



Meningitis Caused by *Enterococcus gallinarum* in an Immunocompetent Host

Huanqin Han^{1,*}, Fan Mo¹, Wuying Zhang¹ and Qingfeng Luo¹

¹Department of Infectious Disease, Affiliated Hospital of Guangdong Medical University, Zhanjiang, China

*Corresponding author: Department of Infectious Disease, Affiliated Hospital of Guangdong Medical University, Zhanjiang, China. Tel: +86-7592387431, Email: huanqinhan@126.com

Received 2018 February 05; Revised 2018 July 27; Accepted 2018 July 30.

Abstract

Introduction: Enterococci are unusual etiological agents of bacterial meningitis. Meningitis caused by *Enterococcus gallinarum*, especially those that occur in immunocompetent hosts, is extremely rare. Moreover, community-acquired *E. gallinarum* meningitis might be extremely unexpected for a clinician and therefore easily misdiagnosed and mistreated.

Case Presentation: A 12-year-old boy presented with an acute onset of fever, headache and vomiting. The cerebrospinal fluid culture from lumbar puncture yielded an isolate that was identified as *E. gallinarum*. The therapeutic regimen was a combination therapy of rifampicin and high-dose intravenous penicillin. One day after starting treatment, the patient became afebrile. A repeated lumbar puncture two weeks later showed few white blood cells in the CSF and no bacterial growth.

Conclusions: This case reveals an incident of meningitis caused by *E. gallinarum* in an immunocompetent host. The combined therapy of rifampicin and high-dose intravenous penicillin might be effective for treatment in such a case.

Keywords: *Enterococcus gallinarum*, Meningitis, Penicillin, Rifampicin

1. Introduction

Enterococcus gallinarum is common to the normal bacterial flora in the intestinal tract of humans and animals. *Enterococcus gallinarum* is a known opportunistic pathogen and may cause sporadic cases of bacteremia, urinary tract infection, infectious endocarditis, spontaneous peritonitis and, less frequently, other diseases (1). Cases of *E. gallinarum* meningitis are even more rare (2), with a Medline database search of the literature revealing only seven reports. Furthermore, most of the cases were due to nosocomial infection, and these patients had some degree of immunosuppression and had been previously subjected to a neurological procedure (3). Although *E. gallinarum* is generally considered of low pathogenic potential, it is now well recognized that this organism can cause serious invasive infections. However, due to its rareness, *E. gallinarum* is often neglected and misdiagnosed. Especially in patients who are otherwise healthy, community-acquired *E. gallinarum* meningitis is unexpected for clinicians. Unfortunately, the therapeutic effects of ceftriaxone and vancomycin, which are commonly empirically used in the treatment of bacterial meningitis, are poor. We report a case of community-acquired *E. gallinarum* meningi-

tis for which penicillin was effective, while the efficacy of ceftazidime and antituberculosis drugs was poor.

2. Case Presentation

A 12-year-old, previously healthy male, was admitted to a county-level hospital for fever, headache, and vomiting. He was diagnosed with a central nervous system infection and pulmonary infection and given a treatment of cefturoxime for three days, followed by ceftazidime for three days. Nevertheless, his condition was not significantly improved. He was then transferred to our hospital after 12 days of illness for further treatment. The patient displayed a bad mental state, and his body temperature was 39°C. The physical examination indicated a suspicious stiff neck. Bloodwork indicated a total white blood cell (WBC) count of $12.6 \times 10^9/L$ (71.8% neutrophils). The blood chemistry, immunoglobulin, and T cell subsets were all within the normal range, which might indicate he was an immunocompetent host. A blood sample was sent for culture and came back negative. Brain MRI showed unusual widening of Virchow-Robin spaces (VRS) in the left frontal lobe, which might suggest a lesion in the central nervous system. Chest CT showed some lesions with proliferation and fibrosis in

the left upper lung, which might suggest old pulmonary tuberculosis. A lumbar puncture was performed, and the opening pressure was 110 mmH₂O (after the treatment of mannitol).

The analysis of cerebrospinal fluid (CSF) revealed the following values: WBC count of $24 \times 10^6/L$ (normal range $< 10 \times 10^6/L$); glucose level 4.3 mmol/L (normal range 2.5 - 4.5 mmol/L); chlorine level 112 mmol/L (normal range 120 - 130 mmol/L); and protein level 872 mg/L (normal range 200 - 400 mg/L). Bacteria and tuberculosis bacilli could not be found on CSF smear microscopy. According to the clinical symptoms and the data above, we considered tubercular meningitis as the most likely diagnosis and underwent diagnostic treatment with isoniazid, rifampicin, pyrazinamide and streptomycin for 2 weeks. However, his symptoms became even worse, and the analysis of CSF showed that the levels of WBC and protein were higher than those before treatment. More specifically, the patient still had a high fever and presented with a remarkable stiff neck. The analysis of CSF showed WBC count of $310 \times 10^6/L$ (75% neutrophils); glucose level 2.2 mmol/L; chlorine level 118 mmol/L; and protein level 899 mg/L.

Fortunately, the CSF culture then yielded an isolate which was identified as *E. gallinarum* (confirmed by VITEK32 microbial analysis instrument, bioMerieux, France). The isolate was sensitive to penicillin (MIC ≤ 0.25 mg/L), rifampicin (MIC ≤ 0.25 mg/L), linezolid (MIC ≤ 2 mg/L) and streptomycin. The isolate exhibited intermediate sensitivity to vancomycin (MIC = 8 mg/L) and resistance to gentamicin and tetracycline. According to this evidence, the therapeutic regimen was changed to another combination therapy of rifampicin and high-dose intravenous penicillin (4 million units every 8 hours; the patient weighed 30 kg). One day after starting treatment, the patient became afebrile. A repeated lumbar puncture two weeks later showed few WBCs in CSF and no bacterial growth. A repeated brain CT was unremarkable. The patient was then discharged and remained asymptomatic for 6 months afterward.

