21 Tetanus

Vaccine introduced in 1930s (DT)/ 1952/53 (DTP)/ 1996 (DTaP)

NOTIFIABLE

In some circumstances, advice in these guidelines may differ from that in the Summary of Product Characteristics of the vaccines. When this occurs, the recommendations in these guidelines, which are based on current expert advice from NIAC, should be followed.

Introduction

Tetanus is an acute potentially fatal diseasecharacterised by muscular rigidity and intermittent spasms. It is the only vaccine preventable disease which is non communicable. It is caused by the neurotoxin produced by *Clostridium tetani* which grows anaerobically in a contaminated wound. The toxin is taken up by nerves, and blocks inhibitory synapses. Effective protection is provided in 90-95% of those who are fully vaccinated. Protection declines with time since vaccination and with age; up to 50% of 20 year olds and up to 70% of 70 year olds who have not received boosters within 10 years may be unprotected. Naturally acquired immunity does not occur.

Epidemiology

Tetanus spores are present in the soil, and in the intestine and faeces of cattle, sheep, horses, chicken, dogs, cats, rats, guinea pigs, and chickens. The spores are very resistant and remain viable for years. Thus, technically it is not possible to eradicate tetanus. In agricultural areas a significant number of adult humans may harbour the organism in their gut. Spores may also be found in contaminated heroin. The spores may be introduced into the body during injury, often through a puncture wound but also through burns or occasionally trivial wounds and the neonatal umbilical stump. Tetanus in not transmitted from person to person.

Internationally, there has been a dramatic decline in tetanus in recent years following improvements in tetanus vaccination coverage. In the 1980s, over 1 million deaths every year were attributable to tetanus, with an estimated 787,000 deaths in 1988 from neonatal tetanus alone. In 2013 it caused an estimated 59,000 deaths. This decrease is directly associated with an increase in vaccination coverage. During 2015, about 86% (116 million) of infants worldwide received 3 doses of diphtheria-tetanus-pertussis (DTP3) vaccine.

In the UK, a number of tetanus cases are reported each year, with the largest number (twenty) reported during an outbreak among injecting drug users in the UK in 2003-2004. In 2010, nine tetanus cases were reported by the HPA, with most occurring in individuals 65 years of age and older.

Between 2000 and 2015, 12 cases of tetanus were reported in Ireland with 2 deaths. The majority of cases were over 20 years of age.

The incubation period ranges from 2 days to months but most cases develop in less than 14 days. The shorter the incubation period, the greater the likelihood of death. Spores germinate in anaerobic conditions, producing toxins that spread via blood and lymphatics. Those most at risk of developing tetanus are young children and people over 60, many of whom have not had appropriate vaccination.

Effects of tetanus

Local tetanus, unusual in humans, is manifested by muscle spasms in areas contiguous to the wound. The spasms may continue for several weeks. Local tetanus may precede generalised tetanus but is usually much milder, about 1% of cases being fatal.

Generalised tetanus is the most common type of tetanus. It usually starts with spasms of the jaw and neck muscles (lockjaw, trismus). The prolonged tonic spasms proceed to involve muscles of the thorax, abdomen and extremities. Spasms may be frequent, last for minutes, and persist for 3-4 weeks. They may occur spontaneously or following minor stimuli such as noise, light or touch. Complete recovery may take months. Complications include laryngospasm, fractures of the long bones, secondary infections, aspiration pneumonia, and autonomic nervous system dysfunction with hypertension, arrhythmias and sweating.

The disease remains severe for 3-4 weeks and gradually subsides over months.

Pulmonary embolism is a problem in drug users and the elderly. Mortality rates in recent years are 10-90%, being highest in infants, the elderly, and those who are unvaccinated or have not received a booster within the previous 10-20 years.

Diagnosis

Diagnosis is primarily clinical, when other causes of muscle spasms such as phenothiazine toxicity, hypocalcaemic tetany and hysteria are outruled. Attempts to culture the organism are seldom successful.

Treatment and Prophylaxis

Treatment consists of Tetanus immunoglobulin TIG (150 IU/kg) given IV or IM at multiple sites, wound debridement, metronidazole in high doses, drugs to control spasms, and supportive care. For severe cases, prolonged intensive care is usually required.

Tetanus immunoglobulin is available in 1 ml ampoules containing 250 IU from the manufacturer..

Prophylaxis with TIG is recommended for those with tetanus-prone wounds who:

- have not received at least 3 doses of tetanus vaccine and their last dose within 10 years (see Table 21.1 below)

or

- are immunocompromised, even if fully immunised (see Chapter 3).

The following wounds are considered tetanus-prone:

- Wounds contaminated with soil, faeces, saliva or foreign bodies
- Puncture wounds, avulsions, burns or crush injuries
- Wounds or burns requiring surgical treatment which has been delayed for more than 6 hours
- Compound fractures.

Occasionally, apparently trivial injuries can result in tetanus.

Dose and route of administration

The dose of tetanus immunoglobulin for prophylaxis is 250 IU (1 ml) intramuscularly into the anterolateral thigh. This dose is doubled to 500 IU (2ml) when any of the following situations exist:

- The injury occurred more than 24 hours previously.
- The patient weighs more than 90 kg.
- The wound is heavily contaminated.
- The wound is infected or involves a fracture.

