The Prognostic Value of the Non-Protein Nitrogen (NPN) Content in the Serum and the Cerebrospinal Fluid

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SUMMARY. The amounts of total protein and nonprotein nitrogen (NPN), together with the pH were determined in serum and lumbar cerebrospinal fluid (CSF) of controls and comatose patients before and after death. The serum/CSF ratio of NPN was calculated. Under normal conditions the value of this ratio is 1.65. The decrease of this value is a sign of worsening of barrier functions. If the NPN content of the serum and CSF becomes identical, i.e., when the serum/CSF ratio approaches or even equals 1.0, and at the same time the pH decreases in the CSF, then the prognosis is hopeless.

KEY WORDS: Serum and CSF Nonprotein Nitrogen - Barrier Functions - Serum/CSF Ratio - Prognostic Value.

In agreement with several authors (among others Siesjö et al., 1968; Zupping, 1972) the investigation of about 1300 patients’ blood and CSF led us to the conclusion that the composition of the CSF gives more reliable information about the normal and pathologic metabolic processes of the CNS than that of the blood (Molnár, 1972, 1973, 1974, 1975). The literature concerning the electrolyte and carbohydrate content, and acid-base charac-
teristics of the CSF is extremely vast (see Davson, 1972; Leusen, 1972; Fenstermacher & Rall, 1972; Molnár, 1974; Molnár & Kovács, 1974, and many others).

Of the substances containing NPN, numerous investigators have studied in the CSF of animals and humans the quantity of urea and its changes (Bradbury & Davson, 1953; Bering & Avman, 1960; Kleeman et al., 1961; Davson et al., 1962; Bradbury et al., 1963; Javid & Settlage, 1965; Davson, 1967). In humans Bradbury et al. (1963) found both in ventricular and lumbar CSF less urea than in the blood. Lumbar CSF contains less urea (28.1 ± 9.2 mEq/l) than serum (34 ± 10.9 mEq/l) according to Sambrook et al. (1973).

Few data (Lickint, 1951; Pruckner & Manuelidis, 1951; Bammer & Schaltenbrand, 1968) can be found regarding the NPN content of the CSF and its changes. This and an accidental observation led us to perform systematic examinations.

CASE REPORT

Mrs. A. G., age 37, was admitted to our clinic because of unconsciousness gradually deepening to coma. Signs of focal organic lesion of the nervous system could not be found. Among laboratory findings the NPN content of the serum (134.2 mg/100ml) was unambiguously pathologic. According to the consulting internist it did not explain the unconsciousness. At that time a lumbar puncture was made. We found the same amount of NPN (134.4 mg/100 ml) in the water-clear CSF as in the serum, that is, the serum/CSF ratio was practically 1.0. The patient died. (Findings at autopsy: chronic nephritis, cerebral edema.) We began on the basis of this experience a series of investigations, which gave us useful data for general practice too.

MATERIALS AND METHODS

The quantity of NPN was measured in the serum and lumbar CSF of controls and in comatose patients. At the same time the total protein and pH values of the CSF were determined, the latter because other authors (Zupping, 1972; Sambrook et al., 1973) and ourselves as well have found a strict correlation between the severity of the damage in the nervous system and the pH of the CSF.

NPN was measured by the titrimetric method of Rappaport & Echhorn (1947) and pH by the aid of a "Radelkis" microanalyzer (Type OP-210/1). The total protein content of CSF was determined according to Exton (see Gernand & Hajek, 1966; Krüger et al., 1970).

We chose as controls 186 individuals who had no symptoms referable to organic damage of the nervous system. The values found in the controls were compared with those of the total protein in CSF, and the NPN and pH values in the serum and CSF of 23 comatose patients who were treated because of serious, mainly cerebrovascular disease causing death. We divided the patients into two groups according to whether their CSF was bloody (11 cases) or water-clear (12 cases). The quantity of NPN and the pH were determined repeatedly in every patient and also within 10 or 20 min after death. As far as possible