



Disponible en ligne sur

**ScienceDirect**  
[www.sciencedirect.com](http://www.sciencedirect.com)

Elsevier Masson France

**EM|consulte**  
[www.em-consulte.com](http://www.em-consulte.com)

**Médecine et  
maladies infectieuses**

Médecine et maladies infectieuses xxx (2017) xxx–xxx

Original article

# Cerebrospinal fluid lactate concentration and bacterial encephalitis diagnosis

## *Lactatorachie et diagnostic d'encéphalite bactérienne*

M. Maillet<sup>a,\*</sup>, T. De Broucker<sup>b</sup>, A. Mailles<sup>c,d</sup>, P. Bouzat<sup>e</sup>, J.P. Stahl<sup>a,d</sup>, on behalf of the steering committee investigator group ,

<sup>a</sup> Service de maladies infectieuses, centre hospitalier universitaire de Grenoble, BP 218, 38043 Grenoble cedex 9, France

<sup>b</sup> Service de neurologie, centre hospitalier de Saint-Denis, 2, rue du Dr-Delafontaine, 93200 Saint-Denis, France

<sup>c</sup> Santé publique France, 12, rue du Val-d'Osne, 94415 Saint-Maurice cedex, France

<sup>d</sup> ESGIB, ESCMID Study Group for Infectious Diseases of the Brain

<sup>e</sup> Pôle anesthésie et réanimation, centre hospitalier universitaire de Grenoble, Grenoble, France

Received 31 July 2017; received in revised form 22 April 2018; accepted 23 May 2018

### Abstract

**Objectives.** – A French national study on infectious encephalitis enrolled 253 patients in 2007. Fifty-two per cent of patients had a proven etiological diagnosis; 16% had bacterial encephalitis. We aimed to assess the predictive value of CSF lactate concentration to diagnose bacterial encephalitis.

**Patients and methods.** – Patients from the 2007 cohort whose CSF lactate concentration was available were included. Clinical and biological features associated with a bacterial etiology were assessed using univariate analysis and multivariate logistic regression. The ROC curve of CSF lactate concentration was used to define the most appropriate cut-off associated with bacterial etiology.

**Results.** – Fifty-seven patients (37 men, 20 women) were included. Ten patients had bacterial encephalitis, 20 patients had viral encephalitis. The mean CSF white blood cells (WBC), protein, glucose, and lactate levels were respectively 92 cells/mm<sup>3</sup> (range: 0–450), 1.2 g/L (range: 0.2–8.2), 3.9 mmol/L (range: 0.8–8.8), and 2.8 mmol/L (range: 0–9.4). In univariate analysis, CSF protein level ( $P < 0.01$ ), WBC count ( $P = 0.02$ ), and lactate concentration ( $P < 0.01$ ) were significantly associated with bacterial etiology. The only factor independently associated with bacterial etiology in the multivariate analysis was CSF lactate concentration. The area under the ROC curve of CSF lactate for the diagnosis of bacterial encephalitis was 0.86. The cut-off value of 3.4 mmol/L correctly classified 87.8% of patients with 70% sensitivity, 91.5% specificity, 64% positive predictive value, and 93% negative predictive value.

**Conclusion.** – A high CSF lactate level seems to be a better predictor than WBC or proteins to differentiate bacterial encephalitis from other etiologies.

© 2018 Elsevier Masson SAS. All rights reserved.

**Keywords:** Cerebrospinal fluid; Encephalitis; Lactates

### Résumé

**Objectif.** – Une étude française sur les encéphalites infectieuses a inclus 253 patients en 2007. Une étiologie était prouvée pour 52 % des patients, 16 % avaient une encéphalite bactérienne. L'objectif était d'évaluer la valeur prédictive de la lactatorachie comme marqueur d'une étiologie bactérienne des encéphalites.

**Patients et méthodes.** – Les patients de cette cohorte pour lesquels la valeur de la lactatorachie était disponible ont été inclus. Les variables associées à l'étiologie bactérienne ont été évaluées par analyse univariée et régression logistique multivariée. La courbe ROC de la lactatorachie a été construite pour définir le seuil le plus associé à l'étiologie bactérienne.

\* Corresponding author.

E-mail addresses: [mmaillet@ch-annecygenevois.fr](mailto:mmaillet@ch-annecygenevois.fr) (M. Maillet), [thomas.debroucker@ch-stdenis.fr](mailto:thomas.debroucker@ch-stdenis.fr) (T. De Broucker), [alexandra.mailles@santepubliquefrance.fr](mailto:alexandra.mailles@santepubliquefrance.fr) (A. Mailles), [pbouzat@chu-grenoble.fr](mailto:pbouzat@chu-grenoble.fr) (P. Bouzat), [jpstahl@chu-grenoble.fr](mailto:jpstahl@chu-grenoble.fr) (J.P. Stahl).

<https://doi.org/10.1016/j.medmal.2018.05.003>

0399-077X/© 2018 Elsevier Masson SAS. All rights reserved.