Table 21.1 Risk assessment of wounds for use of vaccination and tetanus immunoglobulin (TIG)

Vaccination status	Clean wound	Tetanus prone wound	
Fully immunised (5 doses of tetanus vaccine at appropriate intervals)	Nil	No vaccine required unless more than 10 years since previous tetanus vaccine	Consider TIG*
Primary immunisation and age appropriate boosters complete	Nil	Nil	Consider TIG*
Primary immunisation or age appropriate boosters incomplete	Age appropriate tetanus vaccine and complete vaccine schedule	Age appropriate tetanus vaccine and complete vaccine schedule	TIG
Unimmunised or unknown vaccine status	Age appropriate tetanus vaccine and complete vaccine schedule	Age appropriate tetanus vaccine and complete vaccine schedule	TIG

* Consider TIG for fully vaccinated patients who are immunocompromised

Refer to GP for follow-up vaccines.

If both TIG and vaccine are required these should be administered at separate sites.

Tetanus vaccine

This is a toxoid, prepared by inactivating tetanus toxin with formaldehyde and adsorbing it onto aluminium as an adjuvant, to increase immunogenicity. Clinical efficacy after a complete series of vaccines is almost 100%. However immunity wanes and after 10 years may be insufficient to provide protection.

The currently licensed tetanus vaccine are combination vaccines.

Tetanus (T) containing vaccines in combination with high dose diphtheria (D) and acellular pertussis (aP) (DTaP/IPV/Hep B/Hib or DTaP/IPV) are recommended for children up to 10 years of age. In the event of a temporary shortage of DTaP/IPV, Tdap/IPV may be used.

Tetanus (T) containing vaccines in combination with low dose diphtheria (d) and acellular pertussis (ap) (Td, Tdap, Td/IPV or Tdap/IPV) are recommended for those aged 10 years and older.

An up-to-date list of licensed vaccines can be accessed on the HPRA website www.hpra.ie

A list of the currently available vaccines from the National Cold Chain Service can be found at www.immunisation.ie

Tetanus vaccines should be stored at +2 to +8°C. If a tetanus vaccine has been frozen it should not be used.

Dose and route of administration
The dose is 0.5 ml, given by intramuscular injection into the anterolateral thigh or the deltoid area.

Indications

1. ***Primary vaccination***
   This consists of 3 doses at 2, 4 and 6 months of age as part of a 6 in 1 vaccine (DTaP/IPV/Hib/Hep B).

   When 6 in 1 vaccine is given concurrently with PCV, it should be given first as it is less painful.

   If the primary course is interrupted it should be resumed but not repeated, allowing appropriate intervals between the remaining doses (see catch-up schedule in Chapter 2).

   If pertussis-containing vaccines are refused by parents, they should be informed that low dose diphtheria vaccines have insufficient diphtheria vaccine for primary immunisation in children under 10 years of age. Low-dose diphtheria vaccines are not intended for use as part of the primary vaccine schedule and may not give a sufficient immune response if so used.

2. ***Routine booster vaccination***
   A first booster dose is recommended at 4-5 years of age as 4 in 1 vaccine. In the event of a temporary shortage of DTaP/IPV, Tdap/IPV may be used.

   Children who have received four doses of tetanus vaccine before their fourth birthday should receive a 4 in 1 booster at least 6 months after the 4th dose.

   A second booster dose is recommended at 11-14 years as Tdap vaccine **regardless of the interval from a previous tetanus containing vaccine.**

3. ***Tetanus prone wounds***
   See Table 21.1

4. ***Adults***
   Unvaccinated adults should be given tetanus containing vaccine as shown in Table 2.3 in Chapter 2.

   For vaccinated persons who have received 5 doses of tetanus vaccine, booster doses may be considered every 10 years. This is based on concern regarding the decline of antibody levels with age and potential failure of single booster doses to produce protective levels in older individuals.

Children under 10 years should receive tetanus vaccine as DTaP/IPV/Hib/Hep B or DTaP/IPV (or Tdap/IPV in the event of a temporary shortage)

All aged 10 years and over should receive tetanus vaccine as Td, Tdap Td/IPV or Tdap/IPV depending on other vaccine requirements.

If tetanus vaccine is indicated
for those aged <10 years
There should be an interval of at least 6 months between booster doses of DTaP and the completion of a primary course of DTaP containing vaccines.
DTaP containing vaccines can be given at any interval following (an inappropriately administered) Td.

for those aged 10 years and older
Tdap or Tdap/IPV can be given at any interval following a Td containing vaccine.

Contraindications
Anaphylaxis to any of the vaccine constituents

Precautions
Acute severe febrile illness, defer until recovery.
Type III (Arthus) hypersensitivity reaction to a previous dose (see Adverse reactions). Persons experiencing these reactions usually have very high serum diphtheria or tetanus antitoxin levels; they should not be given further routine or emergency booster doses of tetanus or diphtheria containing vaccines more frequently than every 10 years.

Adverse reactions
Local: Pain, palpable lump, swelling and erythema at the injection site occur in up to 20% of recipients. They are more frequent with subsequent doses. Most of these reactions resolve with no treatment. A cold pack or ice wrapped in a cloth applied to the site for 20 minutes per hour as necessary may be required. On occasions paracetamol or ibuprofen may be needed. Antibiotics are very rarely indicated.

Very rarely a Type III (Arthus) hypersensitivity reaction occurs, involving swelling and erythema of most of the diameter of the limb from the shoulder to the elbow or the hip to the knee. This usually begins 2-8 hours after vaccination and is more common in adults. This resolves without sequelae.

General: Malaise, transient fever and headache are uncommon. Temperature over 40°C is rare. Dyspnoea, urticaria, angioedema, and neurological reactions are very rare.

Anaphylaxis is extremely rare (0.6-3 per million doses).

Bibliography

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