

## *Staphylococcus warneri* meningitis in a child: a case report

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### Abstract

Bacterial meningitis is caused by several etiologic agents and leads to sequelae or death. After the advent of mass vaccination to protect against the most frequent agents, such as *Neisseria meningitidis*, *Streptococcus pneumoniae*, and *Haemophilus influenzae* type B, *Staphylococcus species* are more common. This report illustrates an unusual case of bacterial meningitis caused by *Staphylococcus warneri*, a coagulase-negative *Staphylococcus sp.*, as well as its therapeutic approach and clinical outcome.

**Keywords:** *Staphylococcus warneri*, Meningitis, Childhood.

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### Introduction

Coagulase-negative *staphylococci* are significant nosocomial pathogens complicating central venous catheters, prosthetic heart valves, prosthetic joints, neurosurgical ventricular shunts, and in infants on intensive care nurseries. Bacteremia with coagulase-negative *Staphylococci* may be associated with significant morbidity and mortality in hospitalized patients [1]. The characteristics of bacterial meningitis include acute inflammation of the meninges, subarachnoid space, and cerebral vasculature [2]. These are conditions of great concern worldwide due to the potential to cause sequelae and lead to death. Their frequency and etiological agent groups vary according to geographic regions [3, 4].

Several species of the *Staphylococcus* genus are etiological agents of infection of the central nervous system and cause meningoencephalitis in children. Coagulase-negative *Staphylococci* – including *S. warneri* – form a heterogeneous group of microorganisms found in oral and nasal mucosae and skin flora of humans and animals [3].

The authors of this study searched for academic research in the PubMed, PubMed-Medline, SciELO, and LILACS databases from July 2020 to September 2021. The following descriptors were used: *Staphylococcus warneri* AND meningitis OR brain infection.

This article aims to describe a case report of *Staphylococcus warneri* meningitis in a previously healthy child without comorbidities.

### Case Description

The authors report that the patient's legal guardian allowed data from the history to be used for scientific publication.

In addition, there was consent from the institution to use the medical record.

A two years and three months old boy was admitted to the Emergency Room of the Hospital Universitário do Oeste do Paraná in June 2020. Seven days earlier, he presented with abdominal pain, nausea, vomiting, and diarrhea, which was non-bloody and non-mucoid. He had no fever at any time during the evolution of the clinical picture. Those responsible sought medical attention, and on the first day, Azithromycin 10 mg/kg/day was prescribed, and on the following four days, 5 mg/kg/day, for a total of 5 days of treatment.

There was worsening abdominal pain, and the patient had nausea, vomiting, and diarrhea, with a fever measuring up to 39.7°C and a lack of appetite. Because of this clinical picture, he was admitted to the Emergency Room for investigation and remained there for 48 hours. During this period, he received intravenous Ciprofloxacin until he was transferred to the referral hospital.

The child lived in an urban area with his parents and a brother, and the living area had adequate sanitation. He routinely played in the home backyard, with frequent contact with the earth and no pets. His father is a smoker, and his mother has hypertension and hypothyroidism.

He was born in the hospital by cesarean section for cephalopelvic disproportion at a gestational age of 39 weeks. He was large for gestational age, with a birth weight of 4,145 g. He was fed exclusively on breast milk until five months of age, when fruit porridge was introduced. Medical history indicated hospitalization for pneumonia at twelve months of age. The vaccination status was adequate according to Brazil's National Immunization Program (Ministry of Health-Brazil), which recommends a vaccine against *Neisseria meningitidis serotype C* for infants at the third and fifth months and with a booster

at twelve months. His weight and height were adequate (87<sup>th</sup> percentile for weight and 83<sup>rd</sup> percentile for height) according to World Health Organization (WHO) growth charts. His nutritional status was adequate, and he had neuropsychomotor development compatible with chronological age.

The physical examination on admission to the hospital indicated that the infant was generally stable but irritable. His heart rate was 116 beats/minute, respiratory rate 20 breaths/minute, and axillary temperature 36.4°C.

When the head was flexed toward the trunk, he assumed an antalgic position, bending the leg over the thigh and the thigh over the abdomen. The examiner interpreted this response as a positive Brudzinski sign. The patient also had a classic positive Kernig's sign, with pain and resistance when attempting to extend the leg at knee height with the thigh flexed over the hip. Examination of the cranial nerves was normal. Pupils were isochoric and reacting to light.

He presented with an antalgic gait, with pain to walk when flexing the trunk under the abdomen. This symptom led to investigating the possibility of an abdominal cause of the pain, even though the patient had no pain on abdominal palpation, with a negative Blumberg sign. An abdomen ultrasound and CT scan were performed, which showed no abnormal findings.

