SciMedCentral

Annals of Pediatrics & Child Health

Case Report

Rhombencephalitis by Listeria Monocytogenes in an Immunocompetent Child

Ferreras L. Antolín[1]*, González JM Gómez[2], Moreno-Pérez D[1], Martínez MI León[3] and Bienvenido Ros López[4]

[1]*Infectious Diseases and Immunodeficiencies Unit, Regional University Hospital, Spain*
[2]*Emergency and Pediatrics Intensive Care Unit, Regional University Hospital, Spain*
[3]*Department of Radiology, Pediatrics Radiology, Regional University Hospital, Spain*
[4]*Department of Neurosurgery, Maternity Hospital, Regional University Hospital, Spain*

***Corresponding author**
Laura Ferreras Antolín, Infectious Diseases and Immunodeficiencies Unit, Maternity Hospital, Regional University Hospital, Avda, Arroyo de los Ángeles sn, 29011, Málaga, Spain, Email: lferreras85@gmail.com

Submitted: 23 March 2015

Accepted: 21 May 2015

Published: 28 May 2015

Keywords
- Rhombencephalitis
- Listeria monocytogenes
- Inmmunocompetent child

Abstract

A previously healthy 21-month-old girl who presented to the emergency department with 4 days of fever and progressive lethargy, initially computed tomography (CT) scan was normal and the cerebrospinal fluid (CSF) was lymphocyte predominant pleocytosis. Despite medical treatment, she showed a progressive neurological worsening. A new CSF culture showed *L. monocytogenes* growing and a brain MRI demonstrated rhombencephalitis and secondary obstructive hydrocephalus. Meningoencephalitis by *Listeria monocytogenes* is a rare entity in immunocompetent toddlers and older children, rhombencephalitis is an unusual form of presentation, which affects the brain stem and protuberance parenchyma. With this case, we review the clinical presentation and management of this unusual infection.

ABBREVIATIONS

CT: Computed Tomography; CSF: Cerebrospinal Fluid; PICU: Pediatric Intensive Care Unit; ADA: Adenosine Deaminase

INTRODUCTION

Meningoencephalitis by *Listeria monocytogenes* is an infrequent but at the same time deeply studied cause of neonatal meningitis. Although it is a very rare entity in immune competent toddlers and older children, it should be taken into account in cases of atypical lymphocytic meningitis. Rhombencephalitis is a rare form of presentation which affects the brain stem and protuberance parenchyma. In this report we are presenting a case of a previously healthy 21-month-old girl who developed a rhombencephalitis and an obstructive hydrocephalus due to *L. monocytogenes.*

CASE PRESENTATION

A previously healthy 21-month-old girl entered hospital with a 4-day long unmeasured fever and cough. She had been suffering from headaches, vomiting and progressive lethargy for the last 8 hours prior to admission. In the Emergency Department she showed an alternating consciousness level and meningeal signs, but no skin lesions. She had been properly immunized against *Haemophilus influenzae* type b and *Neisseria meningitidis C*. The laboratory test showed mild leukocytosis (12,000 cells/mm^3) and neutrophilia (82%), C-reactive protein 104 mg/L and procalcitonin 28 ng/mL. The computed tomography (CT) scan was normal. The cerebrospinal fluid (CSF) showed 455 cells/mm^3, with lymphocytic predominance (85%), but normal protein (0.89 g/L) and glucose levels (71 mg/dL). No bacteria were seen with the Gram staining, and the pneumococcal antigenic test was negative. She was admitted to the Pediatric Intensive Care Unit (PICU) and started intravenous treatment with acyclovir and cephotaxime.

During 4 days, she continued showing no neurologic improvement, despite the reduction of C-reactive protein and procalcitonin. CSF and blood cultures were negative. She presented a dramatic worsening of the mental status and the appearance of the sixth left craneal nerve palsy. An urgent CT revealed a mild hydrocephalus. A new CSF examination was repeated, and it showed 560 white cells/mm3 (70% lymphocytes), glucose 7 mg/dL and protein 1.4 g/L. Gram staining was negative again and adenosine deaminase (ADA) was 29.8 UI/L. Tuberculin skin test, interferon-gamma release assay and Rose Bengal test were all negative. Standard treatment against meningeal tuberculosis (isoniazid, pyrazinamide, rifampin and amikacin, plus dexamethasone) was added.

