

TETANUS

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SUMMARY: Thirty-two cases of tetanus treated at the British Military Hospital Dharan are described.

With an enthusiastic, planned method of treatment the mortality was reduced from 60 to 30 per cent by simple conventional methods.

Introduction

This is a review of thirty-two cases of tetanus treated at the British Military Hospital, Dharan, Nepal, since its establishment in September 1960 until April 1968.

There is only a limited amount of equipment available in this hospital and there is always a severe shortage of staff and drugs available for the villagers, who provided the majority of patients in this series.

The Nepalese call the disease *Dhanus Tankar* which means literally "bow taut", likening the late stage of opisthotonos to that of a bent bow (Fig. 1).



Fig. 1.

Aetiological factors

Trauma to the foot was a direct cause of at least nine of these thirty-two cases. Footwear is both expensive and cumbersome to the majority of Nepalese. Finger injuries, in marked contrast to the incidence in Great Britain, where septic fingers following a prick provided the majority of sources, provided only two of thirty-two cases seen.

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The seven cases of neonatal tetanus were all due to infected umbilical cords, resulting either from dividing the cord with a rusty shaving razor or knife, or ligating the cord with a dirty piece of string (I did not hear of the application of cow dung to these cords which is so common a cause of neonatal tetanus in Africa). Septic abortions and post-partum sepsis are common causes of tetanus in Nepal, although they accounted for only three of these thirty-two cases.

Burns, an all too common occurrence in Nepal, probably accounted for two of the cases in the series. Otitis media, an almost endemic disease in this medically deprived community, accounted for another two cases.

The predominance of males to females in the series was eighteen to fourteen.

The monthly incidence of tetanus is shown in Table I.

Table I
Monthly incidence of the 32 cases of tetanus

Month	Cases	Month	Cases
January	2	July	3
February	2	August	2
March	1	September	3
April	4	October (harvesting time at the end of the monsoon)	6
May	4	November	2
June (when the monsoon breaks)	1	December	2

The original management of tetanus

In the first seven years (22 cases), a variety of rather haphazard methods of treatment was tried. Anti-tetanus serum (A.T.S.) was given to most patients, as soon as the diagnosis of tetanus was made. The usual dose prescribed was 100,000 units daily for adults and 50,000 units for children. Intramuscular penicillin in doses from one to two mega units, four to six hourly, was prescribed in most cases. The oxytetracycline drugs were only occasionally prescribed.

For sedation, Largactil was most generally used and administered orally, intramuscularly (I.M.) or intravenously (I.V.) in a drip, in doses from 25 to 100 mg.

To control the spasm in the adults, paraldehyde (5 to 10 ml I.M.), pethidine (100 mg I.M.), soluble phenobarbitone (250 mg I.M.) and promazine hydrochloride (100 mg I.M.) were all tried.

Fluids were given down a Ryle's tube, by transfusion or with a feeding mug. A fluid balance chart was only occasionally kept.

Tracheostomy was performed in six out of the twenty-two cases.

Percentage mortality (Tables II and III).

The overall mortality in this period until July 1967 was 60 per cent (twenty-two cases were admitted out of which thirteen died). This was very disappointing and compared badly with the 30 per cent overall mortality in Great Britain for severe tetanus. However, these British cases were treated by experienced staff with modern methods of treatment.

Table II
Case histories of twenty-two cases showing a 60 per cent mortality rate

Case	Date admitted to hospital	Age (years)	Cause and site of infection	Days since injury	Days before onset of symptoms	Duration of symptoms	Tracheostomy performed	Surgery to local part	Period in hospital If died, cause of death
1	16.4.63	14	NK	NK	NK	4 days	—	—	5 days. Died broncho-pneumonia, coma
2	11.8.63	25?	Deep grazes and abrasions of legs, arm and abdomen	NK	NK	NK	No, but endotracheal intubation	—	1 day. Died coma
3	25.11.63	4	Third degree burns of face, chest and arms.	7	NK	NK	Yes	Debridement	4 days. Died coma, respiratory obstruction.
4	22.1.64	16	Spade, left toe	10	8	36 hours	Yes	—	6 days. Died respiratory obstruction (tracheo-bronchial cast)
5	18.11.64	60	Dental, extraction of tooth	12	7	5 days	—	—	25 plus days. Survived
6	7.2.65	33	Lacerations of heel	13	NK	NK	—	—	5 days. Sent home to die coma.
7	5.5.65	23	Splinter in foot	7	2	5 days	—	—	10 days. Survived.
8	19.10.65	40	NK	NK	NK	3 days	—	—	23 days. Survived.

