

## CEREBROSPINAL FLUID SYNDROMES IN PATIENTS WITH ACUTE CONSCIOUSNESS COMPROMISE

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**ABSTRACT** - We reviewed the laboratory cards of 200 analysis of cerebrospinal fluid (CSF) performed to evaluate acute alterations of consciousness in adult patients attended in a neurological emergency room. 61% were men; the mean age was 46 years. The most common clinical data were infective and neurologic. The CSF was abnormal in 149 (74.5%) patients and the most common syndromes were: compressive (21%), hemorrhagic (11.5%), "viral" (8.5%), septic (7.5%), moderate hyperglycorrhachia (6.5%), hydroelectrolytic disturbances (5.5%). There were some statistically significant correlations between CSF syndromes and clinical data: septic syndrome and fever and meningeal signs, hemorrhagic syndrome and headache and meningeal signs, CSF hydroelectrolytic disturbance syndrome and seizures, severe hyperproteinorrachia and headache, fever, meningeal signs and vomiting, moderate hyperproteinorrachia and age over 65 and male sex. We classified the abnormal results in two groups: 1 - sufficient for an immediate clinical decision; 2 - nonspecific. The former group was found in 27.5% of the patients and in 36.9% of the abnormal CSF results. In patients attending to neurologic emergency rooms with acute alterations of consciousness, the examination of the CSF frequently could contribute to an etiologic diagnosis. It must be performed after a rigorous clinical evaluation of the patient.

**KEY WORDS:** cerebrospinal fluid, consciousness, emergency room.

### Síndromes líquóricas em pacientes com comprometimento agudo da consciência

**RESUMO** - Nós revisamos os registros de 200 exames de líquido cefalorraquidiano (LCR) realizados para avaliar alterações agudas da consciência em pacientes adultos atendidos em um pronto-socorro neurológico. 61% eram homens e a idade média era 46 anos. Os dados clínicos mais comuns foram infecciosos e neurológicos. O LCR foi anormal em 149 (74,5%) pacientes e as síndromes mais comuns foram: compressiva (21%), hemorrágica (11,5%), "viral" (8,5%), séptica (7,5%), hiperglicorraquia moderada (6,5%), distúrbio hidro-eletrolítico (5,5%). Nós classificamos os resultados anormais em dois grupos: 1 - suficientes para uma decisão clínica imediata; 2 - inespecíficos. O primeiro grupo foi encontrado em 27,5% dos pacientes e em 36,9% dos resultados anormais. Houve algumas correlações estatisticamente significantes entre dados clínicos e síndromes líquóricas: síndrome séptica e febre e sinais meníngeos, síndrome hemorrágica e cefaléia e sinais meníngeos, distúrbio hidro-eletrolítico no LCR e convulsões, hiperproteinorraquia acentuada e cefaléia, febre, sinais meníngeos e vômitos, hiperproteinorraquia moderada e idade acima de 65 anos e sexo masculino. Em pacientes atendidos em pronto-socorro neurológico com alterações agudas da consciência, o exame do LCR frequentemente pode contribuir para um diagnóstico etiológico. Deve ser solicitado após rigorosa avaliação clínica do paciente.

**PALAVRAS-CHAVE:** líquido, consciência, emergência.

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Patients with consciousness impairment are frequently seen in the emergency room. In this setting, a detailed medical history, concerning mode of onset, previous diseases, associated symptoms, history of medications, drug exposure or abuse is essential, but not ever obtainable. So, the diagnosis may become based upon physical examination and sometimes extensive laboratorial and image tests, such as computed tomography (CT) scan, electroencephalogram and cerebrospinal fluid (CSF) examination.

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In order to study the frequency in which the CSF findings contribute for the evaluation of patients presenting to a neurologic emergency setting with acute consciousness compromise, we reviewed six year results of CSF analysis performed with this indication.

## MATERIAL AND METHODS

We observed 200 laboratory filecards from the Cerebrospinal Fluid Laboratory of the Federal University of São Paulo/ Escola Paulista de Medicina, São Paulo, Brazil. Patients were attended at the neurological emergency room from January, 1990 up to April, 1996. All the tests were performed during the evaluation of patients presenting an acute disturbance of consciousness. There was no history of recent neurosurgery or craniocerebral trauma and only patients older than 12 were included. Clinical data were obtained from laboratory records. Because this is a retrospective study, we preferred not to divide the patients between those presenting an acute confusional state, or *delirium*, and those presenting somnolence or coma. We included only the results of the initial evaluation. Among these 200, we randomly choose 30 hospital filecards to check the inclusion criteria.

