A Fatal Case of Streptococcal Toxic Shock Syndrome Developing in the Third Trimester of Pregnancy, China

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Case Report

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Abstract

Background

Group A streptococcal (GAS) toxic shock syndrome (TSS) is a rare invasive disease, causing a high risk of maternal and fetal mortality during pregnancy. We report a fatal case of a female caused by GAS-TSS in the third trimester of pregnancy in Guangzhou, China.

Case presentation:

The patient is a 33-year-old female who presented at 37 weeks' gestation with a history of three hours fever. She underwent an emergency cesarean section due to fetal bradycardia. The neonate survived after an aggressive anti-infection treatment. However, the patient's condition deteriorated rapidly after the operation and the patient died of disseminated intravascular coagulation and septic shock within 24h after admission. She was finally diagnosed with GAS-TSS. The GAS strains were isolated from two bottles of blood cultures, which confirmed as Streptococcus pyogenes by 16S gene sequencing and identified as serotype M1 by molecular typing.

Conclusions

Dramatical clinical picture and laboratory characters of the pregnant woman presented here might help improve clinicians' awareness and recognition of Streptococcus pyogenes, which could be of great importance for the early diagnosis of GAS- TSS in pregnancy.

Background

Streptococcus pyogenes, the causative agent of Group A streptococcal toxic shock syndrome (GAS-TSS), can cause sepsis and multi-organ failure for pregnant woman with high fatality and high fetal mortality rate [1–5]. Exposure to children (common GAS carriers) is a common way of GAS infection in pregnant women [6]. According to the literature, exotoxin A caused by M1 or M3 serotypes of the organism was associated with invasive and toxic disease [7]. In terms of treatment, clindamycin in combination with penicillin is still the first choice for it can suppresses bacterial toxins and inhibits synthesis of M protein [8–9]. Besides, intravenous immunoglobulin is a better adjuvant therapy [2]. Nevertheless, most pregnant women with GAS-TSS reported don't get a corrected diagnosis timely due to various factor e.g., confused clinical manifestations, lack of rapid identification and l recognition for the pathogen etc. Herein, we report a case of a female who developed GAS -TSS with M1 serotype in the third trimester with dramatical clinical manifestations and characteristic laboratory findings.

Case Presentation

On December 29, 2017, a 33-year-old pregnant woman, gravida 1, at 37 weeks of gestation, was admitted to the emergency department of Guangdong Women and Children Hospital (Guangzhou, China) because of fever lasting for 3 hours and fetal movement increased. No abnormality was found in her regular antenatal examination. However, a week before admission, the patient had started to experience fatigue and throat discomfort.

On admission, the physical findings were within normal levels, except for a febrile condition (temperature: 39.5°C). However, during the following 2 hours, an emergency cesarean section (CS) was performed due to fetal distress. The operation went well and the neonate was transferred to the neonatal intensive critical care unit (NICU) empirically treated with penicillin and cephalosporin for the fever. The blood culture for the infant was negative. The clinic findings demonstrated that the infant became in good health later.

Following the cesarean section, the vital signs of the patient were within normal range at first except for the poor uterine contraction with the pressing to bleed 300 ml. Then, balloon tamponade, uterine artery embolization and abdominal subtotal hysterectomy were successively performed to control the ongoing uterine bleeding. Transfusion of red cell suspension liquid, fresh frozen plasma (FFP), cryoprecipitate and apheresis platelet which were totally up to about 13,400 ml were also initiated. The drastic deterioration of her clinical findings was shown in the Fig. 2. Although the patient was received aggressive modern management with antibiotics and supportive therapy, in an attempt to correct blood clotting, promote contractions, fluid replacement, maintain water and electrolyte balance, etc., the condition deteriorated rapidly including hypotension, progressive decrease in blood oxygen saturation, systemic edema, and metabolic acidosis and the pregnant woman was finally died of disseminated intravascular coagulation and septic shock within 24h after admission.

The pathogenic analysis demonstrated two sets of blood culture collected on admission and after the cesarean section respectively were both present positive and Gram-positive coccus were both observed under light microscopy. After sub-culturing on 5% sheep blood agar plate under 5% CO_2 atmosphere for 24h, the isolate was identified as *Streptococcus pyogenes* using a Microflex matrix-assisted laser desorption/ionization time-of-flight mass spectrometry device (Bruker). Further, pairwise comparison of the 16S rRNA gene sequences was performed using BLAST searches (https://blast.ncbi.nlm.nih.gov/Blast.cgi) and showed that the isolate designed as SFY-1 shared highest similarities to *Streptococcus pyogenes* JCM 5674^T (99.5 %) but less than 97.7 % with other members of the genus *Streptococcus*. To determination its epidemiological characteristics, template preparation, PCR and sequence analysis were performed according to the protocols described in the CDC website (https://www2a.cdc.gov/ncidod/biotech/strepblast.asp) [10]. M protein gene sequence for the strain SFY-1 was detected as M1T1 genotype, which associated with toxic disease. The GenBank accession numbers for 16S rRNA gene sequence and M protein gene sequence of the strain SFY-1 was MW425601 and MW699016, respectively.

