ISSN 2689-8268 | Volume 7

American Journal of Surgery and Clinical Case Reports

Case Report Open Access

Report on a Case of Congenital Tuberculosis in a Premature Infant

Li Y[1*], Zhang H[1] and Guo X[2]

[1]Radiology department, Shanxi Provincial Children's Hospital (Shanxi Maternal and Child Health Hospital), Taiyuan, China

[2]Neonatal intensive care unit (NICU), Shanxi Provincial Children's Hospital (Shanxi Maternal and Child Health Hospital), Taiyuan, China

[*]Corresponding author:

Yongfang Li,
Radiology department, Shanxi Provincial Children's Hospital (Shanxi Maternal and Child Health Hospital), Taiyuan, China

Received: 20 Dec 2023
Accepted: 04 Jan 2024
Published: 10 Jan 2024
J Short Name: AJSCCR

Citation:

Li Y. Report on a Case of Congenital Tuberculosis in a Premature Infant. Ame J Surg Clin Case Rep. 2024; 7(7): 1-5

Keywords:

Congenital Tuberculosis; Premature; Genetic Testing for Pathogens; Chest X-ray

Abbreviation:

CTB: Congenital tuberculosis; MTB: Mycobacterium tuberculosis; IVF: In Vitro Fertilization; BCG: Bacillus Calmette-Guerin; HIV: Human Immunodeficiency Virus; TST: Tuberculin Skin Testing; PCR: Polymerase Chain Reaction; IGRA: Interferon Gamma Release Assay

1. Abstract

1.1. Background: Congenital tuberculosis is a systemic hematogenous disseminated tuberculosis. Due to the carrier of Mycobacterium tuberculosis by the pregnant mother, the newborn is infected with the bacteria through the placenta, umbilical cord, or breathing. congenital tuberculosis is very rare, newborn children often have severe symptoms and progress rapidly. The clinical symptoms and routine imaging examinations of this disease are not characteristic, which can easily delay diagnosis and treatment, so the mortality rate is high.

1.2. Case presentation: A case of congenital tuberculosis was diagnosed in our hospital, the child was born prematurely at 26 weeks, signs of illness appeared immediately after birth. The chest X-ray showed the infection focus of both lungs. After pulmonary surfactant replacement therapy and routine anti infection treatment, the condition was not improved. In addition, the mother has a history of tuberculosis. The diagnosis was confirmed by genetic testing for pathogens. The child was born prematurely with severe symptoms, and the parents abandoned treatment. As well as, the sibling sister of the child has recovered and been discharged from the hospital after receiving isoniazid for preventive treatment.

1.3. Conclusion: This case highlights the importance of mother's tuberculosis history and typical millet pattern on chest X-ray for early diagnosis of congenital tuberculosis, and clarify the necessity of pathogen detection, which is useful for further standardisation of the clinical diagnosis and treatment.

2. Background

Congenital tuberculosis (CTB), also known as intrauterine infectious tuberculosis. It is extremely rare, most cases are caused by the vertical transmission of Mycobacterium tuberculosis (MTB) through the placenta and umbilical cord during pregnancy, and some fetuses may be infected with MTB by inhalation or ingestion during the mother's uterine cavity or delivery process [1,2,3]. Previous reports rarely mentioned the incidence of congenital tuberculosis. It has a mortality rate of up to 50 percent [4,5]. The occurrence of congenital tuberculosis in newborns includes two pathways, namely hematogenous and non-hematogenous dissemination. The vast majority of children are transmitted through hematogenous routes. When the mother gives birth, Mycobacterium tuberculosis in the blood will pass through the placenta or umbilical cord to the fetal liver, and then spread through the bloodstream to various parts of the body, which can affect the lungs, bone marrow, bones, adrenal glands, etc. The non blood route is relatively rare, and sometimes the fetus may inhale or swallow the maternal amniotic fluid carrying Mycobacterium tuberculosis, thus leading to the occurrence of congenital tuberculosis [6].

Since hematogenous infection can be symptomatic in the immediate postnatal period, they can be easily misdiagnosed due to their aggressive condition, rapid progression. The lack of specific manifestations of neonatal tuberculosis, the lack of awareness of the disease by clinicians, the neglect of the mother's tuberculosis history, and the low laboratory examination rate and positive rate, can

lead to the misdiagnosis of neonatal tuberculosis. Cantwell [7] and other authors have formulated the diagnostic criteria for congenital tuberculosis in 1994. At least one of the following must also be ensured if the neonate is clearly suffering from tuberculous lesions: (1) Lesions in newborns in the first week of life, (2) a primary hepatic complex or caseating hepatic granulomas, (3) transmission of tuberculosis bacilli from the placenta or maternal genital tract, or (4) exclusion of the possibility of postpartum acquisition by a In-depth investigation of potential contacts after birth. So far, this case is the only one encountered in our hospital. In this report, we describe our imaging findings and genetic testing results, and review the literatrue to improve our understanding of the disease, avoid the occurrence of misdiagnosis and provide additional evidence and thinking about clinical diagnosis and prognosis.

