Case Report

The importance of tetanus risk assessment during wound management

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A B S T R A C T

Public Health England undertakes surveillance of vaccine preventable diseases including enhanced surveillance of clinically suspected tetanus. In the United Kingdom, tetanus has become increasingly rare due to the success of the national routine immunization program. Consequently, few practitioners have experience of diagnosing and managing patients with clinical tetanus. We report two cases of tetanus where comparatively minor wounds proved fatal. These cases highlight the importance of the accurate identification and management of tetanus prone wounds and the fatal consequences from untreated injuries in susceptible individuals. We conclude that appropriate risk assessment for tetanus prophylaxis forms an essential part of wound management.

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Introduction

Tetanus is a potentially life threatening disease which is caused by a neurotoxin produced following germination of spores of Clostridium tetani which are ubiquitous in the environment [1]. Tetanus is acquired by the inoculation of a wound with tetanus spores. Public Health England (PHE) undertakes surveillance of vaccine preventable diseases including enhanced surveillance of clinically suspected tetanus; all suspected cases are followed up with the patient’s general practitioner to ascertain demographic and clinical information, vaccination history, and risk factors. Here we report on two cases of tetanus where comparatively minor wounds proved fatal.

Case 1

A 91-year old woman attended Accident and Emergency after sustaining a laceration to her head while gardening. The head wound was sutured and she was discharged without receiving tetanus prophylaxis. Six days later she was admitted to hospital with facial paralysis, spasticity, and trismus; a clinical diagnosis of tetanus was considered, reported to the local health protection team and serum and a head wound swab were sent to the PHE Respiratory and Vaccine Preventable Bacteria Reference Unit (RVPBRU). Despite receiving a treatment dose of immunoglobulin, her clinical condition deteriorated and she died the next day. Serological testing confirmed that she did not have protective levels of tetanus antibodies (0.058 IU/mL), supporting a diagnosis of clinical tetanus. C. tetani neurotoxin genes were detected by PCR confirming the presence of the organism in the wound. Tetanus was recorded as the cause of death. Routine PHE follow up of the case identified she was unimmunized.

Case 2

An 82-year old woman fell in her garden resulting in an abrasion to her arm which became infected. She did not seek medical advice at the time of the injury. Eight days later she was complaining of dysphagia and was assessed at home by her general practitioner. On review the next day she was referred to Accident and Emergency with neck stiffness and an inability to open her mouth. Tetanus was not initially considered as part of the different diagnosis; she was prescribed simple analgesia and discharged the same day. Due to a marked deterioration in her clinical condition she was readmitted the following day with trismus, spasticity and spasms; a serum sample was taken and the case reported to the local health protection team. Following surgical debridement of her wound, she was transferred to intensive care with suspected clinical tetanus, started on broad spectrum antibiotics and given a treatment dose of human normal immunoglobulin (HNIG) [2]. The patient was unimmunized and refused tetanus vaccination whilst in hospital. Serological testing confirmed she did not have...
protective levels of tetanus specific antibodies (0.076 IU/mL). Nineteen days after the initial injury, she died in intensive care from acute tetanus.

Discussion

Tetanus is a potentially fatal vaccine preventable infection caused by a neurotoxin which is produced by C. tetani [1]. Cases of clinical tetanus are becoming increasingly rare in the UK due to the success of the vaccination program and many practitioners are unlikely to have had first hand experience of managing such patients. Tetanus prone wounds, including those classed as high risk, however, are a comparatively common presentation to Accident and Emergency departments [3]. These two cases highlight risks associated with delays in recognition of tetanus prone wounds and the fatal consequences from untreated injuries in susceptible individuals.

In the UK, armed forces personnel have been immunized against tetanus since 1938 with tetanus vaccination incorporated into the childhood immunization schedule from 1961 [2]. The current UK schedule comprises of five doses of tetanus-containing vaccine commencing with a primary course at two, three and four months of age, with booster doses offered pre-school (around three years four months) and during adolescence (between 13 and 18 years old) [4]. Coverage of tetanus vaccination evaluated at two years of age has been at least 94% for the last 20 years; seroprevalence data from 2009 suggested that 83% of the population were protected against tetanus although 36% of individuals aged over 70 were found to be susceptible, with women having significantly lower antibody levels than men [5,6]. Most cases of tetanus occurred in susceptible individuals who were either unimmunized or partially immunized and did not have protective levels of antibodies at the time of exposure to C. tetani [7,8]. Adults born prior to 1961, who are more likely to have missed out on childhood vaccinations, are over-represented in this population [6,9]. Sporadic clusters of tetanus in the UK have also been reported among people who inject drugs (PWID) [10].

