From the Department of Child Health, Medical School, University of Sam Ratulangi, Manado

Neonatal Tetanus
Evaluation of Treatment and a Proposal for Classification of Severity

by

TJANDRA HUSADA, T.H. RAMPENGAN, IGN. HARJANTO, I.D. ARIF, and MUZIEF MUNIR

Abstract

An evaluation was made on 22 neonates with Tetanus Neonatorum (age 5 — 21 days), who were admitted to the Military Hospital, Teling, Manado, in 1973. Seventeen of our patients were babies born in their homes and were delivered by the "dukun kampong"; 5 babies were born in the maternity clinic and were helped by midwives.

The therapy given were :

1. *Anti-Tetanus serum 10,000 U, single dose, given immediately on admission.*
2. *Procain Penicilline 100,000 U/kg. b.w./day; i.m. divided into 2 equal doses for 10 days.*
3. *Diazepam (valium) 5 mg./kg. b.w./day; orally, divided into 8 equal doses, and 2½ mg. parenterally 4 times a day.*

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The result was :

1. *8 patients, aged 5 day or less, died (100%).*
2. *9 patients, aged 6 - 10 days — 3 died (33 1/3%).*
3. *5 patients, age more than 10 days — none was dead (0%).*

Thus we have a total of 11 deaths out of 22 patients, which gave us a mortality rate of 50%. Our experience showed that Diazepam (Valium), with a total dose of 8 mg./kg. b.w./day, was not enough to overcome the attack of convulsion. This was obvious, especially among the very young infants (age less than 5 days), who generally had the most severe attack in the first 2 days of treatment. Now we intend to try to give a higher dose of Diazepam (Valium) until the frequencies of convulsion decrease, particularly for patients who are younger than 5 days old.

Introduction

The incidence of neonatal tetanus in developing countries, especially in regions situated near the equator (including Indonesia), is still very high. In Indonesia, the high incidence is mainly due to the low socio-economic level and local customs associated with childbirth. The lack of trained midwives, ignorance and religious prejudices are also factors which bring the expectant mothers to seek help from the "dukun kampong". The mortality rate of neonatal tetanus is also very high in developing and tropical countries because of the lack of medical and nursing facilities. To these can be added the lack of a satisfactory standard therapy.

In Asian countries, the mortality rates vary from 39 to 85.7% (Bytchenko, 1966). Not withstanding recent improvements of therapy in Indonesia like the use of diazepam and corticosteroids, the mortality rate remains extremely high. The absence of satisfactory classification of the severity of the disease up to now makes it very difficult to evaluate objectively the results of various treatments known.

The aim of this study is to examine all factors which might contribute to the severity of the disease and to propose a scoring system for the classification. With this system we evaluated our patients who were admitted to Teling Hospital during 1973.

Material and methods

During 1973, 22 cases of neonatal tetanus were treated in Teling Hospital. Manado. Their ages ranged from 5-21 days on admission. Seventeen of them were born at home where they had their umbilical cords cut with an unsterile tool by a "dukun kampong". Usually the stump was then dressed with a mixture of coal powder and coconut oil, vinegar, and salt, and various kinds of herbs or just a piece of ragged cloth. The other 5 were delivered by a midwife in a maternity clinic. All these patients were given the same treatment which consisted of :

- Antitetanus serum 10,000 U, single dose, given immediately after admission.
- Procain penicilline 100,000 U/kg. b.w., daily i.m., divided into 2 equal doses for 10 days.
- Diazepam (Valium), orally 5 mg./kg. b.w., divided into 8 doses and intramuscularly 2½ mg. 4 times daily.
- Food and oral medicine were administered through a nasal tube, until the patients could be fed by bottle or were able to suck by themselves.
- Treatment of the umbilical cord was restricted to cleaning of the stump with 70% alcohol solution.
- Especially stressed was the cleaning of the respiratory tract during and after the spasms.

All of our cases were treated in this same way, since the objective criteria for severity were not yet clear.

Results

The above treatment given to 22 patients resulted in a mortality rate of 50%

TABLE 1 : *Mortality rate of neonatal tetanus*

No. of cases	Died	Recovered	Mortality
22	11	11	50%

Whether the infection was caused by the 'dukun' or the midwife, it does not make any difference to the mortality rate. It can only be stated that the incubation periods of those delivered by the midwife are longer.

TABLE 2 : *Mortality rate according to birth place*

	No. of cases	Died	Recovered	Mortality
At home by 'dukun'	17	9	8	52.9%
Maternity clinic by midwife	5	2	3	40%

None of the 8 patients of 5 days-old or younger recovered. Of those between 6 and 10 days old, 7 recovered and 3 died. All the 4 patients older than 10 days recovered.

