

*The Albumen in the Cerebro-Spinal Fluid in Cases of Mental Disease*<sup>(1)</sup>. By H. D. MACPHAIL, M.A., M.D., Senior Assistant Medical Officer, City Asylum, Gosforth, Newcastle-upon-Tyne.

THE following short paper is based upon observations made during the examination of the cerebro-spinal fluid from a series of cases of various forms of mental disorder. A good deal of attention has recently been paid to the examination of this fluid in conditions of disease; there have been numerous observers, and several important tests have been devised. In this series of cases a routine examination was followed in every case, which embraced the tests described by Noguchi, and by Ross and Jones, an examination of the cells present, and an estimation of the amount of albumen in the fluid. It is to the last of these methods of examination only that attention is directed in this paper.

Esbach's albuminometer was the instrument used to estimate the amount of albumen present. This instrument is easily employed for the estimation of the amount of albumen present in the urine, but the first difficulty that is encountered in the case of the cerebro-spinal fluid is that the amount of fluid available is so small. In testing the urine, 11 c.c. of urine are taken, and the reagent added to this; but in doing a lumbar puncture it is not advisable to remove more fluid than 10 c.c., except in cases where the pressure is increased; and, as a rule, in cases of mental disease any increase of pressure which occurs is comparatively slight. So that, even if all the fluid obtained by puncture were used, it would not be sufficient for the test; and of course it is always desirable to reserve some of the fluid for other tests. For these reasons, instead of using 11 c.c. of fluid, 5.5 c.c. were used, and to this quantity were added 5.5 c.c. of distilled water; then to this mixture the reagent was added. If the actual amount of albumen shown by this method be doubled, we get the amount of albumen present in the fluid in terms of the scale on the albuminometer.

There is another difficulty, and that is that the amount of albumen present in the fluid is frequently very small: in such cases it is difficult to estimate it exactly, and the results given

are therefore approximate ; but sufficiently accurate information for purposes of comparison is obtainable.

The observations were made upon the results of the examination of the fluid taken from seventy-seven patients. This list was composed of various clinical types, including general paralytics, cases of gross brain lesions, and cases of mental disorder, following such ætiological factors as alcoholism, plumbism, and various nervous disorders, as well as cases of what appeared to be pure functional disorder. In some of the general paralytics a second examination was made after the lapse of three months. As one might expect from such various types of mental disorder, the results of the examination differed greatly from each other, some of the fluids showing marked pathological changes, others showing little deviation from the normal.

The amount of albumen present in the various cases was found to vary within wide limits, the lowest being *·03 per cent.* and the highest *·3 per cent.* In general paralysis the amount of albumen was always increased ; in most of the cases it was *·1 per cent.* or over. In one case it was as high as *·3 per cent.*, and in another *·2 per cent.* In only one case of general paralysis was the amount below *·05 per cent.*; here it was *·03 per cent.* on the first examination and *·04 per cent.* three months subsequently. It is interesting to note that in this case, although the signs were well marked, the disease was non-progressive. In the cases of general paralysis where the amount was not much over *·05 per cent.* the disease was, as a rule, stationary. In advanced cases the amount was always greatly increased. Those with a marked increase always gave a positive reaction to the tests of Noguchi, and of Ross and Jones ; and when Noguchi's test was negative, or at least not definitely positive, the amount of albumen was as a rule not higher than *·05 per cent.* Excess of albumen and a high cell-count go together. In cases of organic dementia the amount as a rule was *·05 per cent.*, and the same quantity was usually found in alcoholic dementia. In one of the cases following on lead-poisoning the amount was *·075 per cent.* In purely functional cases it is rare to get an amount in excess of *·05 per cent.* In a case of imbecility following congenital syphilis there was no increase.

The results obtained in this series of cases are very interesting, and would appear to give quite definite information. An excess

of albumen indicates profound change in the central nervous system, and the greater the percentage of albumen the more pronounced is the change. General paralysis always shows an increase, and in this disease the amount is usually very great; and the greater the amount the worse is the immediate prognosis, while in those cases with a slighter increase the immediate prognosis is better. In other cases it is in those of a graver nature that a large excess is got, and the greater the amount present the more serious is the condition of the patient.

It will thus be seen that a quantitative estimation of albumen is of the greatest importance in the examination of the fluid from any case of mental disorder, and that this test alone conveys very definite information with regard to diagnosis and prognosis. The amount present appears to be in direct proportion to the gravity of the condition of the patient.

This test is of value in all classes of mental cases, as even in functional cases a large increase of albumen was found only in those where the prognosis was bad. In this respect this test differs from the others which are applied to the fluid. The usual tests give positive information in such serious disorders as general paralysis, while the information they give in functional cases is usually of a negative nature only. This test, on the other hand, gives definite information in all classes of mental disorder. A percentage of  $\cdot 05$  appears to be the dividing line as regards an estimation of the amount of damage done to the nervous tissue. If the amount is above this the prognosis is bad; if below this the amount of damage done may be compatible with the patient's recovering—at least partially. If the amount is  $\cdot 1$  *per cent.* or over, the case is almost certainly one of general paralysis, whereas if the amount is as low as  $\cdot 03$  *per cent.* there is quite possibly no marked change in the nervous tissue.

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