Twenty-four hours later, Gram positive bacillus started growing in the second CSF culture and they were identified as *Listeria monocytogenes*. Treatment was changed to ampicillin and amikacin.

A brain MRI demonstrated a periacueductal mesencephalic injury (rhombencephalitis), which caused progressive supratentorial moderate ventriculomegaly; ventriculitis was also noted (Figures 1,2). External ventricular drainage was performed. All viral serology and other microbiological tests were negative, as well as the evaluation of cellular and humoral immunity. Parents were asked about eating habits, but there were no antecedents of food focus or other ill cohabitants.

The patient improved rapidly after the beginning of intravenous ampicillin and the external ventricular drainage placement. She completed a 3-week therapy with ampicillin (amikacin and dexamethasone for the first 2 weeks). A ventriculoperitoneal shunting was definitively placed before discharge.

DISCUSSION

Listeria monocytogenes infection is a rare entity mainly detected in neonatal and elderly period, during pregnancy and in patients with cellular immunodeficiency. Among *Listeria* species, only *Listeria monocytogenes* affects humans. Interpersonal transmission is very rare, except mother-to-child transmission or in nurseries [1]. Enteral is the main way of transmission and incubation period is commonly long (31 days on average). After an initial bacteriemia, *L. monocytogenes* presents tropism for the CNS and intracellular behavior, being transmitted cell to cell via axonal migration up to the brain and brainstem and without being exposed to antibodies or white blood cells. For this reason, patients with cellular immunity defects are mainly affected [1-3]. In our patient, HIV screening and the evaluation of immunity were normal.

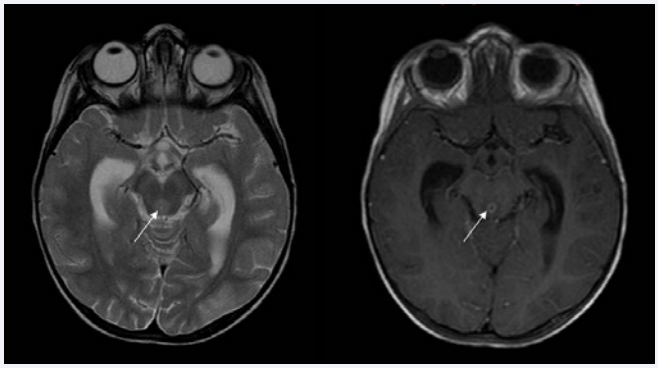

Figure 1 (a) Axial TSE T2-weighted image and (b) axial SE T1-weighted enhanced MR image show periacueductal pathological signal intensity (arrow) and periacueductal enhancement (arrow) respectively, findings consistent with rhombencephalitis.

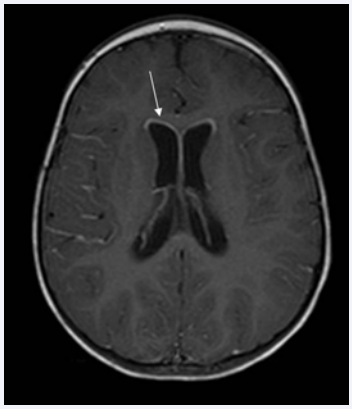

Figure 2 Axial SE T1-weighted image shows pathological ependymal enhancement (arrow) after the administration of IV contrast material, the finding is highly suggestive of ventriculitis.

Infection by *Listeria* can be clinically presented as sepsis, endocarditis or gastroenteritis but it can also be associated with local infections, like conjunctival membranes, skin or lymph nodes [1]. The meningoencephalitis is the most typical clinical expression, tending to generate more affectation on the brain parenchyma than other pathogens involved in bacterial meningitis. Rhombencephalitis is a rare but specific clinical presentation, as in our patient. It refers to the inflammation being located in the region of the protuberance and brain stem.

Typically, rhombencephalitis is characterized by a two phase clinical expression, initially with fever, nausea or vomiting, followed by cranial nerve palsy, cerebellar ataxia, hemiparesia or unilateral affectation of sensitivity. Neck stiffness appears in about 50% of the cases [1-5].

