In Focus

Tetanus is preventable disease through effective immunisation. The tsunami in southeast Asia, with its heavy toll of trauma cases, was an important reminder that outbreaks of tetanus can affect all ages in susceptible populations.

Background

Clostridium tetani is an obligate Gram-positive, anaerobic spore forming rod. The spores are widely distributed in soil, animal intestines, human faeces and occasionally on the skin. Spores that gain entry can persist in normal tissue for months or years.

Under conditions usually associated with infected or necrotic tissue, the spores germinate and the tetanus bacillus produces two exotoxins, tetanolysin and tetanospasmin. Tetanolysin is a haemolysin thought to produce local damage to tissue and facilitate bacterial growth in the surrounding tissues. Tetanospasmin is a potent neurotoxin that leads to the clinical features and complications of tetanus.  

Generalised tetanus is the most common form of the disease, in which there is involvement of most of the muscles of the body in a descending pattern from head down. Local tetanus is uncommon, less severe and is limited to those muscles at the wound site. A form of local tetanus is cephalic tetanus; this follows injury to either the head or neck and usually presents initially with cranial nerve palsies.

Mortality from severe tetanus is inversely proportional to the level of medical facilities available. It often exceeds 50% in the developing world.

Tetanus cases

Ten people presented to Fakinah hospital with tetanus between 13 and 23 days post-tsunami. All patients had received injuries from the tsunami disaster and, on clinical examination, had evidence of puncture or laceration wounds, mostly to the lower limbs. Two patients had minor trauma. Ages ranged from 9 years (the only child) to 60 years, with seven males and three females. Duration of symptoms prior to presentation varied from 1-4 days.

The diagnosis was straightforward in this setting. Tetanus cases were managed conjointly by visiting relief teams according to standard clinical guidelines drafted soon after our arrival. All patients received intravenous diazepam to control muscle spasms, followed by either intravenous or intramuscular tetanus immunoglobulin.

Of the 10 cases treated, four patients were given human tetanus immunoglobulin for intravenous use (single dose 4,000 IU, CSL, Bioplasma, 60mg/mL), four received intramuscular human immunoglobulin (5,000-10,000 IU, Tetagram P, 100-170 mg/mL) and two patients were given horse serum anti-toxin intramuscular (40,000 IU daily for 2 days and 20,000 IU on Day 3, Bio Farma, 20,000 IU/mL). No adverse reactions from immunoglobulin administration were documented. Tetanus toxoid vaccine was withheld during the acute phase of the illness.

Patients were commenced on intravenous metronidazole for a minimum of 7 days. All wounds were cleaned and debrided after
patients were resuscitated and stabilised. All tetanus patients were moved to a quiet and darkened room established for tetanus cases only.

Two patients died from hypoxia following severe continuous generalised spasms during our stay. The first death occurred within hours after our arrival. The second death followed a surgical wound debridement procedure performed under inhalation anaesthesia in the accident and emergency department by another visiting aid team. Of the remaining eight surviving patients, three were transferred to the Red Cross Hospital intensive care unit when this facility became operational and five recovered at Fakinah hospital.

Discussion
The 10 cases we described were consistent with the demographic characteristics of tetanus patients presenting to other emergency facilities in Banda Aceh, Meulaboh and Sigli. Of the 91 cases reported during the period from 31 December 2004 – 22 January 2005, males outnumbered females 1 to 1.5 and the median age was 43 years, with nine cases in occurring in children less than 15 years.
The incubation period was less than 21 days in the cases we reported. Delays in the appearance of symptoms, however, may occur up to several weeks after a tetanus prone injury and more cases would be expected. The population of Aceh Province will remain at high risk from tetanus until both primary and booster doses of the tetanus vaccine is widely administered and immunoglobulin prophylaxis becomes readily available.

The diagnosis of tetanus is a clinical one. Trismus is a common early sign of generalised tetanus and was unmistakable in this setting. The progression and extent of muscle involvement was variable, as was the intensity of muscle spasms experienced.

Patients presenting with severe generalised spasms on admission were most unpredictable in their clinical course. Spasms were initially reflex and brief in duration, but would rapidly intensify to severe and prolonged episodes without apparent stimuli. Spasms were both distressing and excruciatingly painful to the patient. Obvious triggers included patients speaking, swallow or moving. Other sensory stimuli such as touch, noise or bright light would also provoke spasms. Examination of patients and procedures were kept to a minimum at all times. Lack of constant monitoring
meant that life-threatening complications may have occurred at any time without early intervention in this group of patients.

Tetanus immunoglobulin was administered immediately to inhibit any unbound toxin remaining outside the central nervous system. Human tetanus immunoglobulin for intravenous was in limited supply throughout Aceh. The human intramuscular preparation available required large volumes and multiple injections. This carried the real risk of provoking further muscle spasms in patients with severe diseases. Horse serum anti-toxin was used in two cases when human preparations were unavailable. As the risk of severe allergic reactions was significant with this product, skin testing prior to administration was necessary.

Metronidazole was used as first-line antibiotic against Clostridium tetani as viable organisms that reside in the tissues can continue to produce and release exotoxin. Metronidazole avoids the GABA antagonist activity associated with penicillins and has been shown to have better clinical outcomes. Antibiotics, however, do not destroy tetanus spores that can persist in normal tissue and their removal requires thorough cleaning with surgical debridement of the wound.

Uncontrolled spasms led to two deaths at Fakinah hospital during our brief secondment, with an overall mortality of 33% (2/6) in severe cases. Although endotracheal intubation and ventilation of patients was unsustainable at this facility, tracheostomy performed early and electively may have prevented these outcomes. This procedure should be considered carefully in all tetanus patients with severe dysphagia, prolonged spasms or risk of aspiration.

Tetanus disease does not result in tetanus immunity. All patients with tetanus require follow up with active immunisation using tetanus toxoid.

Given the unpredictable nature of tetanus and the associated high morbidity and mortality, patients should receive constant monitoring, preferably in an intensive care environment with meticulous nursing care and skilled medical staff. At Fakinah hospital, relief teams were able to work collaboratively to implement tetanus management guidelines in a timely manner with minimal resources. This strategy may have reduced the mortality in this setting.

Conclusion

Tetanus is preventable; concerted efforts should focus on effective vaccination programs worldwide. Until this occurs, relief agencies and disaster response teams will need to be better prepared for the treatment of tetanus cases when assisting in regions where immunity is lacking.

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References