

A New Approach to Tetanus*

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Summary

Following a five year study the authors are convinced that the treatment of established Tetanus is simplified and improved by three weeks controlled respiration with full muscle relaxation and adequate sedation.

Key Words

Established Tetanus. Controlled respiration. Muscle relaxation. Adequate sedation.

"Tetanus appears to have a dangerous period... I have never seen one die where it had existed three weeks" John Hunter (1835).

Malta and Gozo are two small islands in the Mediterranean having a surface area of 122 square miles and a population of a third of a million. As many tourists visit the Islands in the summer season the population swells to over a million, in the peak of the season. No tourists were ever infected during their stay here.

Tetanus spores are present in the faeces of herbivorous and carnivorous animals and so are ubiquitous in the soil and dust. To germinate the spores need strict anaerobic conditions and when the bacteria are lysed by the white cell enzymes a strong neurotoxin is released. This neuro toxin is lethal in a concentration of 0.1 mg/l.

Epidemiology

In the Maltese Islands there is a fear of Tetanus as its fatality has been as high as 55% (Statistics 1966). This was well before the Intensive ward was opened i.e. five years ago. All cases of suspected Tetanus are immediately referred to St Luke's Hospital: the Islands' main hospital. The total number of cases admitted during this five year study was 37 but Tetanus spores or bacilli were only isolated in 26. None of these cases had ever had Tetanus Toxoid Injection though 4 had had Tetanus Serum (ATS). Out of these 37 cases there were 8 deaths - less than 20%.

The majority of the cases were farmers or part time gardeners and it is the writers opinion that this illness should be classed as an occupational one, in Malta, unlike in other countries.

There were no cases of maternal or neonatal Tetanus.

It is during the summer months that tetanus cases mostly occur mainly because most farmers go barefooted in the fields. The worst month is October when manure is spread onto the soil for preparation for the winter rain. The site of infection is most often a forgotten injury in the sole of the foot though one woman, a nun, cut her finger whilst peeling potatoes.

Presentation

The patients had called on their general practitioner for strange headaches, backaches and mild dysphagia. It is so easy to attribute these symptoms to hard work in the fields but if a proper examination is carried out there is also a slight temperature, tachycardia, stiffness of the lumbosacral muscle group and increased tendon jerks.

Maybe the patient will draw the doctor's attention to a small sore somewhere in the sole of the foot - an old injury that refuses to close. The injury is usually a puncture wound with raised keratinised edges and oozing serous fluid.

Clinical Features

Trismus and increased rigidity of the lumbosacral muscles develop in 24 hours from the onset. Swallowing becomes difficult and breathing tiring and exhausting. Opisthotonos (back arching) is another development because the back muscles in tonic spasm are stronger than the abdominal ones. In another twelve hours the muscle rigidity may develop into painful clonic muscular spasms - a tetanic fit - that is sometimes so severe as to cause tearing of a muscle. Spasm of the facial muscles leads to the characteristic mask of "risus sardonicus" - raised eyebrows, semi-closed eyes, lips drawn back to reveal clenched teeth. In the untreated case severe spasms of the laryngeal and respiratory muscles will produce cyanosis. Death is due to exhaustion and congestive heart failure due to severe acidosis. Besides its effect on the skeletal musculature the tetanus toxin has also a marked effect on the sympathetic nervous system causing tachycardia and

arrhythmias, temperature changes, and vascular instability usually with peaks of hypertension. If uncorrected these catecholamine induced crises may cause myocardial damage and also ventricular failure.

Prognosis

It is common knowledge that if the symptoms of tetanus start within 10 days of the injury the prognosis is very bad. The later the onset of the symptoms the better the prognosis.

There were no cases of deaths in patients who had had Tetanus Toxoid.

If the patient suffers from a concomitant illness (and diabetes is a very common disease in Malta), then the prognosis is more guarded.

