


CASE REPORT

Generalized tetanus in a farmer following treatment of an open ankle fracture by a traditional bone setter

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Key Clinical Message

This is the case of a 31-year-old farmer diagnosed with an open right ankle fracture and tetanus sustained from an accident after opting for traditional bonesetter treatment. Open fractures increase the risk of tetanus infection therefore herbal treatment should be discouraged. Source control is important for holistic management of tetanus.

KEYWORDS

generalized tetanus, traditional bonesetter

1 | INTRODUCTION

Tetanus is an acute infection which is mostly fatal if neglected. It is caused by a gram-positive spore-forming anaerobic organism known as *Clostridium tetani*. The organism affects the nervous system and is usually introduced into the body via spores from the soil with punctured wounds being the most common entry point.¹ The clinical presentation is due to the release of tetanospasmin by the organism resulting in increased rigidity and spasms of the skeletal muscles. This occurs after tetanospasmin gains access to the presynaptic section at the neuromuscular endplate of the motor neuron thereby leading to the disruption of the vesicular synaptic membrane protein. This causes deactivation of inhibitory neurotransmission eventually leading to the skeletal muscle spasms aforementioned.² According to the World Health Organization (WHO) data published in 2020, Africa recorded its highest number of tetanus cases in 2020 (7737) and lowest number in 2017 (2791) in the past decade.³ Ghana recorded its

highest number of cases (1214) cases in 2016 but did not record any case in 2020.⁴ While the disease burden is on the rise in the African continent, Ghana has made significant gains in reducing the disease prevalence.

The role of traditional bonesetters (TBSs) in lower middle-income countries (LMICs) cannot be overestimated. A TBS is a person who practices folk medicine (as opposed to orthodox medicine) and indulges in joint manipulation.⁵ LMICs according to the World Bank refers to countries whose gross national income per capita ranges from 1036USD to 4045USD as at 2021.⁶ TBSs provide accessible and cheap musculoskeletal services in poorly resourced settings, albeit a multitude of complications for orthopedic surgeons in these localities.^{7,8} In Ghana, there have been attempts to integrate TBSs. Yempabe et al., explored the opportunities for future engagement of bone setters by the orthopedic surgeons to reduce complications and improve bone care.⁹

Our literature search did not reveal reported instances of tetanus occurring after application of topical herbal

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medication making this an interestingly rare case in Ghana. The aim of this study is to discuss the occurrence of tetanus in a farmer following treatment of an open ankle fracture by a TBS. The case will also serve as a learning tool for young clinicians (especially those in other LMICs with similar resource limitations) on the symptoms and signs of tetanus and to increase their index of suspicion.

2 | CASE REPORT

A 31-year-old male with no known chronic condition was involved in a road traffic accident a week prior to presentation. He was riding a motorbike on a dusty road (not near a farm) and collided with a truck landing in an open gutter (ditch) with his right leg. The ditch had dirty water and waste in it which came into contact with the wound. He was unable to bear weight on his right leg and visited a healthcare facility where he was immediately referred to Tamale Teaching Hospital but sought the services of a TBS. His wound was covered with herbal creams and his fracture splinted. These herbal creams were homemade by a family member out of plant extracts and a black substance whose name they were unable to divulge. His wounds began to discharge copious amounts of offensive discharge about 9 days after the injury and so he decided to seek orthodox treatment. There was associated fever, pain in the right leg, but no paresthesia, numbness nor vomiting. On examination, he was fully conscious, febrile, and tachycardic. Other systemic examinations were essentially normal. The right leg

was swollen with ulcerations and necrosis of skin as seen in [Figure 1](#), there was differential warmth and tenderness. The patient could dorsiflex and plantar flex the ankle joint. Capillary refill time was <3s but right dorsalis pedis and posterior tibial pulses were not palpable. All other pulses were however palpable. The lower extremity compartment pressure was not measured in this case due to lack of equipment to do so. A diagnosis of open right ankle fracture complicated by necrotizing fasciitis was made after an x-ray of the right lower limb was done as seen in [Figure 1B](#). Wound debridement and application of external fixator was done under spinal anesthesia on admission Day 5 as seen in [Figure 2A](#). A wound swab done revealed the presence of *Citrobacter diversus* and *Morganella morgani* which were both sensitive to meropenem and gentamicin therefore the patient was put on meropenem. On admission Day 7, the patient developed neck stiffness, jaw pain and stiffness, trismus associated with difficulty swallowing, intermittent muscle spasms, and generalized stiffness. A clinical diagnosis of generalized tetanus was made. He was managed with 12,000IU of intramuscular tetanus immunoglobulin (single dose), anti-tetanus serum (ATS), phenobarbitone, diazepam, and antibiotics (metronidazole). Examination of the wound revealed extensive necrotic subcutaneous tissue and muscle. Patient was counseled for an above knee amputation which was performed on the same day as shown in [Figure 2B](#). Postoperative condition was satisfactory. He did not require intubation throughout his stay on the ward. Baclofen was started on admission Day 14 for 7 days to help with the lockjaw and muscle twitching which improved