3. Case Presentation

The mother of this child was an IVF (In vitro fertilization) twin pregnancy, the child was born prematurely at 26 weeks, weighing 790g, measuring 33cm in length, with a head circumference of 24cm, a body temperature of 36.5, a blood pressure of 42/16mmHg, and normal breathing and pulse. There was no history of intrauterine distress or postnatal asphyxia, there was no postnatal exposure to tuberculosis infection. The child was poorly responsive postnatally, had respiratory distress, and the mother denied the history of diabetes mellitus, thyroid dysfunction, gestational hypertension, or any other medical conditions. The general examination after admission showed that, regarding blood gas analysis, the pH was 7.46, the partial pressure of carbon dioxide was 26.7mmHg (1mmHg=0.133kPa), the partial pressure of oxygen was 92mmHg, and the oxygen saturation was 100%. About blood routine examination, the white blood cell count was 11.55*109/L [reference value: (3.5-9.5)*109/L], the absolute value of neutrophils was 9.27*109/L [reference value: (1.8-6.3)*109/L], and the absolute value of lymphocytes was 1.05*109/L [reference value: (1.1-3.2)*109/L]. Urine routine, stool routine, liver and kidney function, electrolytes, and myocardial enzymes of the child showed no abnormalities. In the results of lumbar puncture, routine cerebrospinal fluid examination revealed that the protein qualitative analysis was weakly positive, in cerebrospinal fluid biochemistry, the total protein was 1.05mg/L [reference value: (0.15-0.45)g/L], chloride was 116mmol/L [reference value: (120-132)mmol/L], and glucose was 3.59mmol/L [reference value: (2.8-4.5)mmol/L]. Results of acid-fast staining of sputum and gastric fluids were negative. Chest X-ray showed diffuse granular shadows in both lungs (Figure 1). The symptoms of the child who received routine anti-inflammatory treatment and replacement therapy of pulmonary surfactant did not improved. After inquiring about the history of tuberculosis of the mother, it was learned that she had suffered from endometrial tuberculosis two years ago. During subsequent treatment, it was found that the child's mother was in an active phase of Mycobacterium tuberculosis and progressed to tuberculous meningitis. Eventually, the child was considered as CTB by pathogenic detection at the age of 33 days.

Results of pathogen gene testing revealed that mycobacterium tuberculosis complex was detected in sputum, blood, and cerebrospinal fluid, which had high confidence level (Tables 1-3). However, other bacteria, viruses and fungi have not been detected. The positive Mycobacterium tuberculosis complex, which was considered to be associated with a history of previous tuberculosis infection in the mother. Although pulmonary surfactant replacement therapy was applied early in the patient to exclude pulmonary hyaline membrane disease, the prognosis of the child is still poor. Their parents have suffered long-term and huge economic pressure, so there was no alternative but to abandon treatment.

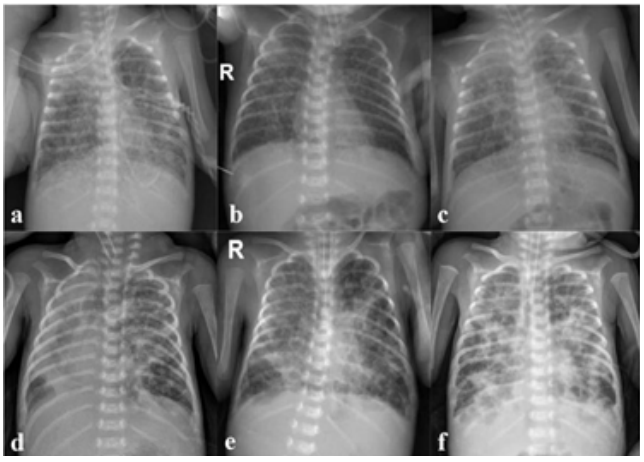

Figure 1: Chest X-ray findings of the child (a:15 days of birth; b:19 days of birth; c:24 days of birth; d:28 days of birth; e:29 days of birth; f:33 days of birth). Diffuse granular shadows were seen in Chest X-ray.

