Letters to the Editor

Ferritin in cerebrospinal fluid differentiation between central nervous system haemorrhage and traumatic spinal puncture

Observations by Hälgren et al.1 and Sindic et al.2 made us investigate to what extent ferritin in cerebrospinal fluid (CSF) may serve as an indicator of central nervous system haemorrhage and facilitate its differentiation from artificial blood contamination of CSF due to traumatic spinal puncture.

Artificial blood contamination of CSF was simulated by the addition of 0·1, 1·0, and 10·0 (v/v) of fresh edetic acid blood (which equals an average erythrocyte content of roughly 4 500, 45 000, or 450 000/μl CSF) of eight patients to their cerebrospinal fluids. These were compared with seven from patients with subarachnoid haemorrhage and five from patients with intracerebral haemorrhage, all confirmed by cranial computed tomography scan or angiogram. All determinations of ferritin concentration were performed by a commercial enzyme immunoassay (Enzymun-Test Ferritin, Boehringer Mannheim, West Germany), the suitability of which for measurement of ferritin in CSF was confirmed by precision and recovery studies.

Cerebrospinal fluids with moderate or even considerable artificial blood contamination of up to 1% (v/v) or an erythrocyte count of 45 000/μl did not show any significant increase of ferritin concentrations compared with those found before blood was added. Only in grossly contaminated CSF, which rarely occurs in clinical practice (10% v/v or 450 000 erythrocytes/μl) was a significant increase exceeding the imprecision of the method observed, which corresponded to the expected carry-over from the plasma ferritin concentrations of each patient. Haemolysis of erythrocytes in grossly contaminated CSF after one week’s incubation, however, causes a further increase of CSF ferritin concentration, depending on intracellular ferritin pools.

In contrast to CSF artificially contaminated with blood, all patients after subarachnoid haemorrhage showed grossly raised (by several orders of magnitude) CSF ferritin concentrations (figure). Even after intraparenchymatous cerebral haemorrhage moderate to pronounced increases of CSF ferritin concentrations were observed, which were clearly distinguishable from commonly encountered degrees of artificial blood contamination (up to 1% v/v). In all cases CSF ferritin was disproportionally raised with regard to the amount of blood present in CSF (figure).

Our findings indicate that ferritin concentrations in CSF may facilitate the differentiation of blood contamination of CSF due to traumatic puncture from genuine central nervous system haemorrhage. While this is quite obvious from the grossly raised concentrations encountered in subarachnoid haemorrhage, even cases of intraparenchymatous haemorrhage could be distinguished by CSF ferritin concentrations, increased disproportionately to the amount of red blood cells present.

In contrast to many other CSF proteins, the interpretation of CSF ferritin concentrations does not require the taking into account of plasma ferritin or the permeability of the blood-CSF barrier. CSF ferritin can be considered to be derived almost exclusively from sources within the central nervous system itself, as even in cases of severely impaired blood-CSF barrier function, the amount of ferritin present in CSF by far exceeds the amount explicable by its molecular size (450 000).3

While the precise sources of ferritin within the central nervous system are not known, degradation of haemoglobin by macrophages after central nervous system haemorrhage seems to be the most obvious origin.

CSF ferritin seems to offer a more specific and sensitive discrimination than the assessment of xanthochromia. Whereas CSF samples from all seven patients with subarachnoid haemorrhage were xanthochromic, only one CSF sample from five patients with intracerebral haemorrhage showed this discoloration.

The fact that xanthochromia occurs in all central nervous system diseases with a considerable blood-CSF barrier dysfunction is well documented and was confirmed in our study. This also applies to artificial blood contamination from 1%. CSF xanthochromia may serve as an indicator of central nervous system haemorrhage, only in the absence of severe impairment of the blood-CSF barrier (albumin CSF: serum ratio less than 15 × 10-6 or CSF protein less than 100 mg/dl) and in the absence of jaundice.

References


New type of staphylococcal endocarditis

We report a case of natural valve endocarditis caused by a previously undescribed penicillin sensitive *Staphylococcus. The strain was positive for clumping factor (slide coagulase positive) but was tube coagulase negative. The clinical picture resembled *Staphylococcus aureus endocarditis with a rapid course and gross valve destruction.

Classic *Staphylococcus epidermidis endocarditis occurs in patients with prothrombin valves and is usually low grade with few embolic phenomena,1 *S aureus endocarditis is aggressive and fulminant and is often associated with intravenous self-administration of drugs.2

Our case highlights a problem if staphylococci are specciated by means of tube coagulase alone. We therefore suggest that staphylococci causing serious sepsis be identified by means of clumping factor and free coagulase tests and that anomalous strains be sent to the reference laboratory.