Clinical Course

Before the opening of the ITU ward mortality was considerably high. Since the ITU ward was opened this mortality rate has been reduced to 20% which is still high compared to what is reported from Oxford U.K. In this series four patients died in the first week of admission to the ITU Ward; one because of respirator failure, one of cephalic tetanus and two because of uncontrolled diabetes and old age. The other four patients died of complications in the third week of the illness from *Pseudomonas* bronchopneumonia.

The patients discharged in the third week from the ITU all left hospital soon after, free of any muscle rigidity or nerve damage.

Three weeks duration of treatment seem to be essential before all manifestations of the illness stopped. It could be that despite widespread local excision of the suspected wound of entry, tetanus spores germinate and produce the toxin from other sites.

Management

It is the local custom to rush off to hospital all cases of suspected tetanus. At Admission Ward the Surgical registrar sees the patient and on the least suspicion admits him immediately to the ITU ward. This is a defensible reaction when the fear the Maltese have of the outcome of the illness is appreciated.

At the ITU ward mild sedation is prescribed while the usual monitoring equipment is set up and blood taken for the usual parameters.

If with further observation and consultant advice the diagnosis is confirmed then without further delay treatment is started. The grave risk of developing a tetanic fit and aspiration of vomit with consequent bronchopneumonia will worsen the prognosis of this serious but otherwise curable illness.

If despite mild sedation the patient develops signs of spreading muscle rigidity then muscle relaxation and intubation with intermittent positive pressure ventilation is performed. This is continued together

with heavy sedation for around three weeks. Experience has taught us that stopping the above regimen earlier than three weeks may lead to an unexpected fit.

Any drugs previously taken by the patient are continued but the dosage is individually regulated as drug interaction and enzyme induction may grossly upset the balance. If the patient was on oral hypoglycaemics then plain insulin in appropriate dosage is administered.

The benzodiazepenes hold the field as regards sedation, sleep induction, anticonvulsant and muscle relaxation. Flunitrazepam (Rohypnol) is the preferred drug used in heavy doses of 0.3 mg per Kg body weight.

Tubocurarine chloride 0.5 mg per Kg body weight is the preferred muscle relaxant drug because it is longer acting and its peripheral vasodilatory action is useful to counteract the sympathetic overactivity.

Chlorpromazine (Largactil) in doses of 0.5 mg per Kg body weight is used to limit the hypertension and cardiac irregularities. β adrenergic blockers are used if hypertension and tachycardia are still not brought under control by chlorpromazine alone. If a stronger α and β blockade is necessary then Labetolol is administered IV with 1 mg at a time boluses till adequate control is attained.

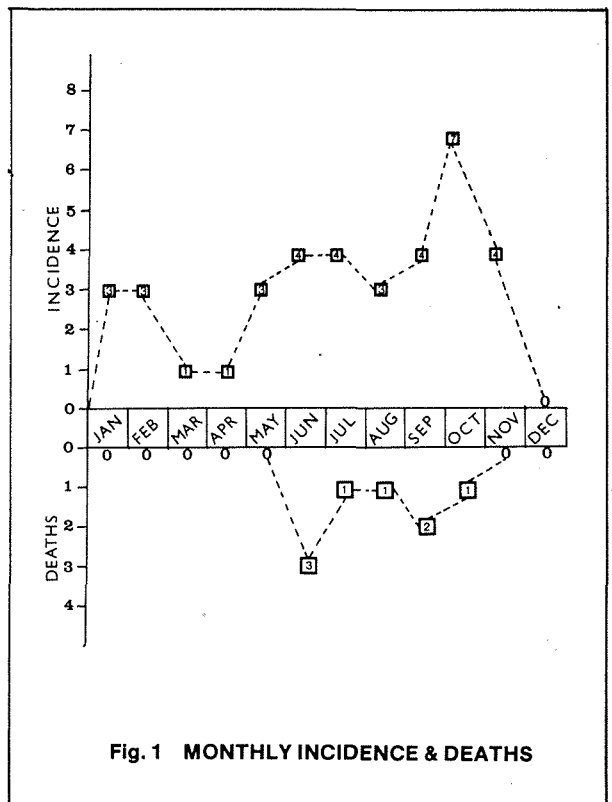


Fig. 1 MONTHLY INCIDENCE & DEATHS

Intravenous feeding is started from the second day of the illness, special attention being given to the high catabolic effect that sympathetic overactivity produces. Strict correction of acid base imbalance is maintained. In this second week it is common to find a hypochromic anaemia that often needs two pints blood transfusion for correction. Could this anaemia be due to an effect as yet undescribed, of the toxin on the bone marrow?