Table 1: The results of pathogen gene testing in blood

Genus			Species			
Classification	Generic Name	Sequence Number	Species Name	Confidence Level	Specific Sequence Number	Relative Abundance
Acid-fast	Mycobacterium	1202	Mycobacterium tuberculosis complex	High	1200	26.68%

Table 2: The results of pathogen gene testing in cerebrospinal fluid

Genus			Species			
Classification	Generic Name	Sequence Number	Species Name	Confidence Level	Specific Sequence Number	Relative Abundance
Acid-fast	Mycobacterium	243	Mycobacterium tuberculosis complex	High	8	0.00%

Table 3: The results of pathogen gene testing in sputum

Genus			Species		
Classification	Generic Name	Sequence Number	Species Name	Confidence Level	Specific Sequence Number
Acid-fast	Mycobacterium	99663	Mycobacterium tuberculosis complex	High	99663

4. Discussion

The diagnosis of congenital tuberculosis is quite difficult. In clinical practice, especially in infants with a progressive illness, which is unresponsive to conventional experiential therapies, and pregnant mothers suspected of having been exposed to any epidemic tuberculosis should be given special attention [8]. Some women's infertility is caused by tuberculosis in the urinary and reproductive systems, and the development of assisted reproductive technology can achieve pregnancy through in vitro fertilization technology, which may increase the incidence of congenital tuberculosis in newborns. In addition, for high-risk pregnant women with HIV (human immunodeficiency virus, HIV) infection, tuberculosis infection should also be considered and evaluated. This is beneficial for early treatment and prognosis of children [9,10,11]. In this case, we report that the child is a test tube baby with severe intrapulmonary infection after birth, with negative antacid staining of sputum and gastric fluid, coupled with the lack of in-depth investigation of the mother's history of tuberculosis at the beginning of admission, anti-routine anti-infective treatment for the child remains ineffective after correcting the deficiency of pulmonary surfactant. As a consequence, based on the positive results of Mycobacterium tuberculosis determined by pathogen genetic testing, the child is highly suspected of having congenital pulmonary tuberculosis. However, the current evidence is not conclusive as the application of anti-tuberculosis drugs has not been clinically validated, and lung puncture bacterial culture may also provide evidence. The case only indicate that the child is a carrier of Mycobacterium tuberculosis in the pregnant mother, and yet severe pulmonary infections may not necessarily be caused by active tuberculosis. The child's parents have suffered long-term and huge economic pressure from the twin pregnancy of test tube babies to the premature birth of the sisters, so they have no choice but to give up treatment. It should be mentioned that, no positive infection of Mycobacterium tuberculosis complex was found in the pathogen gene test of the sibling sister of the child. They once lived together in the mother's body, there was not much difference in weight, clinical symptoms, and physical signs between twins after birth. The pathogen test of the younger sister of the patient was negative, isoniazid preventive therapy combined with routine anti infection treatment were actively used, eventually, she recovered and was discharged from the hospital. The different outcomes of the twin sisters may be related to the strength of the newborn's immune function, or the mother's pulmonary tuberculosis is in an inactive period, resulting in a relatively low infection rate. In the future, we need to actively explore to dispel these doubts. Through the summary of this report, we will keep in mind the repeated and detailed investigation of the family members' medical history of the children, early preventive use of anti-tuberculosis drugs should be carried out for patients with suspected congenital tuberculosis, in addition, necessary countermeasures should be developed for high-risk environments and populations prone to cross infection to prevent the exposure of Mycobacterium tuberculosis and reduce the spread of Mycobacterium tuberculosis [12].

The diagnosis of tuberculosis in newborns with congenital tuberculosis depends on pathogenic testing, including acid fast bacilli in gastric juice, Mycobacterium tuberculosis culture in sputum, blood, cerebrospinal fluid, and bronchoalveolar lavage fluid, tuberculin skin testing (TST), and polymerase chain reaction (PCR), et al. The results of genetic testing for the pathogen showed that the complex group was a highly homologous group of tuberculosis causing mycobacteria, including Mycobacterium tuberculosis, Mycobacterium bovis (BCG, Bacillus Calmette-Guerin), Myco-

bacterium africanum, Mycobacterium volei. As reported in previous literature, though Mycobacterium tuberculosis was the most pathogens causing tuberculosis in humans, the other two species could also cause this type of disease and had similar manifestations [13].

Chest X-ray examination for pulmonary tuberculosis also have important signs, that easily confused with neonatal pneumonia, neonatal pulmonary hyaline membrane disease, sepsis, neonatal respiratory distress syndrome and intracranial infection [14]. Typical pulmonary tuberculosis generally manifests as multiple small pulmonary nodules and miliary shadows in both lungs, and can be seen as fine granular lesions with blurred edges. Newborns usually have no specific abnormal manifestations of tuberculosis, but their mothers often have a history of tuberculosis infection or exposure. Nevertheless, screening pregnant women with latent Mycobacterium tuberculosis infection is a bigger challenge. During pregnancy, elimination of the T-helper 1 (Th1) pro-inflammatory response may weaken the symptoms and increase the susceptibility to novel infections and reactivation of tuberculosis. There are currently two screening tests for diagnosing LTBI. Although the tuberculin skin test (TST) does not require laboratory infrastructure or high costs, its specificity is very low. In contrast, the interferon gamma release assay (IGRA) is more specific, but for many developing countries, high costs and laboratory facilities make them hesitant. It's a barrier that we need to break through urgently in the future [15,16].

