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Case Report

Case of Tetanus with Streptococcus Pyogenes Superinfection in a Thirteen-Year-Old Boy with Unknown Vaccination History: A Diagnostic and Therapeutic Study

Lidia Stopyra:

https://orcid.org/0000-0001-5370-0180

Zeromski Specialist Hospital, Krakow, Department of Infectious Diseases and Pediatrics,

Jakub Kozłowski

https://orcid.org/0009-0008-2564-9291

Zeromski Specialist Hospital, Krakow

Bartłomiej Żaczek

https://orcid.org/0000-0002-9184-3649

University Children's Hospital of Cracow (UCH), Krakow

Alicja Kamińska

https://orcid.org/0009-0007-6393-3405

Zeromski Specialist Hospital, Krakow

Abstract

Introduction and Aim: Tetanus is a severe, potentially fatal disease caused by *Clostridium tetani*, a bacterium that produces a neurotoxin affecting the nervous system. This toxin impairs muscle contraction control, leading to characteristic symptoms such as trismus (lockjaw), muscle spasms, odynophagia, and high fever. Advanced cases may involve seizures and respiratory difficulties due to laryngeal muscle spasms. We aim to present a pediatric case of tetanus to highlight the clinical manifestations, treatment approach, and recovery process.

Description of the Case: A thirteen-year-old Ukrainian boy with an unknown vaccination history was admitted to the pediatric infectious diseases unit with suspected tetanus. The disease presented with trismus, pain in the masticatory muscles, and discomfort in the tongue. Treatment involved the administration of human tetanus immunoglobulin, metronidazole, and penicillin. Over several days, the symptoms gradually subsided, and the patient experienced significant improvement.

Conclusion: This case underscores the importance of timely diagnosis and comprehensive treatment in managing tetanus, particularly in patients with unknown vaccination histories. Early intervention, including immunoglobulin administration and appropriate antibiotics, can lead to a favorable outcome. The patient was discharged with medical recommendations and a follow-up plan, emphasizing the importance of vaccination in preventing this potentially life-threatening disease.

Keywords

tetanus, Clostridium tetani, trismus, vaccination, Ukrainian patient

Introduction

Tetanus is a serious, potentially fatal disease caused by the anaerobic bacterium *Clostridium tetani*. This bacterium is found in soil, animal and human feces, and dust. Entry points of infection include open wounds, cuts, or other skin injuries [1]. Infection occurs through contact of damaged skin with contaminated soil. The bacterium produces tetanus neurotoxin (TeNT), which enters the systemic circulation and binds to motor and sensory neurons, eventually being transported to the spinal cord [2]. TeNT attacks the nervous system, leading to impaired muscle contractions, especially in the jaw, resulting in trismus as a primary symptom.

Other symptoms include muscle spasms, odynophagia, fever, and, in advanced cases, seizures and respiratory difficulties due to laryngeal muscle spasms obstructing the airways. Laboratory findings may show elevated muscle enzymes, such as creatine kinase (CK), and the presence of antitoxin antibodies. For tetanus prophylaxis, vaccinations and tetanus immunoglobulin are administered based on indications [3]. Treatment in cases of infection includes thorough wound cleaning and management, human tetanus immunoglobulin, intravenous metronidazole, and penicillin [4].

Case Report

A thirteen-year-old Ukrainian patient presented with masticatory muscle pain, tongue pain, leg pain, and trismus at the Emergency Department (ED). Symptoms had persisted for several days. Laboratory tests and a non-contrast head CT scan showed no abnormalities. Approximately two weeks before symptom onset, the patient had experienced a bicycle accident with a hand injury. In the ED, he received magnesium sulfate (MgSO4) and two milligrams of diazepam. On the same day, symptoms worsened, with increased swallowing difficulty and trismus.

Following readmission to the ED, he was transferred to the Pediatric Infectious Diseases Department with suspected tetanus.

The patient reported no history of animal bites, unknown drug intake, or exposure to toxic substances, such as rodenticides. According to his guardian, the boy had been vaccinated per the Ukrainian vaccination schedule, but no medical documentation was available. The patient's skin showed no scars from the BCG vaccine.

Muscle contractions and tremors were observed in the lower right limb, suggesting disease progression. Physical examination revealed a wound on the dorsal side of the right hand near the bases of the 1st and 3rd fingers. Blood work showed a BE level of -1.3 mmol/L (normal -2 to +2 mmol/L) and an elevated CRP of 14 mg/L. A complete blood count revealed leukocytosis with neutrophil predominance. Electrolytes were balanced, while troponin and CK levels were low. Other biochemical parameters were within normal ranges. Serology for anti-HBs was negative, suggesting either the absence of hepatitis B vaccination or no immune response.