Table 1

| Immunisation status                                      | Clean wound                                      | Tetanus prone / high risk wound                             |
|----------------------------------------------------------|--------------------------------------------------|------------------------------------------------------------|
| Fully immunised (five doses of vaccine given at appropriate intervals) | No vaccination required.                        | Give Tig if high risk.                                    |
| Primary immunisation complete, boosters up to date but incomplete | Vaccinate if next dose due.                      | No vaccination required.                                   |
| Primary immunisation not complete or boosters not up to date | Reinforcing dose of vaccine given immediately. | Give Tig if high risk.                                    |
| Not immunised or immunisation status unknown / uncertain | Arrive further vaccination as required to complete five dose course. | Vaccinate if next dose due.                              |

Wounds are considered high risk if heavily contaminated with material likely to contain tetanus spores.

During 2006–2013, PHE surveillance data [7] recorded 44 cases of clinical tetanus and five deaths. Cases were aged eight to 91 years old, 54.5% (24/44) were born before 1961; 52% (23/44) were male, however among those aged over 69 years 64.7% (11/17) were female. Overall, 84% (31/37) had a recorded injury; 81% of which were acquired in their home or garden. Three cases in PWID were recorded [10]. No cases of severe tetanus were observed during this period in persons who received appropriate post-exposure prophylaxis. Treatment before the onset of tetanus was recorded in eight cases, none of whom received prophylaxis appropriate to their injury and immunization history.

The timely administration of post-exposure prophylaxis following an injury can prevent clinical tetanus from developing or lessen the severity of infection [11]. When a person presents with a wound, their injury should be assessed and thoroughly cleaned [2]. The type of tetanus prophylaxis recommended depends on the nature of wound and the patient’s vaccination history (Table 1). Fully immunized patients who are immunosuppressed should be managed as if they are incompletely immunized [2].

When left untreated, clinical signs of tetanus infection including muscle rigidity and spasms, usually present between 4 and 21 days after inoculation. The diagnosis of tetanus is primarily based on clinical features [1] and treatment should not be delayed until laboratory evidence is available. When tetanus is suspected a serum sample should be taken prior to the initiation of prophylactic treatment and sent to an appropriate reference laboratory, such as the Respiratory and Vaccine Preventable Bacteria Reference Unit at PHE, for immunity testing [12]. Antibody levels below 0.1 IU/mL (the putative protective level) are consistent with tetanus. Treatment delays allow additional tetanus neurotoxin to bind to the peripheral and central nervous system, increasing the severity of disease. Management should include the administration of tetanus immunoglobulin (TIG), wound debride-ment, antimicrobial agents active against anaerobes, and vaccination with tetanus toxoid upon recovery. In severe cases of tetanus (grade 3) specialist care including respiratory support may be required. If TIG is not available then HNIG may be used [13].

It is important to note that recovery from tetanus does not confer immunity [2]. Therefore, patients with clinical tetanus will still require appropriate vaccination to provide protection against subsequent exposures.

Most patients presenting with tetanus prone wounds are seen either by their general practitioner or at Accident and Emergency departments. A recent review of tetanus prophylaxis among staff in Accident and Emergency departments found variations in self-reported level of knowledge and practice; only a third of
respondents who had local guidelines available said they were always followed [14]. These gaps in knowledge and lack of adherence to current national guidance can lead to patients receiving inadequate care. Similar finding have been observed in the United States and Europe [15,16]. Clear local commissioning pathways are essential to ensure the provision of timely post exposure prophylaxis for vaccine preventable infections such as tetanus. Whenever possible Accident and Emergency departments should provide a first dose of tetanus containing vaccine to patients with an incomplete or uncertain immunization history as patients referred back to general practice may not attend. Clear and effective guidance for the provision of tetanus prophylaxis is readily available [2]. Local and national public health practitioners provide a source of expert advice on appropriate prophylaxis, laboratory tests, and treatment of tetanus. Immunization history is required for the appropriate risk assessment of patients presenting with wounds. Many patients, especially among the elderly, may not be aware of their immunization status nor have it recorded adequately in their health records and are may therefore be incorrectly assumed to be fully vaccinated. In the UK, patients born before 1961 would not have been eligible for routine immunization, although some men would have been immunized during national service, and may have incomplete vaccination histories. Ensuring wounds are managed in accordance with national guidelines and appropriate immunization delivered to susceptible patients requires effective communication between the primary and secondary care. Tetanus is a statutory notifiable disease and the local health protection team must be informed of suspected cases.

The simple cost-effective intervention of taking the time to investigate a patient’s vaccination history and provide timely prophylaxis, particularly to patients who are not known to be fully immunized, can prevent individuals from developing this life-threatening illness.

Conflicts of interest
All authors declare no competing interests. This study received no external funding.

Ethical approval
PHE has approval under PIAg Section 60 of the Health and Social Care Act 2001 to process confidential patient information for public health purposes.

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