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CASE REPORT

Generalized Tetanus in an Unvaccinated Adolescent: A Case Report on Successful Management in a Resource-Limited Setting

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Background: Tetanus is a life-threatening neurological disease caused by *Clostridium tetani*. Among its clinical forms, cephalic tetanus is the rarest, representing only 1–3% of cases. It is typically characterized by cranial nerve involvement, rapid progression to generalized tetanus, and a high risk of mortality.

Case Presentation: We describe the case of a 17-year-old male with no prior tetanus vaccination who presented with trismus, painful muscle spasms, and opisthotonos following a traumatic head injury. Laboratory findings showed leukocytosis, electrolyte disturbances, and raised inflammatory markers.

Management included urgent wound debridement, administration Antibiotics and tetanus immunoglobulin. Intensive sedation was required to control recurrent spasms. Due to respiratory compromise, the patient was intubated and subsequently underwent tracheostomy. After an extended stay in the intensive care unit (ICU), gradual weaning from both sedation and mechanical ventilation was achieved. He was ultimately discharged in stable condition with full neurological recovery.

Discussion: This case illustrates the aggressive course of Generalized tetanus and highlights the critical importance of early airway protection. Tracheostomy proved essential in reducing morbidity and facilitating prolonged ventilatory support. Despite limited resources, coordinated multidisciplinary ICU care, including physiotherapy, contributed significantly to the patient's favorable outcome.

Conclusion: This case shows that generalized tetanus remains a serious but entirely preventable disease, occurring mainly in individuals who are not vaccinated. It highlights how early recognition, prompt antitoxin therapy, careful intensive care management, and timely airway intervention can lead to good outcomes, even in resource-limited settings. Above all, it reinforces vaccination as the most effective and lasting measure to prevent tetanus and reduce its associated morbidity and mortality.

Keywords: tetanus, generalized tetanus, tracheostomy, intensive care

Introduction

Tetanus is a life-threatening condition caused by *Clostridium tetani*, an anaerobic, spore-forming bacterium found everywhere in the environment, particularly in soil, intestinal tracts/feces of animals and humans, and rusty tools like nails, needles, the spores can survive for years.[1]

Tetanus toxin is a zinc-dependent metalloproteinase that disrupts neurotransmitter release by targeting synaptobrevin, also known as vesicle-associated membrane protein (VAMP), a key protein required for synaptic vesicle fusion with the neuronal plasma membrane. By interfering with this process, the toxin initially impairs acetylcholine release at the neuromuscular junction, which can lead to localized flaccid paralysis, a mechanism similar to that seen with botulinum toxin. Unlike botulinum toxin, however, tetanus toxin undergoes extensive retrograde axonal transport along lower motor neurons, allowing it to reach the spinal cord or brainstem. There, it crosses synapses and is taken up by inhibitory interneurons that use gamma-aminobutyric acid (GABA) and glycine to regulate motor neuron activity. Within these

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inhibitory nerve terminals, the toxin cleaves VAMP, blocking the release of inhibitory neurotransmitters. The resulting loss of inhibitory control causes functional disinhibition of lower motor neurons, leading to sustained muscle rigidity and painful spasms that characterize tetanus.[2]

Tetanus clinically presents with muscle rigidity, paroxysmal spasms, respiratory distress, and autonomic dysfunction, often requiring extended intensive care lasting 4–6 weeks. While tetanus can affect individuals of any age in developing countries, mortality rates tend to be lower in children and adults than in neonates. Tetanus presents in four clinical forms: generalized, localized, cephalic, and neonatal. Generalized tetanus is the most common, accounting for 80% of cases.[3] Cephalic tetanus is the rarest clinical presentation of tetanus in adults, comprising only 1–3% of cases. It is characterized by trismus, dysphagia and cranial nerve involvement, with the facial nerve being most frequently affected. However, other cranial nerves, including III, IV, VI, and XII, may also be involved. This form often progresses to generalized tetanus and carries a high mortality risk.[4]

Here, we report a 17 years-old unvaccinated male who following a traumatic head injury, the condition was successfully managed, with the patient spending over a month in the ICU.

