

fluid, he did not think that fluid would of necessity show changes sufficiently strong to go upon. Dr. Buzzard had misunderstood him a little on two points. He (Dr. Collier) agreed that there were many cases which got well under anti-syphilitic treatment. His point was that the cases which did not get well were rather among the cases of slow onset and with localising symptoms than among the acute fulminating cases, which he attributed rather to a condition of acute hydrocephalus than to the presence of a gumma. That hydrocephalus was undiagnosable, the clinical condition being exactly like that of non-localisable cerebral tumour. He thought Dr. Buzzard believed him to have said that that hydrocephalus occurred in basal syphilitic cases. In the two cases above referred to the lesion was confined to the ependyma, and it was a slight lesion.

The Nervous System of a Dog, which suffered from Ataxia and Involuntary Movements.

By F. E. BATTEN, M.D., and GORDON HOLMES, M.D.

White bull terrier—healthy till fourteen months old—failure of eyesight—became dull—unsteady in gait—spasmodic movements of limbs—progressive deterioration. Killed when fifteen months old. Microscopical examination: Marked perivascular infiltration, infiltration of brain tissue; the brain is more affected than the cerebellum or medulla, and the medulla more than the spinal cord. The cell changes are most marked in the cells of the cortex. There is considerable degeneration of the cortico-spinal tracts.

The case is that of a white bull terrier, born in July, 1906. He was healthy till September, 1907, when his owner noticed that the dog's eyesight was defective and he was becoming dull. Mr. Bower, who saw him on September 5, stated that the dog had chorea or some form of brain derangement. There was no acute onset and the dog was not known to have had distemper. On September 10 he came under the care of Mr. Hobday, and although he improved to a certain extent in his general condition he slowly and steadily deteriorated.

On examination on October 10 the dog was in good condition, well nourished, and had a good coat; he could take his food well. When left alone the dog walked round the stable in an aimless manner, the head bent down. He did not seem to see, and in walking round the stable was guided by the wall. When he came to a corner his progress was arrested and he would apparently have remained standing in that position for an indefinite time unless his head was turned out, when he again went on his peregrination round the room. He walked on a very

wide base in an ataxic manner, and had frequent sharp contractions of both the fore and hind limbs. He was easily upset by a tap on the buttock ; he could, however, get up from the floor without help. There was no rigidity of the legs and all movements were capable of being performed. All the reflexes were brisk. His sense of smell was deficient ; he would, however, eat up any food which was placed on the ground ; if, however, it was in a bowl, he would push the bowl along the ground, and would only eat up the food if his nose were raised and put inside the bowl. The dog did not seem to hear, but Mr. Hobday states that white bull terriers are not infrequently congenitally deaf. The dog appeared to be quite blind. The pupils were large, but reacted to light. On examination of the fundus it appeared normal. After examination the dog was killed and the post-mortem performed by Dr. Holmes, and the following is the report of the pathological condition found :

No pathological change was visible to the naked eye in the central nervous system either at the time of the autopsy or when it was cut up after hardening in a 10 per cent. formalin solution. Marked changes were, however, found in sections taken from the different regions of the forebrain, brain-stem, and spinal cord. They were most marked in the forebrain, and were the same and varied only slightly in intensity in all the portions of it which were examined ; they were, however, somewhat greater in the grey than in the white matter. The most striking change was the presence of a large amount of perivascular cell infiltration. In many places these cells were limited to the adventitial sheaths and the perivascular spaces of the vessels, but in other places they broke into and infiltrated the surrounding brain tissue ; and, finally, here and there the tissue is infiltrated by diffuse collections of cells not in the immediate neighbourhood of vessels. Apart from this cell infiltration there was very little evidence of disease of the vessel-walls ; at the most there is only a slight increase of the endothelial nuclei. A few infiltrating cells often surrounded the larger nerve-cells of the cortex, but they were then generally degenerating. The cell infiltration was not, as a rule, so compact in the nervous tissue as in the perivascular spaces. Similar collections of cells are seen in the soft membranes, but only in the immediate neighbourhood of the cortex ; they are found chiefly around the vessels, but in places also in the loose tissue of the meninges.

The majority of these infiltrating cells are lymphocytes, each consists merely of a small round nucleus rich in chromatin, with little or no cytoplasm around it. A small number of plasma cells are also found, especially around smaller vessels where there is not yet a large collection

of cells ; their nuclei are similar to those of the lymphocytes, but they are surrounded by considerably more protoplasm. In addition to these infiltrating cells there is some proliferation of the cells of the adventitial sheaths of the vessels, and of the neuroglial nuclei in the foci, in which there has been much cell infiltration and destruction of tissue.

In the pons and medulla oblongata similar changes are found, but they are less intense. Here, too, the grey matter is more affected than the white, especially that in the neighbourhood of the fourth ventricle. There is very little disease in the cerebellum ; in the white matter collections of small round-cells surround many of the vessels, and in the cortex there are a few irregular foci in which the tissue is infiltrated by similar cells.

In the spinal cord there is practically no disease of the white matter, and in the grey matter there is only a very slight amount of perivascular cell infiltration, and here and there a small focus in which the tissue is infiltrated by similar cells.

