



Medicine for Managers

Dr Paul Lambden BSc MB BS BDS FDSRCS MRCS LRCP DRCOG MHSM

Diphtheria

Diphtheria is a serious and life-threatening disease caused by the bacterium *Corynebacterium diphtheriae*. Cases of the disease have been virtually eradicated in the UK since the introduction of the vaccination programme in the early 1940s. The bacterium produces a toxin which resulted in the formation of a membrane-like material which attaches to the throat and may result in death by choking.

Interestingly, the disease has reached the headlines in the last few weeks because of an outbreak at the refugee centre at Manston, where one man has died.

Diphtheria was originally known in England as 'Boulogne sore throat' because it spread from France.

There was only one reported case of diphtheria in the UK in 2020. Already, this year, there have been fifty reported cases.

As with other very rare diseases, any doctor seeing a case today will be lucky to diagnose the infection swiftly, because the prospect of the infection (apart from in an area where there are other such cases) being the cause will be very low on any differential diagnosis list.

Diphtheria was first recognised over 5,000 years ago but attacks tended to be isolated. As towns and cities developed, the first groups of sufferers occurred and the ancient Greeks were amongst the civilisations that experienced cases of epidemic proportions in about 500BC.

Other parts of the world experienced sporadic epidemics, most serious for children under 5 years old and adults over forty.

In 1826, Bertonneau coined the name diphthérite, a term he derived from the Greek word diphthera meaning leather, which described the appearance of the slough (called a pseudo-membrane) which develops in the throat.

The bacterium was originally identified by Klebs in 1883 and was originally named Klebs-Loeffler bacterium. Its name was changed several times and finally to ***Corynebacterium diphtheriae***.

Loeffler discovered the association between the bacterium and diphtheria and he was also the first person to demonstrate the toxin that it produced.

Antitoxins were first produced in the 1890s and soon were successful. Von Behring won the first Nobel Prize for Medicine for his work on diphtheria.

The use of antitoxins was marred in the early days by a number of fatalities which occurred as a result of using impure medicines. It was not until standardisation occurred, contaminants were removed and the effectiveness was increased by modifying the antitoxin by treating it with aluminium salts, a technique developed in 1926 by Alexander Glenny, that vaccination became reliable.

In the UK in the first three decades of the twentieth century, there were between 50 and 60,000 cases a year and the disease killed an average of 4,000 children annually (5-10% of those infected). Following the introduction of the vaccination programme in the UK in 1942, the number of cases dropped dramatically.

A major European epidemic occurred in 1943 as a result of the war and disruption engulfing the continent. There were over a million cases and 50,000 deaths. There are to this day still epidemics in some parts of the world.

The current schedule for diphtheria vaccination is three doses of 6-in-1 vaccine, administered at 8, 12 and 16 weeks of life, together with a pre-school booster dose at 3 yrs 4 months and a teenage booster dose at age 14.

So successful was the vaccination programme that, in an article written in the late 1960s, it was pointed out that the average GP saw diphtheria every year before the start of the vaccination programme. It went to say that, by 1965, he would have to practise for 400 years to see a case.

Features of diphtheria

The disease is passed from person to person by water droplets that are coughed or sneezed into the air by someone with the infection. It can also be caught from clothing or bedding, toys or towels used by someone with the disease. People with diphtheria are infectious for up to four weeks.



The incubation period is normally between two and five days. The infection starts with fever, shivering, feelings of malaise and a sore throat.

The voice may become hoarse and breathing may become more rapid and difficult.

The lymph nodes in the neck become enlarged. The most serious feature is the development of a grey slough called a pseudomembrane (see picture), composed of dead cells, bacteria and slough which covers the throat and the tonsils, interfering with respiration.

Some people do not have a serious illness but just mild symptoms. They are often unaware of the illness, which they might dismiss as a mild viral infection. Yet they remain infectious and can pass diphtheria to other people.

Apart from the breathing problems caused by the infection, the toxin can cause heart and

nerve damage. The toxin may lead to myocarditis (inflammation of heart muscle) which, in the most severe cases, may result in heart failure and death. Inflammation of nerves may result in muscle weakness. If the nerves affected control the respiratory muscles, breathing may become difficult or impossible leading to death unless a respirator can be obtained.

There is also a form of diphtheria which affects the skin. The condition is characterised by the development of pus-filled blisters on the legs, feet and hands with large ulcers surrounded by reddened skin, characteristic of acute bacterial infections.

It is painful and the ulcerated areas themselves may be covered with the grey membrane which is a feature of the pharyngeal form.

Treatment of diphtheria

The key thrust of control and management of diphtheria is through the vaccination programme which is so successful in the Western world.

However, if the infection is acquired the treatment is with diphtheria antitoxin, antibiotic and supportive care. In suspected cases treatment should be started as quickly as possible.

Patients should be nursed in isolation to prevent the risk of spread. The early administration of antitoxin neutralises circulating toxin, although it is ineffective against toxin already bound to tissues.

Penicillin, erythromycin and metronidazole are effective antibiotics against the infection and should also be used in patients where there is a risk of transmission of the disease or if they are asymptomatic carriers.

The treatment may need to be supplemented with supportive measures, particularly in respect of the respiratory complications.

Airway obstruction from the pseudomembrane may necessitate the insertion of a breathing tube and the patient may need respiratory support and cardiac monitoring to manage compromise of the respiratory muscles or heart rhythm abnormalities as a result of the nerve effects of the toxin.

In Great Britain, the US and many other countries, the vaccination programme has controlled and largely eliminated the infection.

However, in those areas with poor social conditions, overcrowding and inadequate sanitation, there is still a long way to go.

paulambden@compuserve.com