In parallel, airway secretion culture was positive with colonies identified as the same as that of blood culture. Of note, vaginal and pharynx cultures were negative. Besides, antibiotic susceptibility tests for the strain SFY-1 showed susceptibility to chloramphenicol, vancomycin, trimethoprim/sulfamethoxazole, cefotaxime, benzylpenicillin, cefotaxime, amoxicillin, levofloxacin, linezolid, moxifloxacin, quinupristin/dalfopristin and rifampicin but resistance to erythromycin, clindamycin, tetracycline and telithromycin. Moreover, the IgM antibody tests for Influenza A virus was positive.

According to the clinical characteristics and microbiological results, the pregnant woman was finally diagnosed with GAS-TSS. The whole striking changing course of GAS-TSS and diagnosis in pregnant woman are shown in Fig. 1.

Discussion And Conclusions

According to the definition for streptococcal toxic shock syndrome proposed by the Centers for Disease Control and Prevention of the United States [11], this case fulfilled criteria IA and II (A and B) which can be defined as a definite GAS-TSS. Furthermore, the patient working as a professional teacher had a history of exposure to fever children including her students or even her child while there was a scarlet fever outbreak period. Nevertheless, especially in emergency situations, this fact could be easily underestimated and ignored during the whole course. It is noteworthy that the patient might be co-infected with influenza virus infection which could cause a lethal GAS infection as the literature mentioned [12].

In our study, although Rapid MALDI-TOF analysis was used to quickly identify the pathogenic bacteria and automated blood culture alarm system was also conducted to remind on-duty person to deal with positive specimens in time, the condition of the pregnant woman still deteriorated rapidly. The possible main reasons are as below: Firstly, when the patient appears non-specific symptoms, for example, fu-like symptoms, she doesn't receive treatment promptly, which may lead to missing the best treatment time; additionally, clinicians and laboratorians in our countries are often not familiar with this rare infection caused by GAS, perhaps due to the limited number of case reports published in Chinese and English; What's worse, serotype M1, which is often involved in STSS, was detected from GAS of the pregnant woman and of note, the isolate was resistant with clindamycin which also indicated the severity and complexity of this case. Above all, we may conclude that early recognition and rapid identification and timely targeted intensive treatment for GAS and during pregnancy especially with fever is urgent and important. Fortunately, her infant became in good condition after prompt anti-infection treatment.

This case highlights the changes in characteristic laboratory findings of the pregnant woman with M1 serotype GAS-TSS infection in the third trimester of pregnancy, such as rapid elevated PCT, sharp drop in PLT and HBG, coagulation disorders and so on (Figure1 and 2). It is remarkable that PCT is a diagnostic marker for severe bacterial infections and sepsis and has a good relationship with the severity of sepsis. [13]. Additionally, we further confirmed the isolate by 16S rRNA gene analysis, and determined its emm

type by molecular typing, so as to provide a basis for epidemiological analysis of GAS-TSS in pregnant women around the world.

In summary, physicians need to be aware of the characteristic laboratory findings and clinical manifestations of rare and serious infections in pregnant women caused by *Streptococcus pyogene*. The continuous increase of PCT and related exposure history can be used as the key points for highly suspected GAS-TSS infection.

Declarations

Acknowledgements

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Authors' contributions

L-YS performed the isolation and identification of the pathogen, Z-ML performed molecular analysis of the pathogen; C-YY and G-CM collected the case clinical data; M-XP drafted the manuscript and participated in the design of the study. L-LJ critically reviewed the manuscript. All the authors read and approved the final manuscript.

Authors' information

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Availability of data and materials

All data relating to this study are presented within the manuscript.

Consent for publication

The case reported here provided written consent for the publication of this case report.

Ethics approval and consent to participate

This research was carried out according to the principles of the Declaration of Helsinki and was approved by the Ethics Committees of the National Institute for Communicable Disease Control and Prevention and the Chinese Center for Disease Control and Prevention.

Potential conflicts of interest

The authors declare that there are no conflicts of interest.

Abbreviations

GAS-TSS, Group A streptococcal toxic shock syndrome; PCT, procalcitonin; PLT, platelet; HBG, hemoglobin; APTT, activated partial thromboplastin time; PT, prothrombin time; FDP, fibrinogen degradation product.