3. Discussion

Enterococci are clearly unusual etiological agents of bacterial meningitis, and they account for 0.3% - 4.0% of the reported cases of bacterial meningitis (2). Moreover, meningitis caused by *E. gallinarum*, especially those that occur in immunocompetent hosts, is extremely rare. Our case reveals that it is possible that meningitis can be caused by *E. gallinarum* in immunocompetent hosts.

The classic clinical manifestation of bacterial meningitis is characterized by symptoms of fever, headache, neck

stiffness, altered mental status, and even shock (4). Although our case had a relatively long course and the patient was relatively mild without altered mental status, the fact that the first lumbar puncture showed a low WBC number does not necessarily suggest that the *Enterococcus* was introduced (nosocomial infection) by the first lumbar puncture. In fact, the clinical manifestations and CSF parameters of atypical bacterial meningitis, especially in those previously treated, sometimes resemble those of tuberculous meningitis and cryptococcal meningitis. We noticed that the patient presented with fever, headache, and vomiting and had an abnormal brain MRI before the first lumbar puncture, which showed abnormalities of CSF chlorine level and protein level. The cause of atypical CSF parameters and manifestations in our case is perhaps because the patient had been treated with cefuroxime and ceftazidime, which may produce a partial antibiotic effect before being transferred to our hospital. This outcome could also explain why the first CSF parameters were not consistent with typical bacterial meningitis.

Early diagnosis and treatment of bacterial meningitis can be delayed by atypical symptoms and poor sensitivity of standard diagnostic microbiology. Changes in CSF should be interpreted carefully because CSF abnormalities change according to the cause and previous treatment. Thus, clinical manifestations and CSF parameters are not adequate to confirm or exclude diagnosis (4). Repeated lumbar punctures, CSF cultures, and detailed medical history enquiry are essential in patients with suspected meningitis. Although the patient was treated with rifampicin and streptomycin, and CSF culture showed that the isolate was sensitive to this treatment, the clinical efficacy was poor. We postulate that this outcome is because the distribution of streptomycin in the CSF and brain tissue is low, and treatment with rifampicin alone may rapidly cause bacterial resistance.

Enterococcus gallinarum isolates were either resistant or intermediately sensitive to vancomycin (5). In the cases of *E. gallinarum* meningitis reported in the literature, 2 patients were treated with ampicillin and gentamycin for 2 weeks, 1 patient with ampicillin and rifampicin for 3 weeks, 1 patient with teicoplanin for 4 weeks, 1 patient with ampicillin for 8 weeks, and 2 patients with linezolid for 3 weeks (2). Our patient was treated with rifampicin and penicillin for 2 weeks. All of the above patients were cured. In conclusion, the combination of penicillin and rifampicin might be a useful option for treatment of *E. gallinarum* meningitis. We recommend a course of treatment of at least 2 - 3 weeks, as symptoms disappear simultaneously. Linezolid or teicoplanin is also a useful option for treatment when the bacteria are resistant to penicillin.

Acknowledgments

The authors would like to thank the patient involved in this study.

Footnotes

Conflict of Interests: The authors declare no conflicts of interest.

Informed Consent: Informed consent was obtained from the patient's legal guardian for publication of the work.

References

1. Reid KC, Cockerill Iii Fr, Patel R. Clinical and epidemiological features of *Enterococcus casseliflavus/flavescens* and *Enterococcus gallinarum* bacteremia: a report of 20 cases. *Clin Infect Dis*. 2001;**32**(11):1540–6. doi: [10.1086/320542](https://doi.org/10.1086/320542). [PubMed: [11340524](https://pubmed.ncbi.nlm.nih.gov/11340524/)].
2. Khan FY, Elshafi SS. *Enterococcus gallinarum* meningitis: a case report and literature review. *J Infect Dev Ctries*. 2011;**5**(3):231–4. [PubMed: [21444994](https://pubmed.ncbi.nlm.nih.gov/21444994/)].
3. Swampillai J, Liang M, Fisher R, Devlin G. *Enterococcus gallinarum* causing native valve endocarditis and aorto-atrial fistula: a case report and literature review. *Echocardiography*. 2012;**29**(7):873–5. doi: [10.1111/j.1540-8175.2012.01685.x](https://doi.org/10.1111/j.1540-8175.2012.01685.x). [PubMed: [22494323](https://pubmed.ncbi.nlm.nih.gov/22494323/)].
4. Brouwer MC, Thwaites GE, Tunkel AR, van de Beek D. Dilemmas in the diagnosis of acute community-acquired bacterial meningitis. *Lancet*. 2012;**380**(9854):1684–92. doi: [10.1016/S0140-6736\(12\)61185-4](https://doi.org/10.1016/S0140-6736(12)61185-4). [PubMed: [23141617](https://pubmed.ncbi.nlm.nih.gov/23141617/)].
5. Sood S, Malhotra M, Das BK, Kapil A. Enterococcal infections & antimicrobial resistance. *Indian J Med Res*. 2008;**128**(2):111–21. [PubMed: [19001673](https://pubmed.ncbi.nlm.nih.gov/19001673/)].