To perform a statistical analysis, we divided the abnormal results in two groups: 1- sufficient for an immediate clinical decision, not necessarily pointing to the final diagnosis or to the only one; 2 - nonspecific, in which the CSF showed abnormalities without enough specificity for an immediate clinical decision. The groups were composed of the following syndromes: 1 - sufficient: septic; hemorrhagic; severe hyperglycorrachia; neoplastic infiltration; hydroelectrolytic disturbances; 2 - nonspecific: compressive; "viral", allergic (with eosinophils); compatible with neurocysticercosis (positive CSF reactions, with or without pleocytosis); compatible with neurotuberculosis; isolated hypertension; moderate hyperglycorrachia; moderate hypotension; isolated xanthochromia; qualitative alterations of proteins. The four age groups were: 12 to 25, 26 to 45, 46 to 65 and older than 65. The CSF results were correlated to clinical data using Epi-info, version 5.01b.

## RESULTS

The mean age was 46, ranging from 13 to 89, and 122 (61%) were men. The mean time of consciousness alteration until the first CSF analysis was 3 days. The most common clinical data were: headache (21.5%), focal signs (21.5%), fever (18%), meningeal signs (17%), seizures (9.5%) and vomiting (3.5%). We found 149 abnormal CSF analysis (74.5%). Fifty-five were from the sufficient group: 27.5% of the 200 patients and 36,9% of the abnormal results. Table 1 shows the CSF syndromes. The association between clinical data and the syndromes is shown in Table 2.

## DISCUSSION

Our results disclose diseases usually encountered and some interesting associations. To interpret these results, we shall consider the circumstances in which the CSF analysis were solicited: to

Table 1. The CSF syndromes.

Syndrome	Patients n / %
Compressive	42 / 21
Hemorrhagic	23 / 11.5
"Viral"	17 / 8.5
Septic	15 / 7.5
Moderate hyperglycorrachia	13 / 6.5
Hydroelectrolytic disturbance	11 / 5.5
Moderate hypotension	7 / 3.5
Associated syndromes	6 / 3.0
Severe hyperglycorrachia	4 / 2.0
Qualitative alteration of proteins	4 / 2.0
Neoplastic infiltration	3 / 1.5
Others	4 / 2.0

Table 2. Association between CSF syndromes and clinical data.

Syndrome	Associated factor (p<0.05)
Septic	Fever Meningeal signs More than two CD
Hemorrhagic	Headache Meningeal signs
Hydroelectrolytic disturbance	Seizures
Severe hyperproteinorrachia (>150 mg/dl)	Headache Fever Meningeal signs Vomiting
Moderate hyperproteinorrachia (>50 and <150 mg/dl)	Age over 65 Male sex

evaluate critical patients in a neurological urgency setting. Many of the syndromes found, as well as their frequency, are related to these strict selection criteria<sup>1</sup>.

The prevalence of neurological and infectious clinical data is clearly related to our inclusion criteria and to the syndromes found<sup>2</sup>. Patients with obvious systemic causes for their clinical state are evaluated in the clinical - not in the neurological - emergency room.

The association of the age between 12 and 25 with nonspecific results may be related to the predominance of diseases of the sufficient group in older ages: hemorrhagic, neoplastic infiltration, accentuated hyperglycorrachia - presumably due to diabetes type II. As an example, young diabetic patients present more frequently with diabetic keto-acidosis and are infrequently submitted to CSF analysis, except in the suspicion of bacterial meningitis<sup>3</sup>. These patients would not be included because they are seen in the clinical emergency room.

Insults to the central nervous system (CNS) may lead to breakdown of the blood-brain barrier (BBB) and to cerebral edema. It results in extravasation of plasma proteins and in hyperproteinorrachia<sup>4</sup>. The predominance of compressive syndromes, besides indicating an insult to the CNS, partially reflect our selection criteria. The highest CSF protein levels are seen in tumors or inflammatory processes of the brain or spinal cord and in hydrocephalus<sup>5</sup>. These diagnoses, except for neurotuberculosis, were not included in this series. Other causes of BBB breakdown usually lead to lower protein levels. The mean protein level we found was 95.5 mg/dl and in only 4 it was found to be higher than 150 mg/dl, as the sole abnormality. Some grade of chronic vascular suffering, frequently present in the older male population, may lead to moderate elevations of protein<sup>5</sup>. In our study, moderate elevations of CSF protein were associated with the male gender and older age. Even so, we consider the finding of a moderate elevation of the CSF protein level as indicative of a significant insult to the CNS. It is not specific enough to point out a diagnosis but we suggest that these patients might need a closer vigilance of their clinical state.

