

Trends in General Medicine

Severe Generalized Tetanus Successfully Cared in the Intensive Care Unit
(Case Report)

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ABSTRACT

Generalized tetanus, caused by the tetanospasmin toxin from *Clostridium tetani*, remains a health issue in rural areas with low vaccination coverage. This case describes a 38-year-old man from Oaxaca, Mexico, who developed this infection. Treatment included antitetanus immunoglobulin, broad-spectrum antibiotics, invasive mechanical ventilation, and sedoanalgesia. After 14 days in the intensive care unit (ICU), the patient showed favorable progress. This case underscores the importance of an integrated, multidisciplinary approach aligned with best documented practices. Early administration of immunoglobulin and antibiotics was crucial for recovery, as well as the use of mechanical ventilation and tracheostomy to manage respiratory complications. Improving healthcare infrastructure and vaccination coverage in rural areas is essential to effectively prevent and treat tetanus and other preventable diseases.

Keywords

Tetanospasmin, Antitetanus Immunoglobulin, Mechanical Ventilation, Vaccination.

Introduction

Generalized tetanus is an acute infectious disease, potentially lethal, caused by the tetanospasmin exotoxin produced by *Clostridium tetani* [1]. Despite being preventable through vaccination, it continues to pose a significant challenge to public health, especially in rural regions with limited access to medical services [2]. In Mexico, the incidence of tetanus has decreased considerably thanks to vaccination programs, but it persists in areas with low immunization coverage, such as many rural communities in states like Oaxac [3,4].

In this context, in Mexico, the incidence of tetanus is low, with a reported rate of 0.02 per 100,000 inhabitants in 2017, and a total of 26 new cases in the country that year [5]. However, Oaxaca is one of the regions facing greater challenges in terms of access to healthcare, where the incidence of various vaccine-preventable diseases is higher than the national average. Socioeconomic conditions, the geographical dispersion of the population, and traditional agricultural practices increase the risk of exposure to *Clostridium tetani*. Furthermore, vaccination coverage in rural areas of Oaxaca is below the national average, contributing to the persistence of the disease [6].

The management of tetanus requires a multidisciplinary approach in intensive care units (ICUs), where patients can receive advanced

life support, including invasive mechanical ventilation [7]. Early administration of tetanus antitoxin, along with intensive care, has been shown to significantly improve survival in patients with severe generalized tetanus [8].

Based on the above, recent studies emphasize the importance of comprehensive management that includes, wound cleaning and debridement, appropriate antimicrobial therapy, and administration of tetanus immunoglobulin. These approaches have been shown to reduce mortality and improve clinical outcomes in patients with generalized tetanus [1,9].

However, a study conducted in Bangladesh identified that, although early and adequate intervention in the ICU can reduce mortality rates, socioeconomic conditions, and lack of access to advanced care remain significant barriers [10].

In this case report, the successful management of a patient with generalized tetanus in an intensive care unit in Oaxaca, Mexico, is described. The comprehensive and multidisciplinary approach that led to the patient's recovery is highlighted, emphasizing the importance of vaccination and timely and adequate management in resource-limited settings. This case provides evidence of the effectiveness of intensive treatment strategies and the management of associated complications, contributing to the understanding of disease management in rural and low-resource contexts.

Clinical Case

A 38-year-old male patient, originally from San Pedro Pochutla, Oaxaca, Mexico, employed as a farmer, with a history of chronic alcoholism spanning 17 years, and "without vaccination history," presented with current symptoms of pain in the lower limbs and stiffness in the fascial, cervical, and dorsolumbar musculature. He was evaluated at a private general medicine clinic where he was provided with symptomatic management including painkillers, antibiotics, and B complex vitamins on an outpatient basis.

The clinical picture evolved unfavorably, with the addition of stiffness in the musculature of the thoracic limbs, difficulty in oral opening, inability to flex the neck, and painful episodic dorsolumbar spasms lasting between 30 and 40 seconds, without loss of alertness.

