Diagnosis and analysis of a case of cat scratch disease combined with bacterial meningitis in a child

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Case Report

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Abstract

Cat scratch disease is an infectious disease caused by the invasion of Bartonella henselae into the human body. Its clinical manifestations are diverse, but those presenting with neurological symptoms are rare, and cases of combined bacterial meningitis are even rarer. In this study, we report a case of a child with unexplained fever and neurological involvement, in which conventional anti-infective treatment was ineffective, and cat scratch disease was diagnosed with the metagenomics next-generation sequencing of whole blood. The cerebrospinal fluid examination suggested bacterial meningitis, and she was discharged after treatment.

Introduction

Cat scratch disease (CSD) is an infectious disease characterized by localized lymph node enlargement. Its main pathogen is bartonella henselae (B. henselae). Cat scratch disease can be caused by scratches or bites from infected cats or flea bites. The disease is disseminated worldwide, with a low incidence of approximately 6.6/100,000 people assessed abroad [1]. The clinical manifestations of the disease are diverse, with some studies showing that 85%-90% of children present with limited skin and lymph node lesions, often self-limiting, with a fever of unknown origin as the primary manifestation in some cases [2]. However, in some cases, CSD may develop into a disseminated disease with liver, spleen, eye, and central nervous system involvement. The main neurological manifestations of cat scratch disease include neuroretinitis, and other neurological manifestations include encephalopathy, transverse myelitis, spinal radiculitis, and cerebellar ataxia [3]. Cat scratch disease complicated by meningitis is usually aseptic meningitis, and combined bacterial meningitis is sporadic [4]. A case of cat scratch disease combined with bacterial meningitis is reported below.

Case Report

A female child aged 11 years and four months old was admitted to the hospital for "recurrent fever with cough for 15 days". Fifteen days before admission, the child had a recurrent fever after vomiting as the primary manifestation, and chills and shivers accompanied the high fever, and the blood cell content in the hospital and ours indicated an increase in leukocytes \(11.53\times10^9/L\) and CRP (> 10 mg/L). After treatment with piperacillin-sulbactam infusion (Frequency and dosage were unknown) and cough suppression in the hospital, the fever peak decreased, and the child was brought to our hospital. The blood cell count in our hospital indicated elevated CRP and erythrocyte sedimentation rate. Therefore, the child was admitted to our department with a "fever of unknown origin, sepsis, and bronchitis". She said she was scratched by a cat on her left wrist two months ago and bled, which was not treated then.

Physical Examination

The physical examination on admission showed a clear consciousness, a red rash on both lower extremities with itching, no subcutaneous bleeding, and no enlarged superficial lymph nodes. The heart,
lungs, abdomen, and neurological examination were not special.

**Ancillary Tests**

A small pelvic effusion and enlarged left inguinal lymph nodes were observed on CT before admission. Blood cell count showed that WBC was 10.5×10^9/L, N was 59.9%, HGB was 104 g/L, PLT was 320×10^9/L, and CRP was 36.4 mg/L. The assessments of renal function, urine and stool routine, and autoantibodies were not abnormal. The evaluations of Rheumatoid factors and ferritin indicated 606 IU/ml of ASO, 34.79 mg/L of hs-CRP, and 2.6 g/L of a1-AG, and the rest were generally normal. TORCH infectious pathogens tests indicate 1.57 of HSV-IgM. The rest of the values are approximately normal. The purified protein derivative (PPD) tuberculin skin test, Mycoplasma pneumonia, Chlamydia pneumonia, nucleic acid-based detection of respiratory pathogens, T-SPOT, human parvovirus B19 antibody, CCP-IgG, blood culture, and cerebrospinal fluid culture were all negative. Bone marrow examination and cardiac ultrasound showed no abnormalities. Chest CT showed small nodular shadows in the upper lobe of the right lung and the lower lobe of both lungs, primarily chronic inflammation, and ground glass density nodular shadows in the dorsal segment of the lower lobe of the right lung. MRI of the head showed no significant abnormalities in the brain parenchyma, but a mucosal thickening of the left mastoid was detected.

**Treatment**

After admission, cefoperazone sodium, sulbactam sodium, and azithromycin were given to fight the infection. However, the fever was still recurrent after five days of use, with complaints of headache during the fever. But there was no special neurological examination, so she was given cranial MRI, lumbar puncture, bone marrow aspiration, and metagenomics next-generation sequencing of the whole blood. Cerebrospinal fluid cytology showed 50×10^6/L of nucleated cells, 6.0% of neutrophils, 78% of lymphocytes, and 16.0% of monocytes. Cerebrospinal fluid biochemistry, cerebrospinal fluid smear, and pathogenic nucleic acid of cerebrospinal fluid were not significantly abnormal.