**Résultats.** – Cinquante-sept patients (37 hommes, 20 femmes) ont été inclus. Dix patients avaient une encéphalite bactérienne et vingt patients avaient une encéphalite virale. Les cytorachie, protéinorachie, glycorachie et lactatorachie moyennes étaient respectivement de 92 éléments blancs/mm<sup>3</sup> (0–450), 1,2 g/L (0,2–8,2), 3,9 mmol/L (0,8–8,8) et 2,8 mmol/L (0–9,4). En analyse univariée, la protéinorachie ( $p < 0,01$ ), la cytorachie ( $p = 0,02$ ) et la lactatorachie ( $p < 0,01$ ) étaient significativement associées à l'étiologie bactérienne. La seule variable indépendamment associée à l'étiologie bactérienne en analyse multivariée était la lactatorachie. L'aire sous la courbe ROC de la lactatorachie pour le diagnostic d'encéphalite bactérienne était 0,86. La valeur seuil de 3,4 mmol/L classait correctement 87,8 % des patients (sensibilité 70 %, spécificité 91,5 %, VPP 64 % et VPN 93 %).

**Conclusion.** – Une lactatorachie élevée semble être un meilleur prédicteur que la cytorachie ou la protéinorachie pour distinguer les encéphalites bactériennes des autres étiologies.

© 2018 Elsevier Masson SAS. Tous droits réservés.

**Mots clés :** Encéphalite ; Lactate ; Liquide cébrospinal

## 1. Introduction

The etiological diagnosis of encephalitis is difficult and often not achieved in clinical settings, thus leaving patients and caregivers without any clue about the outcome of the disease and possible occurrence of sequelae. In 2007, a French national study on infectious encephalitis enrolled 253 patients [1]. The etiological diagnosis was obtained in 52% of the study population. Forty patients (16% of total, 30% of those with a confirmed etiological diagnosis) had bacterial encephalitis, including possibly challenging diagnosis such as tuberculosis and listeriosis. These patients accounted for the highest rate of in-hospital case fatality (30% for tuberculosis and 46% for listeriosis), supporting the usefulness of better diagnostic tools for these specific infections. Indeed, in case of non-specific clinical presentation and negative bacteriological test, strong evidence is needed to decide whether antibiotics should be prescribed for a longer duration after the initial empirical treatment or whether they should be stopped, or whether a treatment for tuberculous encephalitis should be initiated [2]. Cerebrospinal fluid (CSF) lactate concentration was reported as a surrogate marker of bacterial etiology in meningitis [3–7] and might be related to poor neurological outcome [8,9]. However, the additional value of CSF lactate level remains uncertain and debated, and it has not been mentioned as a good marker of bacterial etiology in encephalitis [4–6]. This issue is particularly relevant for encephalitis, as brain injury such as encephalitis may involve impaired brain cell metabolism and lactate production [10]. Thus, lactate concentration in CSF might be helpful in this context. With the present study, we aimed to assess the predictive value of CSF lactate concentration to diagnose bacterial encephalitis.

## 2. Patients and methods

### 2.1. Study population

Patients from the previously reported study [1] were included if the CSF lactate concentration was available. A patient presenting with encephalitis was defined as a patient aged  $\geq 28$  days and hospitalized in mainland France with an acute onset of illness, at least one abnormality of the CSF (white blood

cell [WBC] count  $\geq 4$  cells/mm<sup>3</sup> or protein level  $\geq 40$  mg/dL), temperature  $\geq 38$  °C, and decreased consciousness or seizures or altered mental status or focal neurological signs. Exclusion criteria, collected variables, and outcomes have been described elsewhere [1]. Informed written consent was obtained from all patients or patients' next of kin. This study was approved by the ethics committee of Grenoble University Hospital (No. 172003) and by the French Data Protection Authority (French acronym CNIL).

### 2.2. Statistical analysis

Data was analyzed using Stata statistical software, version 13 (Stata Corp). The studied outcome was the etiology of encephalitis (bacterial versus other etiologies including viral or unknown cause). Clinical and biological factors associated with a bacterial etiology were assessed in a univariate analysis using Student's *t*-test or Wilcoxon rank test for continuous variables, and Pearson's Chi<sup>2</sup> test or Fisher's exact test for categorical variables. All variables individually associated with a bacterial etiology with *P* value  $< 0.2$  were included in a multivariate logistic regression model. Variable selection was performed according to a descending stepwise procedure.

As lactate concentration is known to be associated with inflammation after brain injury, and infectious encephalitis share common pathological features with brain injury, we were concerned that some factors increasing brain inflammation may constitute confounding factors in our analysis: time between onset of symptoms and lumbar puncture, seizures, parenchymal lesions assessed by brain imaging. Thus, time between onset of symptoms and lumbar puncture, seizures, and lesions on brain imaging were forced into the initial multivariate model. The fit of the final model was assessed using Hosmer and Lemeshow goodness of fit test.

Correlation coefficients between CSF characteristics usually considered as suggesting the bacterial cause of encephalitis (namely CSF WBC count, CSF protein levels, and CSF lactate levels) were assessed.

Diagnostic performance of CSF lactate levels was assessed using receiver operating characteristic (ROC) analysis. For each cut-off values, the number of correctly classified patients

Download English Version:

<https://daneshyari.com/en/article/8952110>

Download Persian Version:

<https://daneshyari.com/article/8952110>

[Daneshyari.com](https://daneshyari.com)