Ranvier, Ziegler, Huguenin, Rilliet and Barthez, Wernicke [*Lehrbuch der Gehirnkrankheiten*]; J. Seitz [*Die Meningitis Tuberculosa der Erwachsenen*].

² Probably excellent results are attainable by the employment of Flemming's Mixture (chrome-osmium acetic acid); but one would scarcely expect them to rival those obtained by the fresh method.

³ Bevan Lewis: *Text-Book of Mental Diseases*.

present ones they are seen in large numbers, and each cell is deeply stained, of large size, and possessed of numerous processes ("spider-cells"), which form a meshwork with those from adjoining cells. The morbid development of these elements explains the adhesion of the pia mater to the cortex, and the consequent facility with which a portion of membrane may be obtained with each section. Huguenin (Ziemssen's "Cyclopædia") speaks of the adhesions existing between the vessels of the pia and the cortex, owing to which strips of the latter come away on removal of the membrane; but the nature of the adhesions is not entered into. Fresh sections show that the vessels dipping into the cortex from the pia are connected on either side with long processes from the spider-cells, and that the membrane itself is still further bound down to the brain by a closely-woven tissue formed of similar processes. The spider-cells cannot be traced, in these specimens, deeper in the cortex than the third layer (that containing the large pyramidal cells), and the inference is that the morbid process had expended its chief force on the superficial parts of the brain; yet—as will appear later—in some of the specimens the large "motor" cells presented changes from the normal, so that the deeper part of the grey matter had not entirely escaped.

As regards the capillaries of the cortex, they are individually prominent, and appear to be in excess. That they are so is probably the case; but doubtless many vessels barely distinguishable in the healthy cortex, by reason of their delicacy, are brought out when that part is the subject of inflammation. Some can be seen in connection with clumps of small round cells—inflammatory foci, possibly of the nature of tubercle (but similar clumps are to be seen in the cortex of the general paralytic, especially when death has supervened at an acute stage of the disorder.) Such foci of disease, together with vascular engorgement and minute extravasations, are described by all authors; here it need only be remarked, in connection with the last-mentioned, that in fresh sections, unless distilled water be used in washing, minute deposits of foreign material of yellowish-brown appearance occur, and are highly suggestive of extravasations of blood, especially when they adjoin a blood-vessel.

The state of the nerve-cells claims more attention, for hitherto it does not appear to have received much. Huguenin says he has never been able to discover changes in the "ganglion-cells." Ziegler refers to a "remarkable swelling" often noticed in them,

and further, to "destruction of the nerve-elements," consequent upon cellular infiltration of the cortex. Otherwise, I have been unable to find particular mention of the condition of the nerve-cells.

In the present case, the quality of the cortex is seen to vary considerably in the different sections. They were taken from the left paracentral lobule and from the left ascending frontal convolution, near its upper end. Whereas in some sections the cortical layers, with their individual nerve-cells, are well-marked, and numerous processes can be seen streaming upward from the latter towards the periphery, in others the cortex can be roughly divided into three layers merely—a peripheral layer, of spider-cells mainly; a central, of large "motor cells," and an intermediate, in which the cells would seem to be gravely implicated. This intermediate portion includes the pyramidal nerve-elements of the second and third layers of the normal cortex, and a great number of the comparatively few cells in it are stunted, the apex-processes being either invisible or quite short; are of round or irregular shape, often showing merely a nucleus surrounded by a little cell-substance; are blurred and poorly stained, although adjacent connective-tissue cells are deeply stained; are, in fact, mere ghosts of their normal selves. Between these diseased nerve-cells are the spider-cells before-mentioned; they are often to be seen in immediate contact with a nerve-cell, partly covering it, and still further by their processes obscuring both cell and its apical prolongation. In some places an area of blurred and granular appearance surrounds the spider-cell, and has around it the diseased pyramidal cells.

Now if the views hitherto prevalent concerning the spider-cell be correct, there is nothing remarkable in the observation that, in an inflamed tissue, an enlarged connective-tissue cell and a diseased nerve cell (common results of the inflammatory process) are in juxtaposition. But if the spider cell be regarded as a "distal extension of the lymphatic system," a "scavenger,"¹ then the observation becomes noteworthy. In this case the spider cells were remarkably clear and well-developed; most of them, at any rate, showed no such signs of deterioration as are evident in old inflammatory states. Assuming, for the moment, that the views lately urged in regard to the function of these cells are correct, I apprehend that at the time of death they had but recently exceeded their normal rôle of depurating agents, and

¹ Bevan Lewis: *Op. Cit.*

begun to attack the essential elements (nerve-cells), and that the day of their own degeneration was as yet distant. In connection with this supposition the duration of the disorder may be considered; death occurred precisely three weeks after the earliest symptoms were noted. The case was in all respects typical clinically, and *post-mortem* the naked-eye appearances of the brain were quite characteristic. Caseous mesenteric glands also found.

As extensive changes had taken place in the region of the hemisphere which borders the longitudinal fissure, it is highly probable that, in the neighbourhood of the Sylvian fissure, the evidence of disease was still more marked. Meningo-encephalitis in the latter part would, of course, still further soften an already comparatively soft tissue; yet with due care fresh sections from this region could probably be obtained, in a case resembling the present, and should prove highly instructive.