Given that the child was considered to have meningitis and was treated with multiple antibiotics in another hospital, the child was treated with vancomycin and ceftriaxone sodium for anti-infection and acyclovir for antiviral treatment. After 5-day treatment, the child still had a recurrent fever. The metagenomics next-generation sequencing of the whole blood showed Bartonella henselae, so the diagnosis of cat scratch disease was confirmed. The temperature was normalized after one day of rifampicin and prednisone acetate, and doxycycline was added after one week of treatment. After two weeks of rifampicin + doxycycline + prednisone acetate treatment, the child's temperature was normal, the red rash on both lower limbs subsided, and the pharynx was slightly red. The routine blood tests showed 8.3×10^9/L of WBC, 70.6% of N, 126 g/L of HGB, 405×10^9/L of PLT, and CRP < 0.5 mg/L; Biochemistry showed no abnormality of liver and kidney function. She was discharged after 23 days of hospitalization. She was advised to continue taking rifampicin, doxycycline, and prednisone acetate orally for four weeks after discharge, during which hepatic and renal function was rechecked every week, and medication was
adjusted according to the results. After four weeks of follow-up by telephone, the child's body temperature remained normal, weight increased significantly, and the dose of prednisone tablets was adjusted on an outpatient basis.

Discussion

Bartonella belongs to the class Proteobacteria, subclass α, order Rhizobiales, family Bartonellaceae, Bartonella. More than 40 species and subspecies of Balaton's have been identified, including Bartonella henselae [5]. With the increase in domestic pet cats, the incubation period is generally 2 to 12 weeks, with more incidence in children and young adults [6, 7]. Papules, herpes, and pustules may appear at the local wound 3–10 days after being scratched by a cat, and local lymph nodes may appear enlarged near the wound after about 2–4 weeks. But none of the above typical symptoms are present in this child, which only manifests as unexplained fever, making clinical diagnosis difficult. However, due to the high requirements of Bartonella henselae's in vitro culture, its antigen and antibody detection is not carried out in most hospitals. And pathological biopsy is an invasive operation increasing the pain of the child. For hospitals that have the conditions, diagnosis can be made by mNGS. In many clinical cases, cat scratch disease presenting as a fever of unknown origin is diagnosed by mNGS.

A study reported by Marra et al. showed that cat scratch disease combined with meningitis is mostly aseptic meningitis [4]. In reviewing the literature, it was found that bacterial meningitis caused by Bartonella henselae (cat scratch disease) is extremely rare, and only one case of cat scratch disease combined with septic meningitis was published in China [8]. However, it was reported as lymphadenitis in a child with cat scratch disease, which is essentially different from the present case, thus lacking the best treatment options. It is currently believed that in non-serious immunocompetent CSD patients, the course of the disease is primarily self-limiting and usually resolves spontaneously within 2–4 months without the need to give anti-infective treatment [9]. However, in severe cases with heavy symptoms, involvement of different tissues and organs, or combined with immunocompromise, it is appropriate to use standardized anti-infective therapy, including azithromycin, rifampin, and doxycycline promptly [10].

There is no standardized treatment for CSD combined with bacterial meningitis, and doxycycline + rifampin is used according to the recommendations for the treatment of optic retinitis, with doxycycline 100 mg orally twice/d and rifampin 300 mg orally twice/d for 4–6 weeks [11, 12]. Prednisone acetate tablets were administered orally at 1 mg/Kg for two weeks, followed by four weeks of gradual reduction of glucocorticoid use according to body weight, for a total of 6 weeks of treatment. The patient was discharged after treatment with rifampin combined with doxycycline and prednisone acetate for anti-inflammation and anti-infection.

This case suggests that clinical workers should pay attention to history taking and can improve lumbar puncture in time. In addition, for children with an unexplained fever that cannot be diagnosed by conventional means, metagenomics next-generation sequencing of the whole blood is used when available to provide accurate information for the diagnosis and treatment of the child and to avoid missed diagnosis and misdiagnosis.
Declarations

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Not applicable.

Author contribution

LJ and YW collect the data; LJ and YJW write the manuscript; LJ and YL revise the manuscript; YL performed literature review. All authors have reviewed the final manuscript.

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Ethics approval and consent to participate

Publication of this case report followed the regulations of the Ethical Board of the West China Second Hospital and was conducted according to the latest version of the Helsinki Declaration. Written informed consent for publication was obtained from the patient's guardian. All identifiable patient information was omitted during the manuscript's initial development. Thank the patient and her family for allowing us to develop this manuscript.

Consent for publication

Written informed consent for publication was obtained from the patient's guardian.

Competing interests

The authors declare that they have no competing interests.

Availability of Data and Materials

All data analysed during this study are included in this published article and the datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

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