

Case Report:

Post-exposure vaccination with tetanus toxoid alone, does not protect against tetanus: an illustrative case

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ABSTRACT

Tetanus is a life threatening infectious disease caused by the anaerobic Gram-positive bacillus *Clostridium tetani* which enters the body through an open wound. A 60-years-old male patient who was referred to our institute with a history of a rusted iron with complaints of nail prick injury and difficulty in opening the mouth. This individual previously not receive tetanus immunoglobulin. Prior to coming to our institute, the rusted iron nail was extracted and he had received tetanus toxoid. After he was admitted in the tetanus ward at our institute, he developed spasms. He was treated with intravenous diazepam and tetanus immunoglobulins. Wound exploration revealed a retained residual foreign body that was a part of his rubber foot wear in the wound. He died on the sixth day of admission. The present case highlights the need for administering appropriate active and passive immunization for tetanus along with meticulous wound care.

Key words: Tetanus, Nail prick injury, Tetanus immunoglobulin

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INTRODUCTION

Tetanus is a vaccine-preventable disease caused by an exotoxin produced by *Clostridium tetani*. Tetanus occurs worldwide and tetanus spores are present in soil and the faeces of animals.¹ In 2013, the World Health Organization (WHO) reported 13,528 tetanus cases worldwide; of them 2814 cases (21%) were reported from India.² Despite the passive and effective immunization available, tetanus is still a significant health problem especially in developing world.³ The majority of cases occurring in developing countries are seen in neonates; in developed countries adults are affected.⁴ We report the occurrence of tetanus in a 60-years-old male patient following iron nail prick injury.

CASE REPORT

A 60-year-old man was referred to our institute with the complaints of difficulty in opening his

mouth. He gave a history of accidentally stepping on a rusted iron nail with his left foot at his work place 10 days ago. He consulted a local doctor who had performed extraction of the iron nail from the plantar aspect of left foot. He was treated with intramuscular (IM) injection tetanus toxoid (TT) (0.5 mL), oral cefixime (200 mg twice-a-day for 5 days), analgesics and local dressing of the wound with betadine. On fifth day of follow-up with the local doctor, he complained of pain at the site of iron nail prick. Plain radiograph of the left foot was done which was normal. He was known to have coronary artery disease for which he had undergone coronary artery bypass grafting 6 months ago. He was known to have essential hypertension that was well controlled with 40 mg daily oral telmisartan. He had never received tetanus immunizations. At the time of admission he was conscious and vital

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parameters were stable. On physical examination the site of injury had completely healed but patient complained of pain at the site. He was unable to open his mouth completely suggestive of trismus. The patient was admitted in tetanus ward at our institute. Laboratory investigations such as complete blood picture, blood glucose levels and renal function profile were done; blood sugar levels were 168 mg/dL, and total leucocyte count was 13500/mm.³ The other investigations were normal. The patient developed spasms on the second day after admission. Patient was started on intravenous (IV) diazepam infusion at the rate of 2.5µg/min, metronidazole (500mg every 8th hourly); and tetanus immunoglobulin (6000 IU, IM). Wound exploration was also done. During exploration of the wound a foreign body measuring 7 × 5 mm was removed (Figure 1).

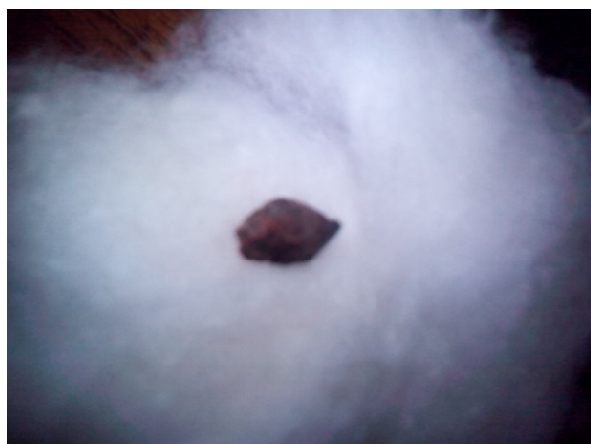


Figure 1: Photograph of the 7 × 5 mm foreign body extracted from the wound

The patient identified it as a piece from his footwear (Figure 2). The iron nail pierced along with a piece of rubber sole and only the iron nail was pulled out leaving the piece of footwear inside which was not visible in the plain radiograph of the foot taken. Patient expired on the sixth day of admission due to cardiorespiratory arrest. Culture of anaerobic swab taken during exploration of wound grew *Clostridium tetani*.

DISCUSSION

Tetanus is caused by a neurotoxin, tetanospasmin which is one of the most potent toxins ever identified, with minimum human



Figure 2: Photograph of the foot wear showing the origin of the foreign body that was extracted from the wound shown in Figure 1

lethal dose of less than 2.5 ng/kg released from wounds infected with Gram-positive bacillus *Clostridium tetani*.⁵ The spores enter the body through breaks in the skin, and germinate under low-oxygen conditions. Deep puncture wounds and wounds with a lot of devitalised tissue provide an oxygen-free environment for the bacteria to grow, especially in the presence of a foreign body, crush injury and suppurative infections.

Primary immunization in children refers to 3 doses of diphtheria pertussis tetanus (DPT) vaccine are given at an interval of 4-8 weeks, starting at 6 weeks of age, followed by a booster at 18 months. The second booster, diphtheria, tetanus (DT) is given at 5-6 years and third booster by upto 10 years. The initial series for adults involves 3 doses. The first and second doses are given 4-8 weeks apart and the third is given 6 months after the second. Booster doses are required every 10 years to maintain protective antitoxin titers. Tetanus does not confer immunity because of the small amount of toxin needed to produce illness. The minimum protective level of antitoxin is 0.01 IU/ml, which is usually achieved in all recipients of vaccine who have completed primary properly spaced doses of tetanus toxoid. Immunization of all pregnant women is an important step in preventing neonatal tetanus. Two or three doses of tetanus toxoid

are administered during pregnancy with last dose administered one month before delivery. The incubation period of tetanus ranges from 3 days to 21 days. Antibodies do not rise until 4 days after vaccination⁶. So vaccination with tetanus toxoid alone at the time of injury is of no use in individuals who are previously unimmunized.

In this case, patient developed tetanus even after immunization with TT after the injury as he was previously unimmunized resulting in failure of immunity development. The appropriate use of TT and tetanus immunoglobulins in wound management is essential for prevention of tetanus.⁷ A detailed history and physical examination with immediate wound exploration and administering TT along with tetanus immunoglobulins in cases where indicated can prevent the development of this dreadful disease.⁸ This case is interesting as an unexpected foreign body i.e., small rubber piece of patient's footwear entered the wound along with the rusted iron nail. Though the iron nail was pulled, a part of footwear that was left inside the wound, acted as a nidus for spore generation in the body. There are case reports on patients developing tetanus following nail prick or thorn prick injuries with no post-exposure prophylaxis after the injury, but to the best of our knowledge there are sparse reports where a foreign body entered the foot along with the nail and caused tetanus. In previously immunized individuals this may not occur as passive immunity is developed. But in

individuals with no history of immunization tetanus immunoglobulin should be administered along with tetanus toxoid. Hence, a detailed history taking and instituting immunization as per the guidelines,⁷ wound exploration can be life saving.

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