No definite change could be found in the nerve-cells of the spinal cord, and even in the medulla and pons there was remarkably little change in the cells considering the intensity of the disease of the vascular and interstitial tissues. In the neighbourhood of foci of intense round-cell infiltration there was generally some disintegration of the tigroid. No definite changes could be recognised in the nerve-cells of the cerebellum. A considerable number of the cortical cells were destroyed in the patches of round-cell infiltration ; in some of these the remains of cells can be seen surrounded by nuclei which seem to act as neurophages. As it is in the deeper layers of the cortex that the disease is generally situated it is the cells of these layers which have suffered the most severely. Where the cortex is not infiltrated in this way there is but little visible alteration in the cells ; in some there has been more or less, but usually only partial disintegration of the tigroid. In many places apparently normal cells are seen lying along a vessel which is surrounded by a large amount of perivascular cell infiltration or on the border of a patch of disease. Here and there are cell changes suggestive of acuter disease, generally in the form of shrunken cells which stain very intensely and diffusely, and in which the nucleus is scarcely visible. A few swollen cells in definite chromatolysis are also found.

The Marchi method reveals an enormous amount of degeneration of the myelinated fibres of the forebrain. Some of this degeneration is evidently of considerable age, as its fatty products, which are stained black by the osmic acid, are in places collected into large masses, and

some of it has evidently already disappeared. It was chiefly the fibres of the white matter which were affected; relatively few degenerated fibres are found in the cortex, but this is probably due to the degeneration products having been already absorbed from here.

In the brain-stem there is marked degeneration of the pyramidal tracts, and degenerated fibres are also found in some of the bundles which spring from its grey matter, as in the dorsal longitudinal bundles and in the vestibulo-spinal tracts.

In the spinal cord, too, it is chiefly the cortico-spinal tracts which are affected, but there is also a little diffuse degeneration in the rest of the ventro-lateral columns. This degeneration diminishes caudal-wards; it probably represents affection of the fibres which descend to the cord from higher centres; probably none of the proprio-spinal fibres are degenerated. In the lower segments there is slight degeneration of some of the dorsal root fibres, and, owing to this, a little diffuse degeneration ascending through the dorsal columns. There is no evidence of fibre degeneration in the grey matter or in the ventral spinal roots.

These changes indicate the existence of a chronic inflammatory process which has evidently affected the central nervous system through the blood-vessels, or through their adventitial or perivascular lymphatic spaces. We have been unable to discover the causal factor of this inflammation, but the changes in the nervous tissue itself are so slight that it may be with more probability attributed to the action of toxins circulating in the blood or lymph than to a direct infection of the brain itself.

These pathological changes bear a certain amount of resemblance to those which are found in the nervous system in general paralysis of the insane, in which one of the most striking features is the infiltration of the perivascular spaces by lymphocytes and plasma-cells. Dr. Mott has described somewhat similar changes in the nervous system in chronic trypanosome infection, as in sleeping sickness in man and in dourine, or *mal de coit*, of horses, and in both of these diseases he believes the changes are due to a chronic infection of the lymphatics of the nervous system.

Examinations of the nervous system of dogs which have had canine chorea in its more typical forms have been made by one of us, and the same perivascular implication and degeneration of the myelin above described has been present also in these cases. It would seem, therefore, justifiable to assume that the disease from which this animal was suffering was chorea, although it cannot be held to be proved that such was

the case. Numerous clinical types of chorea in the dog may be described. There are those cases in which involuntary rhythmical movements of the limbs are the most striking feature; other cases in which paraplegia, more or less complete, is the leading feature; other cases in which ataxia and circus movements are marked, and again other cases in which the mental symptoms are the most striking.

The present case would seem to belong to the last class.

DISCUSSION.

The PRESIDENT said the last bull terrier he saw was deaf to all forms of test which he applied.

Dr. FERRIER asked whether it was a case of ordinary chorea in dogs.

Dr. PURVES STEWART asked whether Dr. Batten associated deafness in bull terriers with the presence of adenoids. One was familiar with the snoring respiration of those dogs, and there might possibly be some causal connection between the conditions.

Sir VICTOR HORSLEY, referring to the question just asked, said it might safely be inferred that Dr. Batten had not examined the dog's post-nasal space with his finger. He had often seen perivascular lesions in chorea in dogs, but the symptoms described were extremely characteristic of rabies, as well as of chorea.

A Note upon the Symptomatology of Tumours growing in the Fourth Ventricle.

By T. GRAINGER STEWART, M.B.

THE symptomatology of tumours growing in the fourth ventricle is both complex and indefinite. The situation of the fourth ventricle and its relationship to surrounding parts are such that any tumour originating in it is liable to interfere with the functions of the cerebellum, pons and medulla by direct pressure on these structures, and further, by blocking the intraventricular system, to give rise to internal hydrocephalus. In Germany the occurrence of cysticercus in the fourth ventricle is by no means rare, and numerous cases have been collected. Stern¹ has recorded 4 cases of his own and has collected 68 cases from the literature. From the study of these cases a clinical picture has been evolved, which differs, however, in many respects from that found in cases of intraventricular tumour.

Through the kindness of Sir William Gowers, Dr. Ferrier, and Dr. Risien Russell, I am enabled to recount the clinical history and patho-

¹ *Zeitschr. f. klin. Med.*, Berlin, 1907, lxi., p. 64.