Antibiotics in high doses are given both to control any secondary infection and bronchopneumonia as well as to limit the number of bacilli sporing off. Penicillin remains the drug of choice in a massive

dose of 12 million units daily. If the patient is allergic than Erythromycin is given. Additional antibiotics are prescribed depending on sputum and blood cultures.

Anti tetanic serum is no longer given. Human Anti-Tetanus Globulin in a strong dose of 3000 Units is prescribed once only IV.

The wound is attended to on the second or third day. Thorough cleaning with excision of the edges is performed. Peroxide soaked gauze is packed every six hours to try and limit the number of germinating spores.

After three to four days of intubation a formal tracheostomy is performed. This helps the patient and nurse enormously. Phsiotherapy is simplified, mouth hygiene is facilitated and the patient feels more comfortable. In the third week the patient can usually talk and his morale is improved when sips of fluid are partaken.

Discussion

Despite all precautionary measures cases of tetanus occur at the rate of 8 a year in the Maltese islands. With the modern approach the infection is not fatal in itself but the complications can indeed be.

It is our hope that as more people become immunised the disease will be eradicated completely, because as our study shows none of the cases had ever had tetanus toxoid injections. In 1982 a law has been passed whereby children attending kinder garten have to produce an immunisation certificate for Tetanus, Diphteria and Polio.

It is our wish that this illness will be recognised as an occupational one by all governments.

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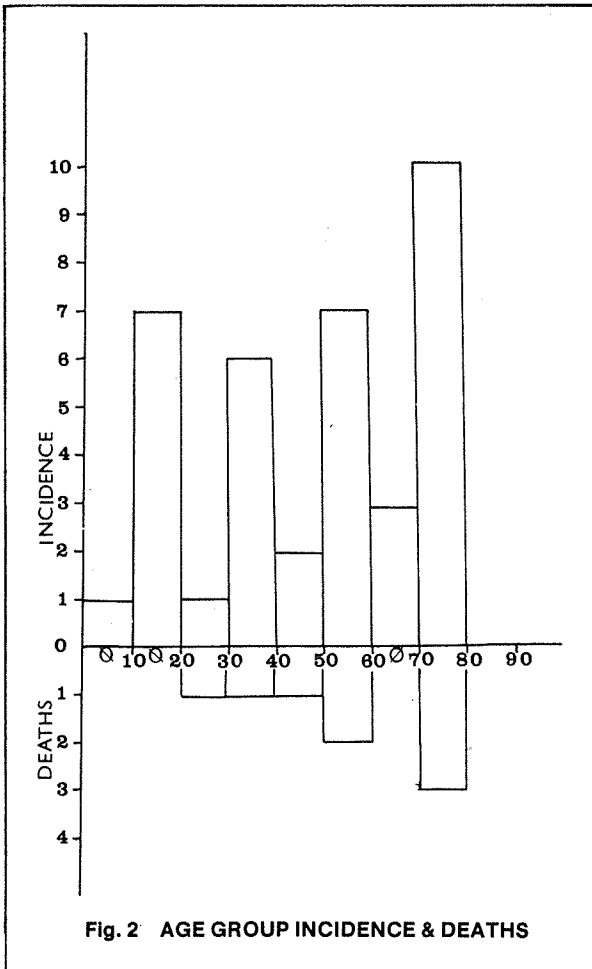


Fig. 2 AGE GROUP INCIDENCE & DEATHS