Antibodies to *Clostridium tetani* IgG were tested, yielding a negative result with an antitoxin level of 0.04 IU/mL, indicating no prior tetanus vaccination. The WHO and CDC consider serum antitoxin levels of at least 0.1-0.2 IU/mL protective [5]. Bacterial culture and direct preparation were taken from the wound, revealing *Streptococcus pyogenes*sensitive to penicillin. ECG showed sinus bradycardia, with a rate between 50-55 bpm. The case was reported to the sanitary-epidemiological station via ZLK-1 form submission.

Based on history and clinical presentation, tetanus was diagnosed upon admission. The patient received intramuscular tetanus immunoglobulin, along with metronidazole and penicillin. A surgical consultation was requested, and wound irrigation with Betadine was advised, without the need for surgical intervention. After improvement, the patient was discharged in good general condition with recommendations for follow-up. A visit to the Infectious Diseases Clinic and vaccination updates per the Polish Immunization Program (PIP) [3] were scheduled.

Conclusion

Tetanus is prevalent in third-world countries with low vaccination rates [6]. Tetanus spores can survive for decades, so any wound contaminated with soil carries a risk of tetanus infection.

Pre-exposure prophylaxis consists of tetanus vaccinations administered according to the PIP. In children, the primary vaccination schedule includes four doses (at 2, 4, and 6 months, with a fourth dose between 16-18 months). Adults without prior tetanus immunization receive a three-dose primary series, with a second dose 4-6 weeks later and the last dose 6-12 months afterward. For adults, a booster is recommended every 10 years [3].

The post-exposure tetanus immunization schedule depends on the patient's vaccination status and wound type. It includes both the administration of the tetanus toxoid (vaccine) and, in some cases, tetanus immunoglobulin (Table 1).

Wounds should be cleaned with running water, disinfected, and, if necessary, surgically managed [7]. If prodromal

symptoms like pain near the wound or malaise develop, immediate medical attention is required. A detailed history, including vaccination status confirmed by medical documentation, is crucial for planning treatment. Hospitalization is recommended, and in severe cases, intensive care may be necessary. Treatment is based on clinical symptoms, with benzodiazepines, especially diazepam, helping control muscle spasms and generalized rigidity [1]. Intravenous magnesium sulfate (MgSO4) is beneficial for reducing cardiovascular instability [3,6]. Regardless of disease severity, antimicrobial treatment with penicillin and metronidazole may be applied [8].

Currently, due to unsatisfactory PIP implementation, the risk of tetanus cases is especially high among migrants from regions with lower vaccination rates, such as Zakarpattya, where only 61.6% of the population has protective tetanus antibody levels. However, in most areas covered by the study, tetanus immunity levels are satisfactory, reaching \geq 80% seropositivity, which is considered sufficient to protect the population [9].

Caregivers' reliability concerning vaccination history should be evaluated with caution. In the current epidemiological situation, tetanus should be considered in patients with injuries, regardless of caregivers' statements about PIP compliance.

Patient's vaccination	Degree of contamination of the wound			
history	Low	Hight		
Unvaccinated,	Administration of the	Administration of vaccine		
incompletely vaccinated	vaccine and then	+ antitoxin and then		
or uncertain vaccination	continuation of the	continuation of primary		
history	primary vaccination	vaccination according to		
	according to the scheme 0,	the scheme 0, 1, 6 months		
	1, 6 months			
Vaccination with the last	Administration of one	Administration of one		
dose > 10 years	booster dose	booster dose + antitoxin		
(primary or booster				
vaccination)				
(primary or booster vaccination)				

Table 1. Post-exposure Tetanus Prophylaxis in Case of Injury [3].

Vaccination with the last	Administration	of	one	Administration	of	one
dose 5-10 years ago	booster dose			booster dose		
(primary or booster						
vaccination)						
Vaccination with last dose	Vaccination	is	not	Vaccination	is	not
<5 years ago	required			required		
(primary or booster						
vaccination)						

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Author's contribution

Conceptualization: Bartłomiej Żaczek, Jakub Kozłowski, Alicja Kamińska, Lidia Stopyra Methodology: Lidia Stopyra Investigation: Jakub Kozłowski Resources and data curation: Bartłomiej Żaczek, Alicja Kamińska Writing - rough preparation: Bartłomiej Żaczek, Jakub Kozłowski, Alicja Kamińska Writing - review and editing: Lidia Stopyra Visualization: Jakub Kozłowski Project administration: Lidia Stopyra

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