The Complete Blood Count showed hemoglobin: 9.2 (g/dL) and HCT: 29.1 (%); White Blood Count: leukocytosis: 18 ( $\times 10^9/L$ ) with left shift and the presence of myelocytes, besides elevated C-reactive Protein (CRP) and normal erythrocyte sedimentation rate (ESR) value. Cerebrospinal fluid (CSF) was collected and showed the following alteration: pleocytosis with 25 leukocytes of lymphomononuclear pattern, with 13 neutrophils, 86 lymphocytes, and one monocyte (being the expected value: absence of cells). The blood glucose was normal: 56 mg/dL. The cerebrospinal fluid (CSF) culture and antibiogram revealed growth of *Staphylococcus warneri* resistant to oxacillin and erythromycin, susceptible to linezolid, chloramphenicol, gentamicin, levofloxacin, tigecycline, sulfamethoxazole-trimethoprim, and vancomycin. The child was treated with intravenous vancomycin at a dose of 60 mg/Kg/day for 14 days and had complete remission of symptoms on the third day of treatment.

## Discussion and Conclusion

The first case of meningitis caused by this agent was described in 2010, in a 59-year-old Brazilian woman with hyperinfection by *Strongyloides stercoralis*, who was on treatment with rituximab for lymphoma [3]. The second case report was described in 2019 in a premature infant with meningitis in Shanghai, China [5]. Cases of meningitis following traumatic brain injury have also been described [6].

*Staphylococcus warneri* represents only 1% of the staphylococci present in the flora of normal individuals. This bacteria has a morphology that resembles *Staphylococcus epidermidis*, such as gram-positive cocci, negative coagulase, with 0.5 to 1.0  $\mu\text{m}$  in diameter, nonmotile and non-spore-forming, occurring in pairs, singly or in tetrads. The difference between *S. warneri* and

*S. epidermidis* is due to its failure to demonstrate phosphatase activity and its ability to produce acid from trehalose [7, 8].

This group has gained a prominent position with a proportional increase in its incidence since mass immunization included most common agents such as *Neisseria meningitidis*, *Streptococcus pneumoniae*, and *Haemophilus influenzae* type B [2], which is part of Brazil's National Immunization Program distributed free by the country's public health network.

Despite this increased incidence, these agents are an uncommon cause of meningitis in children. Staphylococcal meningitis has a worldwide prevalence of around 1% of bacterial meningitis, and in Brazil, they represented 0.67% of meningitis reported between 2007 and 2016 [9]. Although unusual, these infections can have a high mortality rate. Meningitis due to *Staphylococcus aureus* has mortality rates ranging from 14 to 77% in several studies [10, 11]. Among the agents of staphylococcal meningitis in Brazil, *Staphylococcus aureus* and *Staphylococcus epidermidis* are the most common [9].

Coagulase-negative staphylococci (CoNS) are usually commensals of the skin or surface organisms. It is uncommon for them to cause clinically significant infection unless there is an underlying predisposition. Contrary to these facts, the child had no risk factors for this type of infection, such as immunosuppression, the presence of catheters, prostheses, or heart valves. In addition, he had no history of previous serious infections, good weight gain, and no family history suggesting immunodepression. An HIV Elisa test was also negative. He was seen again ten months following discharge, during which time he had no other infections.

The way *S. warneri* reached the central nervous system is uncertain, but an important fact is that the patient presented anal pruritus and pruritic lesions on the buttocks a few days before the meningitis process. One possibility is that the bacteria may have transferred from the skin into the bloodstream. The patient was treated with vermifugal medication prior to admission. The mother could not tell which medication was used for the treatment.

Thus, with the presence of symptoms and clinical signs suggestive of meningitis, laboratory tests corroborating the clinical findings, and discarding other justifications for the condition, we considered the culture positive for *S. warneri* as the etiologic agent of meningitis and treated it as such.

Early diagnosis is essential for a better clinical outcome of these infections. Clinical suspicion is based on signs and symptoms of meningeal inflammation, and their presentations vary according to the age group affected.

In older children, it is possible to find the classic triad composed of headache, vomiting, and fever, in addition to meningeal signs on physical examination, such as neck stiffness, Brudzinski's sign, and Kernig's sign, and Lasègue's sign. The younger the child is, the more nonspecific the symptoms are, and he may manifest only irritability or refusal to eat associated with fever. If there is increased intracranial pressure, bulging of the fontanel can be observed. In newborns, the signs are indistinguishable from other sepsis conditions.

CSF collection should be performed when there is a classic clinical suspicion of meningitis or in the investigation of

suspected cases with nonspecific symptoms, provided there are no contraindications to performing a lumbar puncture. The CSF will be submitted for cytology, biochemistry, and identification of the microorganism by culture, Gram staining, and specific antigen detection tests.

The treatment consists of initiating antibiotic therapy as early as possible. Initial antibiotic choice should be empirical and later guided by sensitivity testing. The selected antibiotic(s) should have good penetration of the blood-brain barrier, reaching adequate bactericidal concentrations with the lowest toxicity possible.

In this report of a preschool-age child, he was discharged from the hospital without any detectable sequelae. Over ten months, follow-up in the outpatient clinic has not detected any further sequelae.

## Competing interests

The authors have declared no competing interests.

## Authors' contributions

All the authors contributed to data collection, critically reviewed the manuscript, and approved the final version of the manuscript.

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