After the diagnosis of neonatal congenital tuberculosis is confirmed, it is necessary to follow the principles of early, combined, moderate, regular and rational treatment, and anti-tuberculosis drugs should be used as soon as possible. For initial treatment, isoniazid combined with rifampicin is recommended in China, which can generally achieve good prognosis [17]. In clinical work, early diagnosis of congenital tuberculosis is very difficult, which makes high-risk infants who have not been diagnosed to a potential source of infection in the hospital. Therefore, ward management needs to be strengthened, isolation measures need to be implemented, and healthcare workers in neonatal wards should be given extra attention.

5. Conclusion

The clinical and imaging manifestations of congenital tuberculosis are non-specific. Thorough evaluation of mothers of infants with suspected congenital tuberculosis is necessary to avoid delays in diagnosis [18]. Early clarification of congenital tuberculosis, and early application of anti-tuberculosis drugs, often results in favorable outcomes.

References

1. Sun JM, Wang C, Jin DQ, Deng F. Fatal congenital tuberculosis owing to late diagnosis of maternal tuberculosis: case report and review of congenital tuberculosis in China. Paediatrics and international child health. 2020; 40(3): 194-198.
2. Chang CW, Wu PW, Yeh CH. Congenital tuberculosis: case report and review of the literature[J]. Paediatr Int Child Health. 2018; 38(3): 216-219.
3. Mane S, Chopade R, Patil A. Disseminated Congenital Tuberculosis in Neonates: A Case Series. J Trop Pediatr. 2022; 68(3): fmac031.
4. Risan NA, Febrianda RD and Nataprawira HM. Case Report: Congenital disseminated tuberculosis neonate born to tuberculosis COVID-19 mother. Front. Pediatr. 2022; 10:941570.
5. Varimo T, Nieminen T, Aronniemi J, Kekomäki S, Teivaanmäki T, Metsäranta M, et al. A case of congenital tuberculosis with a favorable outcome in a full term neonate. Clin Case Rep. 2020; 8: 1802-5.
6. Newberry DM, Bell TR. Congenital tuberculosis: a new concern in the neonatal intensive care unit. Adv Neonatal Care. 2018; 18(5): E1-2.
7. Cantwell MF, Shehab ZM, Costello AM, Sands L, Green WF, Ewing EP, et al. Brief report: congenital tuberculosis. N Engl J Med. 1994; 330(15): 1051-1054.
8. Sands A, Santiago MT, Uduwana S. Congenital Tuberculosis After In Vitro Fertilization: A Case for Tuberculosis Screening of Women Evaluated for Infertility. Clin Infect Dis. 2023; 76(3): e982-e986.
9. Zhuang G, Yang L, Qu L. Congenital tuberculosis in a neonate following in vitro fertilization-embryo transfer: A case report. Front Pediatr. 2022; 10: 985707.
10. Tamura K, Kawasuji H, Tachi S. Congenital tuberculosis in an extremely preterm infant and prevention of nosocomial infection. J Infect Chemother. 2019; 25(9): 727-730.
11. Feng Zhang, Xiao-Fo Zhang, Hai-Yi Zhou. Clinical characteristics in 26 children with congenital tuberculosis in Central Southern China: a retrospective study. Paediatrics and International Child Health. 2022; 42: 127-132.
12. Ryu BH, Baek EH, Kim DH. Preterm Twins Born to a mother with Miliary Tuberculosis: Importance of Early Recognition and Prompt Response in Infection Control to Manage Congenital Tuberculosis Exposure in a Neonatal Intensive Care Unit[J]. Jpn J Infect Dis. 2021; 74(2): 97-101.
13. World Health Organization. Global tuberculosis report 2019. Geneva: World Health Organization. 2019.
14. Abalain ML, Petsaris O, Héry-Arnaud G. Fatal congenital tuberculosis due to a Beijing strain in a prematureneonate. J Med Microbiol. 2010; 59: 733-735.
15. Saramba MI, Zhao D. A Perspective of the Diagnosis and Management of Congenital Tuberculosis. J Pathog. 2016; 2016: 8623825.

16. Mathad JS, Gupta A. Tuberculosis in pregnant and postpartum women: epidemiology, management, and research gaps. Clin Infect Dis. 2012; 55(11): 1532–1549.

17. Zhuang XL, Yang Y. Treatments and effects of congenital tuberculosis by early venous anti-tuberculosis. Sichuan Med J. 2015; 36(5): 674-677.

18. Li C, Liu L, Tao Y. Diagnosis and treatment of congenital tuberculosis: a systematic review of 92 cases. Orphanet J Rare Dis. 2019; 14(1): 131.