A week later, he was admitted to the emergency department of the local general hospital where, upon physical examination, a cutting wound was identified on the inner side of the right ankle, approximately 2 cm long by 1 cm wide, with dirty edges, caused by a "blade" according to a family reference. As part of his management, cerebrospinal fluid cytology, cytology, and culture were performed, revealing slight hyperproteinorrhachia (57.4 mg/dL, with a cutoff value of <45 mg/dL), without pleocytosis (0-1 mononuclear cells per field). Additionally, cultures were negative for *Staphylococcus aureus*, *Streptococcus pyogenes*, *Pseudomonas aeruginosa*, yeast-like structures, or enterobacteria. Furthermore, computed tomography did not show any structural alterations.

Based on the above, a diagnosis of generalized tetanus was made, and the patient was admitted to the internal medicine service, where upon physical examination, the following was noted: sinus tachycardia (128 beats per minute [bpm]), tachypnea (24 breaths per minute), decreased chest motility with the use of accessory ventilatory muscles, generalized involuntary muscular hypertonicity, respiratory difficulty with peripheral oxygen desaturation of 86%, trismus, sialorrhea, opisthotonus lasting up to 20 seconds, and severe generalized pain.

Advanced airway management was initiated with pressure-controlled ventilation (PCV), positive end-expiratory pressure (PEEP) of 5 cm H₂O, and a fractional inspired oxygen (FiO₂) of 30%. Additionally, sedoanalgesia was administered with midazolam, buprenorphine, and vecuronium; antimicrobial coverage with doxycycline and metronidazole, and 500 IU of human tetanus immunoglobulin.

During hospitalization, he experienced variations in heart rate between 54 and 138 bpm, and hypotension requiring the use of vasopressor agents. Consequently, 5 days later, he was transferred via air to the Intensive Care Unit (ICU) of a referral general hospital in Oaxaca de Juárez, Oaxaca, Mexico. The results of the paraclinical studies upon admission are shown in Tables 1-3.

Table 1: Blood cytometric parameters.

Parameter	Result	Reference values
Erythrocytes	4.68	4.00 – 6.20
Hemoglobin (g/dL)	14.3	11.00 – 18.00
Hematocrit (%)	43.5	35.00 – 55.00
Medium corpuscular volume (fL)	92.9	80.00 – 100.00
Mean corpuscular hemoglobin (pg)	30.6	26.00 – 34.00
Leucocytes (x 10 ³ /mL)	14.43	3.50 – 10.00
Neutrophils (%)	81.6	42.20 – 75.20
Platelets (x 10 ³ /mL)	351	150.00 – 450.00

Table 2: Blood chemistry and electrolytes.

Parameter	Result	Reference values
Erythrocytes	4.68	4.00 – 6.20
Hemoglobin (g/dL)	14.3	11.00 – 18.00
Hematocrit (%)	43.5	35.00 – 55.00
Medium corpuscular volume (fL)	92.9	80.00 – 100.00
Mean corpuscular hemoglobin (pg)	30.6	26.00 – 34.00
Leucocytes (x 10 ³ /mL)	14.43	3.50 – 10.00
Neutrophils (%)	81.6	42.20 – 75.20
Platelets (x 10 ³ /mL)	351	150.00 – 450.00

Table 3: Hepatic and musculoskeletal profile.

Parameter	Result	Reference values
Total Protein (g/dL)	6.1	6.3 – 6.8
Albumin (g/dL)	3.4	3.5 – 5.0
Total bilirubin (mg/dL)	0.6	0.2 – 1.3
Aspartate aminotransferase (UI/L)	57	15.0 – 46.0
Alanine aminotransferase (UI/L)	62	11.0 – 66.0
Gamma glutamyltransferase (UI/L)	47	0.0 – 40.0
Creatinekinase (UI/L)	795	38.0 – 180.0
Lactic dehydrogenase (UI/L)	397	120.0 – 246.0
C-reactive protein (mg/dL)	6.2	< 1.0
Fibrinogen (mg/dL)	763	200 – 500

In addition to dual sedation, neuromuscular blockade, and the administration of vasopressor agents, the patient presented with metabolic alkalosis (pH: 7.49, pCO₂: 40 mm Hg, pO₂: 91 mm Hg, HCO₃: 29.8 mEq/L), with preserved renal function. During his stay in the ICU, the patient remained on invasive mechanical ventilation with muscle relaxation, vasopressor infusions, broad-spectrum antibiotic regimen, analgesia, and sedation with midazolam and Propofol, later transitioning to dexmedetomidine, metoprolol, and tramadol. Additionally, a tracheostomy was performed on the third day of his admission to this unit, without complications.