The diagnosis is based on the bacterial isolation in biological fluids. The CSF characteristics are usually non-specific. It must be included in the differential diagnosis of lymphocytic meningitis in 30% of the cases and in about 60%, glucose level is normal [1]. In our case, the lymphocytic predominance and the normal glucose level were fulfilled but, as she showed an important initial inflammatory answer, the diagnosis was oriented to bacterial infection; that was the reason why cephotaxime was associated to acyclovir.

It is necessary to consider some aspects about diagnosis tests:

- The Gram staining is less useful for diagnosis than it is for other bacterial meningitis caused by common germs, being initially negative, approximately in 60% of the cases [1-3].

- The blood culture is generally positive in about two thirds of the cases. As in our case, a change in the cultures from an initial negativity to a later positivity has been documented [3,4]. For this reason, if no concrete germ is isolated by meningoencephalitis, the repetition of the cultures should be indicated, regardless of the beginning of the treatment.

- A CSF ADA level over 9-10 UI/L points to tuberculosis infection or to neurobrucellosis. Nevertheless, it has been proved that high ADA levels cannot rule out an infection by *Listeria*, as it was in our case, or by other pathogens like *CMV*, *Toxoplasma, Treponema* or *Criptococcus* [5].

In addition to the microbiological diagnosis, MR imaging is extremely important in order to demonstrate the predilection of *Listeria* infection for the brain stem and cerebellum. These regions can also be involved in viral encephalitis, lymphoma, vasculitic diseases (systemic lupus erythematosus, Behçet disease), neurosarcoidosis, tuberculosis, multiple sclerosis and acute disseminated encephalomyelitis. However, it is *Listeria* the most common cause of rhombencephalitis.

As regards the treatment, intravenous ampicillin is the drug of choice [1-3]. Based on its synergy, it is strongly recommend the association with aminoglycosides (gentamicin or amikacin), in case of severe infection (meningitis or endocarditis). Cotrimoxazol can be used in those patients with allergy or resistance to penicillins. Carbapenems have been used as well, sometimes combined with aminoglycosides [2]. Linezolid has also been used, and represents a valid alternative in patients who cannot tolerate ampicillin and especially with CNS localization. Vancomycin has proved to be effective in *invitro* testing, and has showed a high clinical failure rate [4]. The association of dexamethasone to the antibiotic treatment may also be useful in some cases.

Hydrocephalus has been reported in association with meningitis of diverse origin, although *L. monocytogenes* infection and the development of hydrocephalus are quite related [2-4]. Other serious complications which have been reported are cranial nerve palsy, diabetes insipidus or secretion of inappropriate anti-diuretic hormone. Mortality is high, up to 30-50% of the cases [3,4].

To conclude, although *L. monocytogenes* continues being an uncommon cause of meningitis in previously healthy children, it should be taken into account mainly in patients with clinical deterioration, lymphocytic meningitis and little response to third generation cephalosporins empirical treatment. Negative Gramstaining or blood and CSF cultures, or the presence of high levels of ADA in CSF do not exclude infection by *L. monocytogenes*.

REFERENCES

1. Lorber B. Listeria monocytogenes. In: Long S. Principles and Practice of Pediatric Infectious Diseases, 3rd ed. Philadelphia, Churchill Livingstone. 2012: 762-767.

2. Ben Shimol S, Einhorn M, Greenberg D. Listeria meningitis and ventriculitis in an immunocompetent child: case report and literature review. Infection. 2012; 40: 207-211.

3. Platnaris A, Hatzimichael A, Ktenidou-Kartali S, Kontoyiannides K, Kollios K, Anagnostopoulos J, et al. A case of Listeria meningoencephalitis complicated by hydrocephalus in an immunocompetent infant. Eur J Pediatr. 2009; 168: 343-346.

4. Lee JE, Cho WK, Nam CH, Jung MH, Kang JH, Suh BK. A case of meningoencephalitis caused by Listeria monocytogenes in a healthy child. Korean J Pediatr. 2010; 53: 653-656.

5. Cabezas P, Ruiz A, Morales JL, Porcel JM. [Meningitis caused by Listeria monocytogenes with high levels of adenosine deaminase]. Enferm Infecc Microbiol Clin. 2011; 29: 240.

Cite this article

Antolín FL, Gómez GJM, Moreno-Pérez D, León MMI, López BR (2015) Rhombencephalitis by Listeria Monocytogenes in an Immunocompetent Child Ann Pediatr Child Health 3(5): 1068.