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Table 1

Table 1. Drug susceptibility testing results of a *Streptococcus pyogenes* isolate from a 33-year-old pregnant woman, China.

Antimicrobial drug	Interpretation*	MIC, μg/mL
Erythromycin	R	≥0.25
Chloramphenicol	S	≤4
Clindamycin	R	≥0.25
Tetracycline	R	≥0.2
Vancomycin	S	≤0.1
Trimethoprim/sulfamethoxazole	S	≤10
Telithromycin	R	≥1
Benzylpenicillin(other)	S	≤0.12
Benzylpenicillin(oral)	S	≤0.06
Benzylpenicillin (NM)	S	≤0.2
Cefotaxime (HS)	S	≤0.5
Levofloxacin	S	≤2
Linezolid	S	≤2
Moxifloxacin	S	≤1
Quinupristin/Dalfopristin	S	≤1
Rifampicin	S	≤1

Note: *Interpretation was based on the breakpoints for *Streptococcus* spp.β-Hemolytic Group as listed in the CLSI M100-S28 guidelines[14]. R, resistant; S, susceptible.

Figures

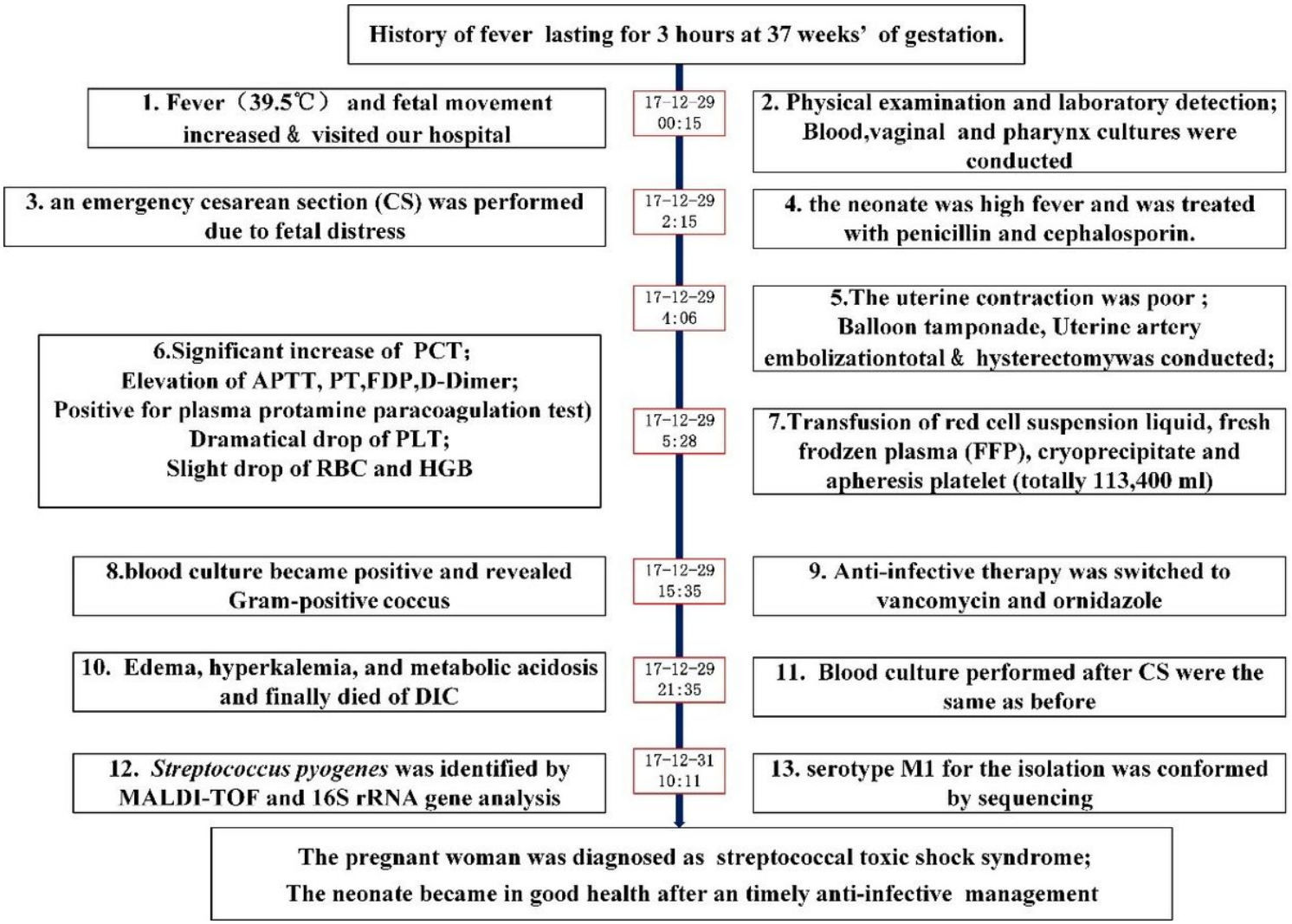

Figure 1

Course of disease and maternal and infant outcome of pregnant women infected with GAS-TSS.