9	27.12.65	25	NK	NK	NK	12 hours	—	—	Hours. Died coma
10	8.10.65	27	Abortion, uterus.	5	4	1 day	—	—	3 days. Died aspiration pneumonia.
11	8.5.66	40	Crushed finger with stone.	21	18	3 days	Yes	—	4 days. Died hyperpyrexia.
12	8.5.66	31	Abortion, uterus	8	8	hours	—	—	5 days. Survived.
13	20.5.66	18	Laceration, sole of foot with stone	14	11 plus days	3 days	—	—	24 days. Survived.
14	4.8.66	15 days	Infected umbilical cord	15	12	3 days	—	—	38 days. Survived.
15	4.9.66	9 days	Infected umbilical cord	9	8	1 day	—	—	8 days. Survived.
16	20.10.66	22	Paronychia of right hallux. Second degree tear of perineum following F.T.N.D.	15 13	12	1 day	Yes	—	39 days. Survived.
17	20.10.66	17	Laceration of heel with stone.	21	18	3 days	—	—	2 days. Died pneumonia.
18	12.3.67	27	Abortion, uterus	9	6	3 days	Yes	—	10 days. Died pneumonia.
19	3.4.67	23	Cut finger. tooth extraction.	90 60	59	10 hours	—	—	2 days. Died uncontrolled spasms etc.
20	20.4.67	10 days	Infected umbilical cord	10	9	1 day	—	—	29 plus days. Survived.
21	27.4.67	3	Small burn left hand. Otitis media	9 7	8	1 day	—	—	30 days. Died hyperpyrexia.
22	11.6.67	13	Bamboo cane in sole of foot.	8	7	1 day	Yes	—	5 days. Died hyperpyrexia.

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Table III

Case histories of ten cases treated with 'Suggested Treatment of Tetanus Patient' showing a 30 per cent mortality rate

Case	Date admitted to hospital	Age (years)	Cause and site of infection	Days since injury	Days before onset of symptoms	Duration of symptoms	Tracheostomy performed	Surgery to local part	Period in hospital If died, cause of death
23	2.7.67	7	Dog bite, abdomen.	2	2	Minutes	—	Excision	57 plus days. Survived.
24	26.7.67	11	Ligating umbilical cord with string	11 days	9	36 hours	—	Umbilical toilet	21 plus days. Survived.
25	31.7.67	23	Rotten skin over feet.	NK	NK	9 days	—	Foot toilet	13 plus days. Survived.
26	30.9.67	6 days	Shaving razor on umbilicus	6	6	3 hours	—	Umbilical toilet	6 days. Died hyperpyrexia.
27	1.10.67	6 days	Contusion, face presentation.	6	2	4 days	—	Umbilical toilet	14 plus days. Survived.
28	7.10.67	13 days	Shaving razor on umbilicus	13	10	3 days	—	Umbilical toilet	15 plus days. Survived.
29	21.10.67	67	Rusty nail, sole of foot.	20	14	6 days	—	—	9 plus days. Survived.
30	10.12.67	16	Block of wood, head	8	5	3 days	Yes	—	29 days. Survived.
31	17.1.68	3	Otitis media, ear Measles	7 15	3 11	4 days 4 days	Yes	Toilet to ear	5 days. Died respiratory obstruction (tracheo-bronchial cast).
32	7.2.68	11	Bamboo cane in foot	6	5	1 day	Yes	wide excision of wound & bamboo	3 days. Died respiratory obstruction (tracheo-bronchial cast).

In our defence, many of the Nepalese were most reluctant to bring their sick to hospital, preferring rather the more conventional sacrifice of hens and goats to the strange world of white medicine. It was for this reason that we only saw very ill patients and only three of the twenty-two cases could be described as mild.