Case Presentation

A 17-year-old boy came to our hospital with symptoms of lockjaw, abdominal rigidity, muscle spasms, and opisthotonos for four days. He had a history of head injury 3 days prior to his symptoms and had no documented history of tetanus immunization. He had initially been treated at other hospitals and he was referred to our facility for advanced care. The patient had no chronic illnesses. He was awake and alert with a Glasgow Coma Scale (GCS) score of 15/15 but displayed significant distress, irritability, restlessness, and hyper-excitability tachycardia, excessive sweating, high-grade fever, and signs of severe dehydration. Musculoskeletal examination noted marked muscle rigidity and spasms, particularly in the jaw, neck, and back, along with pronounced opisthotonos.

The patient's laboratory results revealed an ALT SGPT level of 180.9 U/L. Magnesium was measured at 2.04 mmol/L, potassium at 4.34 mmol/L, and sodium at 157.6 mmol/L. The CRP level was 85.0 mg/L. Viral screenings for HBV antigen, HCV antigen, and HIV were all negative. The complete blood count showed a white blood cell count of 14.27 $x10^9$/L, with a differential of neutrophils at 83.5%, lymphocytes at 9.4%, monocytes at 6.4%, eosinophils at 0.4%, and basophils at 0.3%. The absolute neutrophil count was 11.92 $x10^9$/L, the lymphocyte count was 1.33 $x10^9$/L, and the monocyte count was 0.92 $x10^9$/L. The red blood cell count was 5.16 $x10^{12}$/L, hemoglobin was 14.2 g/dL, and platelets were 367 $x10^9$/L. Renal function tests showed a creatinine level of 1.06 mg/dL and blood urea at 60.19 mg/dL.

Given the patient's history of injury and lack of vaccination, along with the presence of muscle spasms, generalized rigidity, and opisthotonos, a clinical diagnosis of generalized tetanus was made, the wound was thoroughly cleaned and dressed, and the patient was started on IV antibiotics and Diazepam 10mg 3hourly. Tetanus Immunoglobulin (3000 IU.) was administered, along with antipyretics. He was then transferred to the ICU for intensive management.

As his muscle spasms intensified, airway protection became necessary. The patient was intubated and placed on post-intubation sedation and analgesia with Midazolam, Atracurium, Fentanyl, and Magnesium Sulfate. Despite increasing the doses of sedatives and muscle relaxants, severe spasms persisted, and he developed tonic-colonic seizures, leading to the addition of Levetiracetam. After two weeks of intubation without significant improvement, a tracheostomy was performed with family consent on 29th October, 2024.

A few days after the tracheostomy, his muscle spasms lessened, enabling the gradual reduction and cessation of sedatives and paralytics. The patient regained alertness, and was eventually weaned off mechanical ventilation, physiotherapy was initiated later, and he was transferred to the ward and week later he was discharged after educating the family about the physiotherapy he came for follow up after 4 weeks, muscle rigidity was resolved and Td was given.

Discussion

Tetanus is a life-threatening neurological disorder caused by a potent exotoxin produced by *Clostridium tetani*, an anaerobic, gram-positive, spore-forming bacillus widely distributed in soil and animal feces. The disease manifests as an acute clinical syndrome, characterized primarily by generalized muscle hypertonia and recurrent, often severe, spasms.[1]

Without treatment, the condition can progress to severe hypertonia and autonomic dysfunction, causing fluctuations in blood pressure, cardiac arrhythmias, asphyxia, and potentially death.[5]

Tetanus can be classified into four clinical forms: Generalized tetanus, which accounts for the majority of cases, most often begins with trismus, reported as the initial symptom in more than 80% of patients. In the early phase, signs of autonomic overactivity may be observed, such as sweating and tachycardia. As the disease progresses, these disturbances can intensify, leading to profuse sweating, cardiac arrhythmias, labile blood pressure, and fever. The clinical picture is marked by persistent tonic contraction of skeletal muscles accompanied by recurrent, intensely painful spasms. Additional characteristic features include neck stiffness, opisthotonos, a sardonic smile, abdominal rigidity, episodes of apnea, upper airway obstruction, and difficulty swallowing.[6] Cephalic tetanus, the rarest form, is associated with head or facial injuries or otitis media. Unlike other types, it causes flaccid cranial nerve palsies rather than muscle spasms, although lockjaw may still be present. This form has the potential to progress to generalized tetanus, underscoring the importance of early recognition and management.[7]

