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Aseptic Meningitis Caused by Coxsackievirus B and Cytomegalovirus (CMV) at a University Hospital in Dakar (Senegal)

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Abstract

Introduction: Viral meningitis are the main causes of meningitis for all causes combined. They are frequent but underdiagnosed. The aim of this study was to determine the role of viruses in aseptic meningitis at the pediatric hospital of Diamniadio in Dakar.

This was a prospective study from the 1st of January to the 31st of August 2017 involving 30 patients from the children's hospital of Diamniadio. The cytochemical tests and the assessments of soluble antigens in the CSFs were carried out at the laboratory of the hospital of Diamniadio. The virological tests were carried out at the Pasteur Institute of Dakar.

The analysis of the CSFs found 7 Coxsackievirus and 1 Cytomegalovirus (CMV). No microbial organisms were detected by conventional bacteriological analyses.

Keywords: Meningitis; CSF; Coxsackievirus; Cytomegalovirus; Senegal

Introduction

Viral meningitis is the main cause of meningitis for all causes combined [1].Unfortunately, it is underdiagnosed due to the limited technical platforms of laboratories.Viral meningitis results in aseptic meningitis, with a clear cerebrospinal fluid. The aim of this study was to determine the role of viruses in aseptic meningitis at the pediatric hospital of Diamniadio in Dakar.

Materials and Methods

This was a prospective study covering the period from the 1st of January to the 31st of August 2017. All of the clear CSFs obtained from the patients with a suspicion of clinical meningitis were included in this study. The purulent CSFs were not retained in this study.

To eliminate a bacterial infection, Gram staining was carried out on all of the samples. The CSFs were also inoculated in normal Mueller-Hinton (MH) medium and in MH Supplemented with Sheep Blood (MHSB) and vitamins (Polyvitex bioMérieux). The latex agglutination test was performed on all of the samples with Pastorex meningitis kit (Bio-Rad).

The virological part of the analysis of the CSFs was carried out at the Virology unit of the Pasteur Institute of Dakar (PID). The detection and the molecular characterization of the viral agents was carried out by PCR or RT-PCR followed by sequencing.

The data were processed using Epi-Info version 3.5.4 software.

Results

A total of 30 aseptic CSFs were received by the laboratory during the study period. The patients were aged from 0 to 15 years. The analysis of the CSF was revealed an average protein concentration of 1.15 g/L, with extremes of 0.15 g/L and 5 g/L. The average glucose level was 0.52 g/L, with extremes of 0.27 g/L and 0.88 g/L. The average level of polynuclear neutrophils was 8352/mm^3, with extremes of 1350/mm^3 and 23940/mm^3. The average level of lymphocytes was 7690/mm^3, with extremes of 989/mm^3 and 75400/mm^3. The conventional bacteriological analysis did not find any microorganisms.

The virological analysis found 7 Coxsackievirus and 1 Cytomegalovirus (CMV) in the CSFs (Table 1).

Discussion

We identified 30 aseptic CSFs during the study period.

The viruses isolated in our study were mainly non-poliomyelytic *enteroviruses*, particularly *Coxsackie B-1 (CV-B1), Coxsackie B-2 (CV-B2)*. In Taiwan, *Coxsackie B-1 (CV-B1)* virus has already been isolated from the CSF of a child of less than 2 years of age [2]. Similarly, in Brazil, *Coxsackie B-2 (CV-B2)* virus caused a fatal meningoencephalitis in a child of 8 years of age [3].

Enteroviruses are common infectious agents divided into four species (human *enteroviruses* species A through D) that currently comprise 108 serotypes [4]. They are non-enveloped positive-sense single-stranded RNA viruses, belonging to the family of *Picornaviridæ*, that are very resistant to the external environment and that are transmitted mainly by the fecal-oral route as well as by air [4]. These *enteroviruses* are frequent agents of meningitis in children. There is little data available regarding *enteroviruses* in Senegal. To our knowledge, our study is one of the first to report the isolation of *enteroviruses* in CSFs in Senegal. Their presence had previously been detected in nasopharyngeal secretions and stools in Senegal [5].

In Hong Kong, in the summer of 2008, laboratory surveillance has

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Table 1: Viruses isolated from the CSFs.

Genotypes of the viruses	Frequency	Percentage
Coxsackievirus (CV-B1)	5	71.42%
Coxsackivirus (CV-B2)	2	28.57%
CMV	1	14.28%
Total	8	100.00%

detected increased number of Coxsackievirus B3 (CVB3) associated with aseptic meningitis, constituting 11.6% of those infected [6].

Coxsackie B viruses are a more virulent type of cytolytic viruses in neonates and immunosuppressed individuals. They can cause illnesses without any discernible signs, as well as upper respiratory tract, heart, and nervous systems diseases [7, 8].

We found also one CMV among viruses isolated from CSFs. CMV meningitis is a well-documented clinical entity in immunocompromised adults [9]. But a study suggests that CMV meningitis should be included in the differential diagnosis of immunocompetent adults with lymphocytic meningitis [9].

Our data confirm that *Enteroviruses* are one of the agents responsible for meningitis in Senegal. Meningitis by *enteroviruses* is often underdiagnosed due to a lack of testing for them. Testing by Polymerase Chain Reaction (RT-PCR) for *enteroviruses* in the CSF is recommended, however, in cases of meningitis that do not appear to have a bacterial origin [1].

Conclusion

Coxsackievirus and CMV account for a significant part of the etiologies of viral meningitis. Meningitis involving enterovirus generally progress in a favorable manner without treatment [1]. Further investigations need to be conducted for better understanding of the part of these viruses among viral causes of meningitis in Senegal.

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