Plan of action

It was because we were dissatisfied with the results that we decided to introduce an agreed plan of treatment for tetanus. We also made urgent representations for a Radcliffe respirator, although this had not arrived during my time in Nepal. Our scheme of treatment (Chart 1) was printed and issued to the wards.

Chart 1

Suggested treatment of tetanus patients

- a. Immediate I.V. injection of 100,000 units of A.T.S. with an anti-histamine (Piriton 10 mg or Phenergan 50 mg).
Repeat I.V. of A.T.S. 80,000 units after 24 hours (+ Piriton).
Repeat I.V. of A.T.S. 50,000 units after further 24 hours (+ Piriton).
Repeat I.V. of A.T.S. 30,000 units after further 24 hours (+ Piriton).

For babies half the above doses are recommended

- b. Finally immunisation of the cured patient with tetanus toxoid, when fully recovered from the disease, as tetanus gives little immunity.
- c. Early, planned tracheostomy when spasms have just developed so that an emergency tracheostomy on a moribund, anoxic patient in the bed is not necessary. The frequency of goitre makes the operation more difficult in Nepal than elsewhere.
- d. Early passage of a Ryle's tube, when the patient is unable to swallow sufficient fluids by mouth, with maintenance of a Fluid Balance Chart and passage of self-retaining catheter in an ill patient to facilitate nursing and prevent bed sores.
- e. *Chemotherapy*. Intramuscularly penicillin 2 m.u. six hourly. Achromycin elixir 250 mg six hourly down the Ryle's tube.
- f. *Control of spasms*. Largactil 100 mg I.M. six hourly, changing to oral Largactil down the tube when spasms controlled.
- g. *Uncontrolled spasms*. Paraldehyde 5 ml I.M.
- h. *Nursing position*. Patients may die from chest infections after tracheostomy: Use a sterile sucker tube (kept in a bowl of hibitane) which must not be used if it touches the ground or the bed: Frequent sucking out: Two hourly position change of patient, day and night, with alternate blocking of the bottom, then top of the bed and turning patient from side to side: Clinical examination of chest daily plus X-ray daily and physiotherapy every hour.
- i. *Exhausted patient*. Hydrocortisone 25 mg I.M. twice a day.
- k. *Bowels*. Liquid paraffin down the Ryle's tube from the 1st day to prevent the necessity for manual removal of faeces.

- l. *Observations.* One hourly temperature recording day and night because of the danger of hyperpyrexia which occurs so quickly. This will require urgent tepid sponging from T. 102° F. +
- m. *Management of the tracheostomy tube.* Suck out quarter hourly: Remember not to suck too long as a patient has to breathe: Clean inner tube every half hour: Change outer tube every fourth day: Keep a piece of wet gauze (two thicknesses only) over the hole to stop the patient getting too dry. Moisten gauze every fifteen minutes: Spare tracheostomy tube + dilator + clean tape by the bed all the time.
- n. *Observation chart to be ticked off.*

Tetanus twenty-four hour chart.

In addition to Chart 1, we prepared a chart which we hoped would be filled in as each treatment was performed. This chart was called the "Tetanus Twenty-four Hour Chart". It included the temperature, pulse, respirations, blood pressure, times of suction, changing of tracheostomy tubes and position in bed—whether it was on the left side, the right side, lying on the front, or the back, with the head of the bed raised or the bottom of the bed blocked. The chart also contained space to record the administration of drugs—A.T.S., penicillin, Achromycin, Largactil, hydrocortisone, liquid paraffin. There were spaces for feeding, mouth toilet, releasing catheter, bowel actions, pressure areas and recordings as to spasms, (yes or no), and tepid sponging.

The chart was not popular with the nursing staff, as it was a whole-time job to fill it in, and there was just not sufficient trained or even untrained staff to perform the duties, let alone record such detailed attentions. For this reason the conventional Temperature, Pulse and Respiration (T.P.R.) chart was used. As the nurses pointed out, any changes were much more noticeable on this T.P.R. chart.