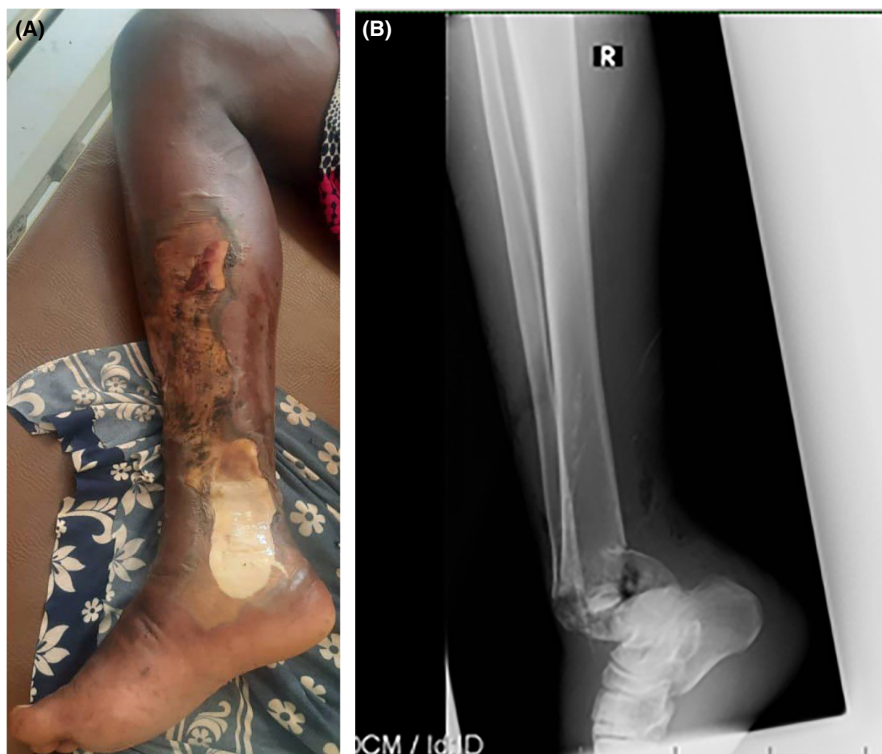
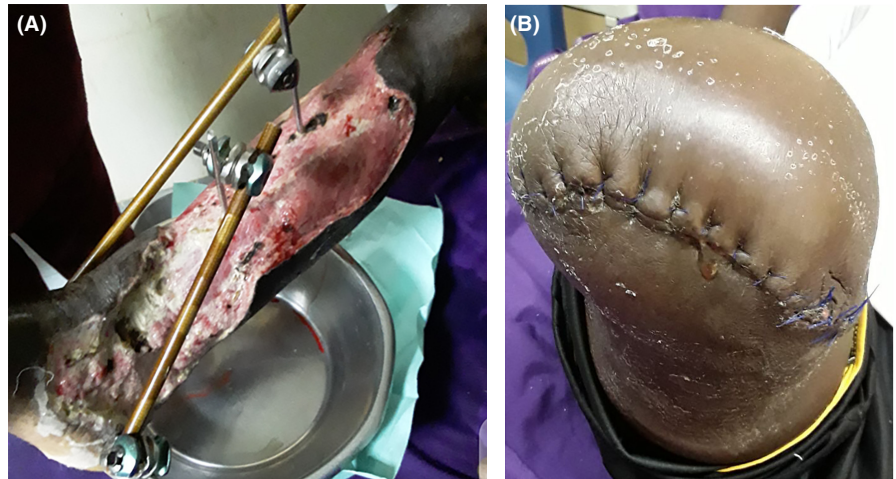


FIGURE 1 (A) Showing right leg with cellulitic changes. (B) X-ray of the right leg showing open fracture dislocation at the ankle joint.

FIGURE 2 (A) Right leg after debridement and application of external fixator. (B) Amputation stump after above knee amputation.



with physiotherapy. He was discharged on postoperative day 14 after the amputation, spending a total of 25 days on the ward. Subsequent reviews showed that the patient had improved and stiffness significantly reduced with medical treatment and physiotherapy.

3 | DISCUSSION

According to WHO reports, tetanus incidence in sub-Saharan Africa is high making it a public health problem. About 71% of the affected persons were men.¹⁰ A study in Bangladesh indicated that majority of the cases of tetanus were from rural areas and the affected people were mainly male and farming was their main occupation.¹¹ In this case, the patient was a 31-year-old male farmer, he falls within the aforementioned age and gender category, and occupation thereby increasing his chances of acquiring tetanus. The risk factors of tetanus include puncture wounds, lacerations, abrasions, burns victims, penetrating injuries, umbilical stump infection, and low level of immunity.¹² The patient had an open fracture which served as his source of infection. The application of the topical herbal medication may have facilitated the infection process.