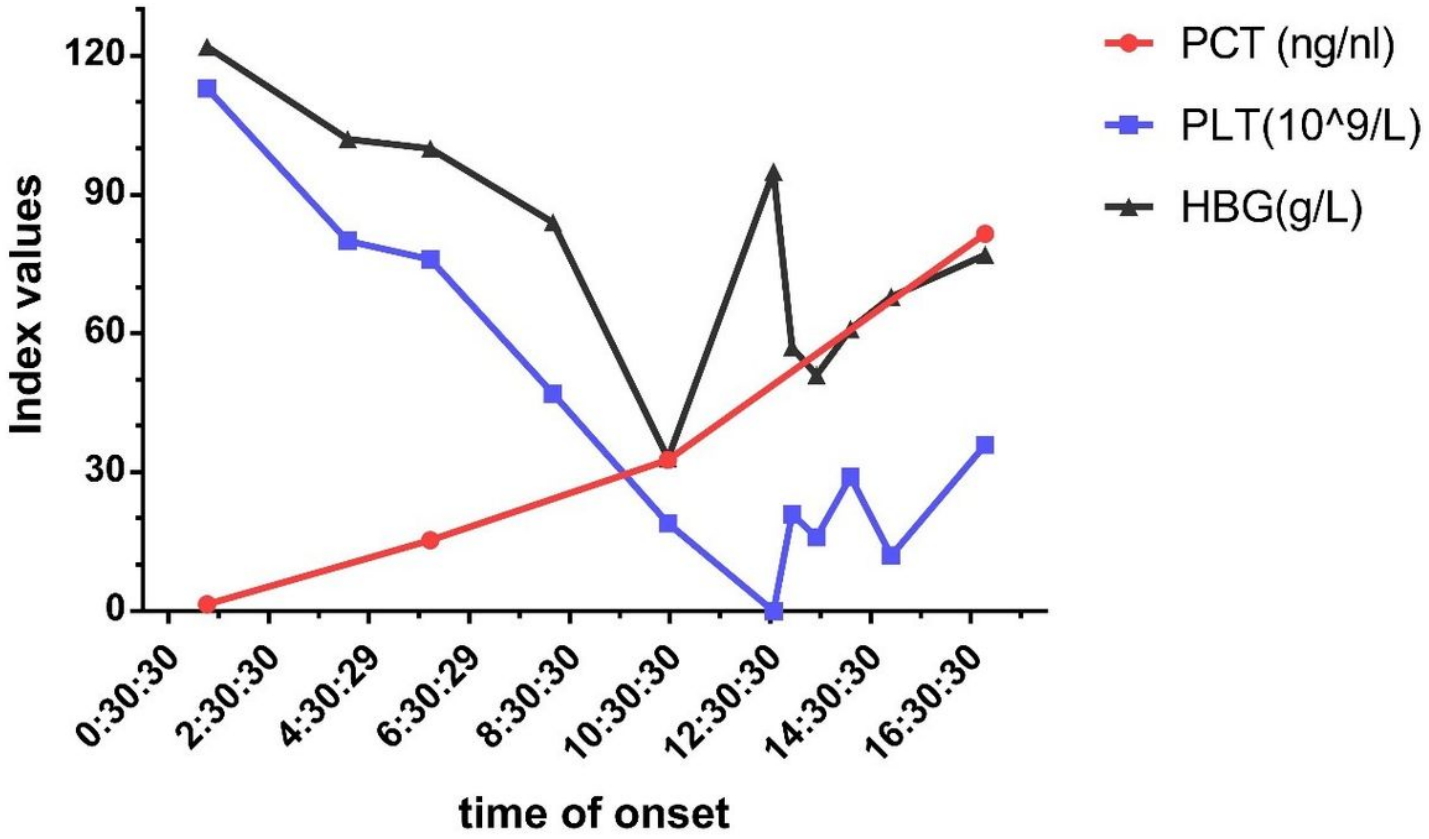

Figure 2

The change trend of PCT、PLT and HBG values of pregnant woman infected with GAS-TSS during the whole course of disease.