A separate fluid balance chart was requested as there was not sufficient room on the original chart. Likewise the routine observation chart was requested for such occurrences as the length and duration of spasms. The nurses were equally unhappy about charting drugs on the special chart. By the time all these special charts were in use, the original Twenty-four Hour Tetanus Chart had little value and was soon abandoned.

Comment on the final period (Table III)

Following the implementation of the suggested treatment with the subsequent ten patients, our mortality rate dropped to 30 per cent, to that of the overall mortality in Great Britain. This was still very disappointing for, by now, we had much more experience in the treatment of tetanus than most centres in Great Britain could possibly have had. We were, however, using the old-fashioned pre-respirator methods.

Conclusions

The basic fundamental requirements for the treatment of tetanus are peace and quietness, which can only be found in a side ward, with a special nurse for that case alone for twenty-four hours of the day. Both these requirements were denied us completely. In spite of this, with sufficient medical enthusiasm and the willingness to visit the wards frequently day and night to review the patient's progress and modify the treatment accordingly, many more cases of tetanus can survive.

The very highest individual nursing attention is essential. The nurses must be skilled in their work. Tetanus is a great challenge to the dedicated nurse and doctor, the management is frightening and yet wonderfully satisfying. Good nursing alone can save most patients.

There must be no delay over the question of tracheostomy. Generally speaking, when a tracheostomy is first considered it should then be immediately performed. Endotracheal intubation must also be considered in the neonate, where the nursing care of a tracheostomy will be very difficult and positively dangerous. The postoperative care of the tracheostomy tube is one of the most vital nursing procedures. Inspissated mucus at the end of the tube can act as a valve so that, although the sucker can be pushed down so that apparently there is a clear airway, minutes later the patient's airway can be completely obstructed. Nursing the tracheostomy patient in a steam tent marginally reduces this complication. In a dry tropical climate, when no humidifier is available, silver tubes are probably safer than plastic tubes because they can be removed for cleaning. The outer tube may well require changing on the second day instead of the more conventional fourth day. When in doubt about the airway, it is much better to remove the whole tube immediately.

In this series, the tracheostomies were usually performed under general anaesthetic, through a small transverse incision. The trachea was opened between the first and second tracheal rings and a flap was prepared cutting down each side of the second and third rings. This was then lifted up and the silver tracheostomy tube slipped in.

As soon as the temperature starts to rise, repeated checking is the only way to save lives from hyperpyrexia. This checking is specially important if tepid sponging has been used to lower the temperature. The temperature should then be taken every fifteen minutes.

A child of twelve may well need 100 mg of Largactil four hourly and neonates will require 5 mg hourly. Adults may require doses of up to 150 mg four hourly. Largactil plays an important role in keeping the temperature down. The dose of one-tenth of the ampoule of 250 mg of phenobarbitone is ideal for neonates.

Interestingly, nearly all the neonates were found to have large umbilical hernias when followed up at out-patients. The majority of neonates developed a form of chronic tetanus from which they took several weeks to recover.

Generally, the longer the incubation period following injury, the milder is the attack. However, the 'period of onset', that is, the time between the first symptom and the first spontaneous spasm, is more important. If less than forty-eight hours this can be very serious.

Tetanus is an extremely variable and difficult disease to manage. No two cases are ever the same, the mildest case can become the most serious over a matter of only a few hours.

Prophylaxis

Early adequate wound excision and toilet is without doubt the best method of prevention of tetanus, although it is obviously not practical to treat every potential tetanus wound in this way. The majority of wounds in this series had healed before the

patient's admission. Surgery was only possible in three (9 per cent) and wound toilet in six (18 per cent). Active immunisation should always be strived for.

Differential diagnosis

Meningitis — particularly tuberculosis, coma with associated fits — as with *Shigella* dysentery and with snake bites, hysteria, rabies, and simple trismus from local causes, all had to be considered in the diagnosis. Serum arthralgia, following the prophylactic administration of A.T.S. was not seen.

Opinion

Because patients still die with this conservative regime, it is considered that tracheostomy, curarisation and intermittent positive pressure respiration should always be the treatment of choice in Great Britain, ideally in a tetanus unit, where the nursing must be of the very highest standard.

REFERENCES

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