TABLE 3 : *Relationship of age with mortality*

Age on admission (days)	No. of cases	Died	Recovered	Mortality
⩽ 5	8	8	0	100%
6 — 10	10	3	7	30%
> 10	4	0	4	0%

Table 4 shows that the temperature on admission does not affect the final result. Each of the 3 groups: febrile, subfebrile, and hyperpyrexia has the same mortality rate — 50%.

TABLE 4 : *Mortality in relation to body temperature on admission*

Body temperature on admission	No. of cases	Died	Recovered	Mortality
< 38°C	8	4	4	50%
38° — 39°C	10	5	5	50%
> 39°C	4	2	2	50%

The fact that the conclusion remained for a longer period of treatment does not seem to affect the mortality, based on our limited number of cases. Two of the 4 patients who still showed convulsion after the 6th day of treatment died. The same percentage of mortality is found in those who showed convulsion only within 5 days of treatment.

TABLE 5 : *Mortality in relation to duration of convulsion*

Duration of convulsion (days)	No. of cases	Died	Recovered	Mortality
1 — 5	18	9	9	50%
6 — 10	3	9	1	66.6%
> 10	1	0	1	6%

Almost all dead cases are found whitin the first 5 days of treatment (Table 6). The duration of admission of those recovered varied from 11 to 26 days with a mean of 16.7 days.

TABLE 6 : *Mortality in relation to days of hospitalization*

Hospitalization (days)	No of cases	Percentage of cases	Mortality
1 — 5	9	40.9%	100%
6 — 10	2	9.1%	100%
11 — 15	4	18.2%	0%
> 15	7	31.8%	0%

From our small number of cases, there seems to be a definite relationship between mortality and signs and symptoms as of age, spontaneous paroxysmal convulsion, cyanosis, induced spasm, hyperpyrexia, trismus and risus sardonicus (Table 7).

TABLE 7: *Mortality in relation to signs and symptoms*

No. of cases	Age (days)	Signs and Syptoms					
		Spontaneous paroxysmal spasm	Cyanosis	Induced spasm	Febris 39° C	Trismus, Risus sardonicus	Mortality
8	⩽ 5	8	5	—	1	6	100%
3	6 — 10	3	3	—	—	3	100%
7	6 — 10	—	—	3	—	7	0%
4	> 10	—	—	3	1	3	0%

Discussion

Indonesian investigators (Liem et al., 1970; Komalarini et al., 1971; Sunarto and Drajat Budiman, 1972; Jo Kian Tjay and Leman Sembiring, 1972; Daili et al., 1972; Barten, 1973) using different kinds of treatment found mortality rates ranging from 39 to 75.4%. They stressed the importance of nursing care, but none mentioned the degree of severity that no conclusion can be drawn. The difference of their mortality rates might have been due not only to the treatment but also to the different severities. Jenkins and Luhn (1972) have classified these; however, in our opinion they are too simple. Therefore we would like to propose a new concept: THE CLASSIFICATION OF SEVERITY WITH SCORING SYSTEM.

By classifying the severity with a scoring system, we aim to find out how far the severity could possibly influence the mortality and whether it might be used as a guideline in choosing the most suitable treatment. We believe that by giving a score to each sign and symptom of neonatal tetanus, a somewhat objective measure of the severity could be obtained.

Based on observations of our limited number of cases and literature studies we consider that the important factors influencing the severity are:

I. Age.

By this we mean the age at which the patient shows the first sign of the disease which is usually manifested by the inability to suck. Because the contamination generally occurs at the time of cutting the umbilical cord, this age is about the same with the incubation period. We do not want to use the age on admission considering that the parents might not bring the baby to the hospital at the first sight of the symptom. The age at which the neonatal tetanus patient shows the first symptom is an important factor for the prognosis. This is also the opinion of many authors who generally stated that the younger the age the more severe is the disease; and, consequently, the worse is the prognosis (Athavale and Pai, 1965; Cole, 1959; Jo Kian Tjay and Leman Sembiring, 1972; Jelliffe, 1970; McCracken et al., 1971; Nelson, 1959; Patel and Joag, 1958; Sunarto and Drajat Budiman, 1972; Schofield, 1973; Tompkins, 1958).

II. Spontaneous paroxysmal spasms.

Our 11 patients who had spontaneous paroxysmal spasm died. Many investigators also consider this as an important factor of severity (Alhady et al., 1960; Femi-Pears, 1966; Jenkins and Luhn, 1962; McCracken et al., 1971; Mollaret et al., 1960; Patel et al., 1963; Sunarto and Drajat Budiman, 1972; Schofield, 1973; Wright, 1960); so do the oldest statement of Hippocrates which said: "..... major spasm inevitably indicating death within four days ....." (MacRae, 1973).