The symptoms improved favorably: mechanical ventilation was withdrawn on the tenth day, and the patient was referred back to his local general hospital after 14 days; he was stable, without sedation, alert, oriented, non-focal, with a Glasgow score of 15, afebrile without antibiotic therapy, receiving low-flow oxygen supplementation through a tracheostomy cannula, without the need for vasopressor support, tolerating a soft diet ad libitum, and with spontaneous diuresis.

Discussion

The discussion of this clinical case highlights the importance of comprehensive and advanced management of generalized tetanus in resource-limited settings. The success in treating the described patient aligns with the best practices documented in the medical literature and offers valuable insights for managing this disease in similar contexts.

Tetanus is strictly a clinical diagnosis [11]. The growth of *Clostridium tetani* in wound cultures or cerebrospinal fluid (CSF) is only a supportive feature, as it can be present without tetanus [12]. Additionally, there are no laboratory tests that can confirm tetanus [7]; however, the presence of hyperproteinorrachia without pleocytosis in CSF analysis is consistent with the literature, which describes these findings in patients with generalized tetanus [13].

The use of tetanus immunoglobulin and broad-spectrum antibiotics, such as doxycycline and metronidazole, was crucial in the patient's treatment. These agents help neutralize the toxin produced by *Clostridium tetani* and eliminate the added bacterial infection [14].

Previous studies have demonstrated that early administration of tetanus immunoglobulin is crucial in reducing mortality and morbidity associated with generalized tetanus [10,15]. Likewise, the combination of these antibiotics has also been documented as effective in controlling secondary infections and preventing additional complications [16,17].

The duration of ICU stay and mechanical ventilation management in this case are comparable to the times reported in other studies, which document ICU stays ranging from 2 to 4 weeks for severe cases of tetanus [18]. The management of invasive mechanical ventilation and sedoanalgesia with midazolam and buprenorphine allowed for the control of severe muscle spasms and ensured adequate respiratory function. In this case, mechanical ventilation was maintained for ten days, which allowed for the stabilization of

the patient and their gradual recovery, aligning with the recovery times observed in other studies [1].

Thus, the literature supports the use of sedatives and muscle relaxants in managing severe tetanus symptoms when available in appropriate settings [10,13]. Although intravenous magnesium was not used in this case, it has been shown to be effective in the literature for controlling tetanic spasms and reducing the need for ventilatory support in some patients [19].

The management of dysautonomia is another critical aspect in the treatment of severe generalized tetanus. The patient experienced variations in heart rate and episodes of hypotension, requiring the use of vasopressor agents. This intervention is consistent with practices described in the literature, where managing dysautonomia with medications such as clonidine, dexmedetomidine, and beta-blockers is fundamental in reducing complications and improving outcomes [20].

Additionally, the case underscores the importance of tracheostomy in patients with tetanus requiring prolonged ventilation. This intervention helps better manage secretions and reduce the risk of respiratory infections [21]. In this case, tracheostomy was performed without complications and contributed to the successful recovery of the patient, aligning with observations in other studies where improved clinical outcomes have been documented with this intrahospital practice [1,8,10,13].

It's worth noting that timely referral and transfer of the patient to an ICU in the city of Oaxaca were crucial for his survival. This case highlights the importance of enhancing healthcare infrastructure in rural areas and training personnel in the management of infectious emergencies [22].

Conclusion

The successful management of this case of generalized tetanus highlights the effectiveness of a comprehensive and multidisciplinary approach in a resource-limited setting. Early administration of tetanus immunoglobulin, appropriate antibiotic use, mechanical ventilation, and management of dysautonomia were crucial for the patient's recovery. This case underscores the importance of improving vaccination coverage and healthcare infrastructure in rural areas to effectively prevent and manage tetanus and other vaccine-preventable diseases.

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