Tetanus can be effectively prevented through immunization with tetanus-toxoid-containing vaccines, such as the diphtheria-tetanus-pertussis (DPT) vaccine. Vaccination programs have significantly reduced the incidence of tetanus in developed countries. Additionally, the advent of intensive care units (ICUs) has contributed to a substantial decline in tetanus mortality rates, from 43% between 1956 and 1968 to 15% between 1969 and 1984. Mechanical ventilation, in particular, has played a key role in reducing mortality among tetanus patients. A previous cohort study demonstrated an inverse relationship between mortality rates and the number of ventilated patients, with mortality decreasing from 58% in 1993 to 18% in 2002 among patients who underwent tracheostomy.[8]

In developing countries, the mortality rate is significantly higher, ranging from 20% to 45%, largely due to limited access to early treatment and intensive care. Survivors often experience long-term complications, including motor impairments and cognitive issues.[9]

Similar to our patient, individuals without prior immunization are at a significantly higher risk of tetanus infection. Furthermore, the decline in anti-tetanus toxin antibody levels with advancing age places older adults at an elevated risk of infection.[10]

Diagnosis of adult tetanus is largely based on clinical findings. As defined by the WHO, if a patient has a recent history of injury, the presence of at least one key symptom supports the diagnosis: trismus, the characteristic *Risus sardonicus*, or painful muscle spasms that are triggered by external stimuli.[11]

The management of tetanus involves sedation and control of muscle spasms, neutralizing the tetanus toxin, preventing its production through the use of antibiotics effective against *Clostridium tetani* and wound debridement, addressing complications such as autonomic dysfunction, and providing supportive care.[12]

The absorption of tetanospasmin can be prevented through the administration of human tetanus immunoglobulin (HTIG), which directly neutralizes free tetanospasmin. According to the Centers for Disease Control and Prevention (CDC), a prophylactic dose of 250 IU is recommended for high-risk patients, while therapeutic doses range from 3000 to 6000 IU. In cases of wounds associated with tetanus, HTIG should be administered prior to wound debridement, as manipulation can release free tetanospasmin.[13]

Antibiotics like penicillin and metronidazole are recommended for eliminating *C. tetani*. While *C. tetani* is generally susceptible to penicillin, its ability to penetrate abscesses is limited and can be counteracted by other microbial pathogens. Metronidazole, on the other hand, has shown excellent efficacy in a controlled trial.[14]

The importance of wound debridement in tetanus management is emphasized by cases where *C. tetani* persisted despite 16 days of high-dose intravenous penicillin, highlighting the critical role of wound care in treatment.[5]

Benzodiazepines are the preferred treatment for controlling rigidity, spasms, and providing sedation. Intravenous magnesium sulfate is another effective option, helping to manage spasms and reduce autonomic hyperactivity.[9]

Limitations

This report has several limitations that should be acknowledged. As a single case, the findings cannot be generalized to all patients with tetanus. Microbiological confirmation of *Clostridium tetani* was not performed, and the diagnosis was based on clinical features, which reflects routine practice in many resource-limited settings. In addition, long-term

outcomes beyond the early follow-up period were not assessed. Despite these limitations, the case provides valuable insight into the successful management of severe tetanus in a setting with limited resources.

Conclusion

This case has important clinical and public health implications. Clinically, tetanus remains a medical emergency that requires prompt recognition and aggressive supportive care, including hospitalization, antitoxin administration, airway protection, and management of muscle spasms, in order to reduce morbidity and mortality. Tetanus often presents with painful muscle rigidity, difficulty swallowing, and respiratory compromise, and treatment can be prolonged and complex, particularly in resource-limited settings where intensive care resources may be scarce.[15] From a public health perspective, the case underscores that tetanus is entirely preventable through immunization; high vaccination coverage with tetanus-toxoids is associated with dramatic reductions in tetanus incidence and deaths globally, while inadequate immunity leaves individuals vulnerable even after routine injuries. WHO recommends a full schedule of primary and booster tetanus vaccinations across the life course to ensure lasting protection because natural infection does not confer immunity.[16]

Declaration of Generative AI Use

During the preparation of this work, the authors used ChatGPT (GPT-4) to support language clarity and enhance readability. Following its use, the authors carefully reviewed and edited the content to ensure accuracy and coherence, and take full responsibility for the final version of the manuscript.

Ethics and Consent

A Written consent form was attained from the patient's father for publication of this case report and the attached images. In our institution, ethical approval is not required for case reports.

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Disclosure

The authors declare no conflict of interest in this work.

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