LVIII. A FURTHER NOTE ON THE CHLORIDES AND INORGANIC CONSTITUENTS OF THE SERUM AND CEREBROSPINAL FLUID IN NEPHRITIS.

By GEOFFREY CHALLEN LINDER.

From the Department of Pathology, University of Capetown.

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LINDER AND CARMICHAEL [1931] recorded the results of a study of the inorganic constituents of the serum and cerebrospinal fluid in four cases of advanced nephritis. They hoped to find an explanation for the very high level of the cerebrospinal fluid-chloride which has been found in some cases of uraemia. But cases of uraemia showing this feature are somewhat rare, for the highest they found over a period of some years was 761 mg./100 ml. This was in Case IV of the above paper, and the findings in that case are included in Table I, together with those in Hamilton's [1925] case Mc. Gn. which is the only other case of this kind for which data are available. In both of these the relationship of the chloride of the cerebrospinal fluid to the chloride of the serum and also that of the bicarbonate showed unusual departures from the normal. It was therefore suggested that a breakdown of the normal regulating mechanism was the condition which gave rise to the occasional very high chlorides in uraemia.

The following figures (Case V) were obtained from the arterial blood and cerebrospinal fluid of a man suspected of having meningitis. The discovery that the cerebrospinal fluid-chloride was 850 mg./100 ml. led to the diagnosis of uraemia. Even at rest dyspnoea was intense. Death occurred 12 hours later.

All methods employed were the same as those used by Linder and Carmichael [1931].

Table I.

	Chloride			Bicarbonate			Total base			Inorganic phosphorus		Protein		Other acids	
	Serum-water		CSF	Serum-water		CSF	Serum-water		CSF	Serum-water		Serum	CSF	Serum-water	CSF
	mg./100 ml.		mM	mM		HCO ₃ sw/ HCO ₃ CSF	mM		B _{CSF} / B _{sw}	mM		g./100 ml.		mM	
Mc. Gn.	—	118	142	0.83	16	16	1.0	178	174	0.98	—	1.3	6.8	—	—
Case IV	380	98	127	0.77	13.0	13.2	0.98	164	—	—	4.7	5	7.0	0.09	26
Case V	800	116	145	0.80	2.8	7.4	0.38	167.5	154.5	0.92	2.5	0.9	7.3	0.175	31

The points of interest in the results from Case V are (1) that the serum-water chloride has not risen in proportion to the cerebrospinal fluid-chloride, and therefore the ratio Cl_{sw}/Cl_{CSF} is 0.80; this is lower than any recorded ratio except that of Case IV; (2) that the acidosis is extreme, the bicarbonate being so low that the formula suggested by Hamilton correlating serum-water and cerebrospinal fluid-bicarbonates could not be applied; (3) that the total base

shows a normal distribution; (4) that the distribution of phosphorus and undetermined anions suggests that the meningeal barrier is able to resist the passage of these into the cerebrospinal fluid.

In Case IV the acidosis was less severe, but the normal regulating mechanism showed greater disturbance, for the bicarbonate was the same in the two fluids instead of being higher in the cerebrospinal fluid as Hamilton's formula would require; the phosphorus was the same instead of being lower in the cerebrospinal fluid, and the chloride ratio was reduced to 0.77. The conditions found by Hamilton in Mc. Gn. were similar to those in Case IV.

The hypothesis that the very high chloride in the cerebrospinal fluid is concerned with a departure from the normal relationship to the chloride of the serum is supported by these additional results. But it is evident that a second important factor is the level of the serum-water chloride. When this is high as in Case V and in Mc. Gn. the cerebrospinal fluid chlorides reach a higher level than in Case IV, although the disturbance of chloride equilibrium was greater in the last. A third factor may possibly be the retention by the meningeal barrier of the power to resist the invasion of the cerebrospinal fluid by phosphates, sulphates and other anions from the serum, thus preserving base to carry chloride and bicarbonate. Atchley and Benedict [1930] found that a decrease in serum-chlorides was the rule in uraemia, but Bulger *et al.* [1926] point out that in uraemia with high serum-chlorides the bicarbonate may be extremely low, which was so in Case V. These facts explain the rarity of very high cerebrospinal fluid-chlorides in uraemia and their evil significance.

SUMMARY.

A very high cerebrospinal fluid-chloride titre in uraemia indicates the presence of (i) a disturbance of the normal serum-cerebrospinal fluid relationships, and (ii) a high serum-chloride with a very severe acidosis.

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