C. tetani is usually found in spore-form in the soil and can enter the body when there is a breach in the integrity of the skin. The spores may germinate when conditions are favorable producing tetanospasmin that binds to the gangliosides at the neuromuscular junction and travel via the neuron to the ventral and cranial nerves' motor neurons usually within a period of 2–14 days. The patient developed tetanus on the 14th day after the accident which is still within the incubation period of the organism. Other routes of toxin absorption include the hematological and lymphatic routes. When the nervous system is attacked by the toxin, it causes painful and violent muscular contractions alongside neck stiffness primarily in the jaw (termed lockjaw), moves to the neck, and can later become generalized. Trismus or lockjaw

occurs in 50%–70% of patients with generalized tetanus and is usually the first symptom. Giannini et al. reported a diagnostically tasking case of tetanus where a 73-year-old woman had dysphagia and cardiac symptoms.¹³ In this case, the patient was younger and had the generalized form of tetanus characterized by neck stiffness, jaw-pain associated with dysphagia but no evidence of cardiac involvement clinically. An electrocardiogram was not done because it was not indicated in our case. Similarly, dysphagia was also reported and lockjaw which is pathognomonic of tetanus was also the first symptom. Clinical diagnosis of tetanus involves taking relevant history of events which could predispose an individual to contact with *C. tetani*, mechanism of injury, type of wound, vaccination history as well as symptoms and signs pathognomonic of tetanus.¹⁴ The patient in this case report had a motorbike accident on a dusty road and fell into a ditch containing dirty water which came into contact with his open wound. This predisposed him to a myriad of microorganisms particularly *C. tetani* or other organisms found in soil and dust.¹⁴ Coupled with his previously discussed symptoms and signs as well as his relevant history, a diagnosis of tetanus could be arrived at. The diagnosis of tetanus remains solely clinical as a wound swab containing *C. tetani* is found in only 30% of confirmed cases with isolates sometimes being false-positives.^{15,16} In this case, the wound swab did not culture *C. tetani* which did not necessarily mean that the patient did not have tetanus given that the clinical symptoms override laboratory investigations when it comes to this condition.

In 2017, Kyu et al. provided evidence that prior vaccination against tetanus helps reduce the fatality of illness.¹⁷ In this case, the patient did not have an up-to-date immunization. The patient did not also receive ATS at the primary care facility. He also sought herbal treatment of his open fracture which may have increased his risk of tetanus infection. A tetanus risk/rating scale was developed to assess the severity and prognosis of tetanus. It comprises the following parameters; incubation period <7 days,

prior history of burns, surgical wounds, compound fractures (open fractures), septic abortion, umbilical stump, intramuscular injection, narcotic addiction, generalized tetanus, elevated temperature $>40^{\circ}\text{C}$ and tachycardia $>120\text{bpm}$, awarding one point to each parameter. A mild score is between 0 and 1, moderate—2 or 3, severe is 4, and very severe is 5 or 6.¹⁸ The patient in this study had a tetanus rating score of 2 making it a moderate case with a mortality rate of 20%.

The principles of management of tetanus include, source control, antibiotic therapy to eliminate clostridium, neutralization of systemic tetanospasmin, and symptomatic control. In this patient, the initial wound debridement did not adequately control the source of the tetanus. Debridement was done because the patient did not initially consent to above knee amputation. However, the patient had significant improvement in his symptoms following the above knee amputation. This underpins the importance of source control in the overall management of tetanus.

4 | CONCLUSION

Open fractures (compound fractures) increase the risk of tetanus infection and so herbal treatment of these fractures should be discouraged. Source control plays an intricate role in the holistic management of tetanus. We recommend clinicians develop a high index of suspicion when patients present with injuries from farms and gutters as well as enquire about tetanus prophylaxis no matter the facility from which they have been referred. Timely interventions after diagnosis saves lives though cost implications cannot be overridden.

AUTHOR CONTRIBUTIONS

Naa Adzoa Adzeley Boi-Dsane: Conceptualization; writing – original draft; writing – review and editing. **Anwar Sadat Seidu:** Writing – review and editing. **Alexis Dun Bo-ib Buunaaim:** Writing – review and editing.

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CONFLICT OF INTEREST STATEMENT

The authors have no conflict of interest to declare.

DATA AVAILABILITY STATEMENT

All relevant data for this study have been made available.

CONSENT

Written informed consent was obtained from the patient to publish this report in accordance with the journal's patient consent policy.

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