Marked elevations of CSF protein levels were associated to headache, fever, meningeal signs and vomiting, reflecting its association to septic and to hemorrhagic syndromes. High CSF protein levels, in patients with bacterial meningitis, is associated to a higher risk of subdural effusion and abscess formation<sup>6</sup>. In patients with subarachnoid hemorrhage (SAH), complications like vasospasm, are related to the amount of red blood cells (RBC) in the subarachnoid space and the CSF protein level parallels the amount of RBC<sup>5,7</sup>. It is not of our knowledge the existence of papers relating complications of SAH and CSF protein levels.

Only 16% of the laboratory-cards showed a septic (7.5%) or "viral" (8.5%) syndromes, while 58.5% showed noninfectious ones. This relatively high frequency of other diagnosis compared with infections of the CNS may be explained by the fact that the typical or mild cases of meningitis were not included by our criteria. Certainly, a great part of the patients that had a CSF analysis, due to a hypothesis of meningitis, were not included because they had no consciousness compromise. The syndrome of "viral" meningitis is usually thought as essentially benign. Nevertheless, we found 17 cases that showed acute consciousness compromise. It may be related to the many possible etiologies, including fungi and protozoa<sup>1</sup>.

To evaluate the hypothesis of a subarachnoid hemorrhage, we perform a CT scan of the head<sup>7,8</sup>. If no blood is seen, one can perform a CSF analysis to evaluate the presence of minor bleeding. Francisco found that spontaneous subarachnoid hemorrhage with less than 45.000 red cells in the CSF usually is invisible on CT scans<sup>8</sup>. So, the relatively high frequency of the CSF diagnosis of a CNS hemorrhage may be explained by the relatively low red cells count (mean: 34.661).

The 3 cases with neoplastic infiltration had no previous diagnosis. Even rare, the finding of neoplastic cells in the CSF is a striking diagnosis and a prognostic information in any individual patient<sup>2,5,9</sup>. Moderate hypotension may reflect systemic dehydration just as moderate hyperglycorrachia may be considered an unspecific consequence of a stressful situation<sup>5</sup>. Qualitative alteration of proteins

(QAP), reflected in the positivity of the Pandy, Nonne or Weichbrodt reactions, may be caused by diseases like syphilis or multiple sclerosis. May also be secondary to elevation of the CSF protein<sup>1-5</sup>. All the patients with compressive syndrome also had QAP and 3 of the 4 patients with QAP as the sole abnormality had a borderline protein level (mean: 48.5 mg/dl, with lumbar puncture). Severe hyperglycorrachia is an example of a sufficient CSF result secondary to a systemic metabolic disturbance. A more careful clinical evaluation prior to the CSF analysis might had made it unnecessary.

The association of seizures to hydroelectrolytic disturbances in the CSF was very interesting. It is well known that systemic electrolytic changes are reflected in the CSF and that they can predispose patients to seizures<sup>5,10</sup>. It is a demonstration that metabolic dysfunction must always be carefully sought in critical ill neurological patients.

We found an elevated frequency of syndromes considered sufficient for an immediate clinical decision or a diagnosis (36.9%). It may be explained by a thorough previous evaluation, before performing the puncture, but may also reflect our strict selection criteria. Both contributed to exclude patients with obvious secondary neurological compromise. By evaluating *delirium*, in a neurological emergency setting, Neves found that the CSF analysis confirmed an initial diagnostic hypothesis in 17.2% of cases<sup>2</sup>. In the patients we studied, were included not only *delirium* but also patients who were somnolent or comatose. Even that the etiologies may be similar, the clinical situation in which the CSF analysis was performed is quite different. Many of our patients had a CSF analysis only after the initial diagnosis that seemed more probable were excluded. In the neurological emergency setting, it must be emphasized the urge to evaluate the patient as a whole, carefully trying to differentiate primary and secondary neurological involvement. When the primary clinical suspicion is meningitis, CSF analysis almost always is the first exam to be performed. In the suspicion of SAH, a CSF analysis may be required, if the CT scan is normal. Many systemic causes of acute consciousness compromise are reversible and need urgent evaluation and treatment. In these cases, performing and waiting the results of a CSF analysis may be not worthwhile. So, it was possible to obtain a so high contribution of the CSF analysis mainly because of carefully selecting patients that would benefit from it, based on reasonable clinical judgment.

## CONCLUSION

The CSF examination may significantly contribute for the evaluation of patients who show an acute compromise of the CNS. A high frequency of results considered "sufficient" can be expected if the patients are reasonably selected. A CSF analysis may reveal uncommon diseases, but usually it reveals unsuspected usual diseases. Given the high probability of a "sufficient" result in the CSF examination, we suggest that it must be reasonably considered in the evaluation of patients presenting acute confusional status or somnolence not only if the primary suspicion is meningitis or SAH.

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