III. Cyanosis.

This is closely related to the spontaneous paroxysmal spasm, especially when the spasm is very severe. Therefore it is a sign of severity too. Eight of our 11 patients who showed this symptom died. According to Smythe (1963), cyanosis is brought about by the obstruction of the respiratory tract, or by respiratory insufficiency due to the intoxication of the vital centers in the brainstem with tetanus toxin (Montgomery, 1961).

IV. Hyperpyrexia.

The result of our observation were similar to those of Sunarto and Drajat Budiman (1972): the body temperature on admission does not have much effect on the mortality. Other authors (Kloetzel, 1963; McCracken et al., 1971; Patel and Joag, 1958), however, believed that very high fever (> 100° F) would have deterious influence. We consider that very high fever (> 39° C) will certainly influence the outcome unfavorably, both by inducing dehydration and initiating spasms.

V. Trismus, risus sardonicus and induced spasms.

Similar to our observation, many authors (Femi-Pears, 1966; Jenkins and Luhn, 1962; McCracken et al., 1971; Patel and Jong, 1958; Schofield, 1973; Sunarto and Drajat Budiman, 1972) considered trismus, risus sardonicus and induced spasms as having not much influence on the severity compared with the other symptoms.

From the facts mentioned above we therefore proposed to give a score to each sign and symptom:

— age : ⩽ 5 days 4
6 — 10 days 2

> 10 days 1
— spasms : spontaneous paroxysmal 2
induced 1
— cyanosis 2
— fever 39° C 1
— trismus or risus sardonicus 1

We realize that the frequency of spasms is also important in determining the severity; but as it is very difficult to monitor accurately, we have decided not to include it in the scoring system. We then classify the results of this scoring as follows :

— mild, if the total score is 2 or 3
— moderate ..... 4 or 5
— severe ..... 6 or 7
— very severe ..... 8 or 10

Scoring is done on the first day of admission when the signs and symptoms are usually positive. When this system is applied to our 22 patients, a direct relationship can be seen between the severity of the disease and the mortality rate.

Severity	No. of cases	Mortality
mild	4	0
moderate	4	0
severe	7	4
very severe	7	7

Five other important factors are to be considered in relation to our patients:

A. The fact that the incubation period of those delivered by the midwife were longer shows that the contamination might have occurred a few days after birth. All cases helped by the midwife were delivered in the maternity clinic without interference of the mother. So the infection might have been due to dermatol which is still widely used.

B. Besides medical treatment, nursing care of the patient is of paramount importance. It is even considered as a "sine qua non" (Conn, 1962). Our experience revealed that our deceased patients mostly succumbed during the night when there were only a small number of nurses on duty. Barten (1973) stressed the importance of nursing care by quoting a mortality rate of 39% obtained with conventional treatment alone, but she did not mention the severity of her patients' illness.

C. No agreement has yet been reached about the use of A.T.S. neither the dose nor the route of administration. Some believe a single dose of 10,000 U is enough (Patel et al., 1963; Barten, 1973); however, we doubt it. The high mortality of our severe and very severe cases might have been partly due to the low dose given. Considering that the concentration of tetanus toxin in a neonatal patient is relatively high, namely due to the small amount of blood and lighter body weight (Smythe, 1963), it seems that a higher dose of A.T.S. for severe and very severe cases is justifiable. Shirkey (1972) stated that a dose of 80,000 U can be given in different sites to neonatal tetanus patients.

D. Regarding the administration of Procain penicillin, there is a general agreement about the dose as well as the length of treatment, despite the fact that the real effect of antibiotics in tetanus is still obscure. Tetracycline can also be used in cases which are hypersensitive to penicilline.

E. Recent investigations revealed that diazepam (Valium) as a relaxant in tetanus neonatorum gave good results. It has been said that diazepam is the "drug of choice" for the control of spasms (Schofield, 1973). However, the authors found different results in their trials (Daili et al., 1972; Komalarini et al., 1971; Liem et al., 1970; Sunarto and Drajat Budiman, 1972). Their doses might be too small. Cheach et al. (1972) stated that one of the main goals of any tetanus therapy is the easy control of central manifestations, especially reflex spasms, spasticity and anxiety. With only a small dose these may not be achieved. A higher dose, particularly for severe and very severe cases, might not be necessary. Ayim (1972) believed that for developing countries, a conventional treatment for neonatal tetanus is still the "method of choice". But one thing is certain, whatever is given, unless we have a classification of the severity we will not be able to compare the results in the search for an adequate therapy.

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