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CASE REPORT

# Neonatal Tetanus After Home Delivery: Report of One Case

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Neonatal tetanus is a rare disease in developed countries, but remains common in developing countries. Pregnant women immigrating to Taiwan from developing countries may carry a risk of neonatal tetanus to the child, because of inadequate tetanus toxoid immunization and inappropriate postnatal cord care. Many young pediatricians in Taiwan are unfamiliar with this disease. Herein, we describe the clinical course of a newborn with neonatal tetanus, who was admitted with complaints of difficult feeding and muscle rigidity. After mechanical ventilation for 58 days and a prolonged hospital stay, the infant was discharged in good condition. It is important to maintain a high index of suspicion for neonatal sepsis when infants present with seizure-like symptoms, in order to allow its early diagnosis and appropriate treatment.

## 1. Introduction

Neonatal tetanus has previously been a major cause of neonatal death. However, the advent of tetanus toxoid vaccination and routine aseptic delivery means that it has now become a rare disease in developed countries. There have been no reported cases of neonatal tetanus in Taiwan for many years. However, it remains an important cause of neonatal death in developing countries.

An increasing number of immigrants are moving to Taiwan from Southeast Asia and China, where individuals are not always routinely vaccinated against tetanus. Immigrant women may not have received tetanus toxoid vaccination during childhood and therefore cannot transfer tetanus antibodies to their developing fetus during pregnancy. There is thus a risk of the neonate developing tetanus if the subsequent delivery and umbilical cord care are not aseptic.

We report on a pregnant immigrant mother from Vietnam who delivered at home. The baby exhibited

symptoms of neonatal tetanus at 3 days of age, was admitted to hospital, and was subsequently discharged after more than 2 months of hospitalization. This case should remind physicians of the symptoms of neonatal tetanus, and alert them to the possibility of similar presentations occurring in the future.

## 2. Case Report

A full-term female infant (birth weight 2500 g) born to a Vietnamese mother at home was admitted at 5 days of age. The delivery was performed with the assistance of the woman's mother, who performed non-aseptic cord cutting using scissors. The first 2 days of the infant's life were uneventful. However, 2 days prior to admission, the infant exhibited poor feeding and muscle rigidity. Fever and irritability developed on the following day. Seizure and lip cyanosis were observed on the morning of admission.

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Meningitis was initially suspected upon admission. The patient was transferred to the hospital pediatric intensive care unit where trismus, neck stiffness, four-limb spasticity and stridor were observed (Figure 1). A foul odor emanated from around the umbilicus, and erythema was observed in the umbilicus (Figure 2). Body temperature was 40°C.

Neonatal tetanus was highly suspected on the basis of the clinical manifestations and case history. Diazepam followed by phenobarbital was prescribed for persistent spasticity. However, the spasticity persisted and rocuronium was administered, after which the spasticity subsided rapidly.

At admission, the white blood cell count was  $22.8 \times 10^9/L$ . Biochemical analysis of plasma revealed the following:  $Ca^{++}$ , 2.37mmol/L;  $Mg^{++}$ , 1.3mmol/L;  $Na^+$ , 146mmol/L; glucose, 10.3mmol/L; blood urea nitrogen, 8.2mmol/L; creatinine, 27  $\mu$ mol/L; C-reactive protein <3.8nmol/L. Cerebrospinal fluid was clear with a white blood cell count,  $0.039 \times 10^9/L$ ; polymorphonuclear leukocytes, 30%; lymphocytes, 70%; glucose, 4.4mmol/L; protein, 87mg/dL; and normal

Gram staining. Arterial blood gas under spontaneous respiration was: pH, 7.25;  $pCO_2$ , 31mmHg;  $pO_2$ , 132mmHg;  $HCO_3^-$ , 14mmol/L.

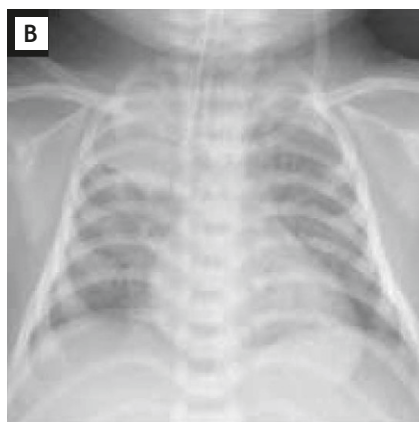
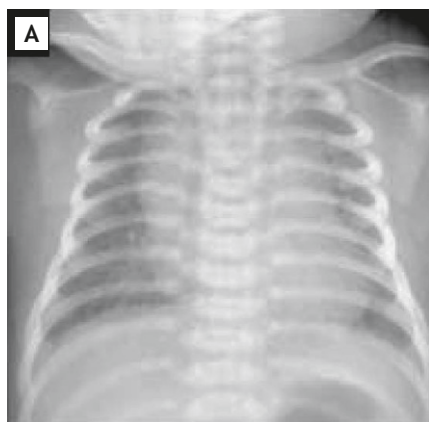
Brain sonography at admission revealed no abnormalities. Tetanus immunoglobulin (500IU) was administered intramuscularly after admission, in addition to aqueous penicillin and cefotaxime. Endotracheal intubation was performed to control spasticity and unstable peripheral  $O_2$  saturation. The patient's body temperature was 38°C on the day after admission, and no fever was detected from the third day of hospitalization. Cerebrospinal fluid and blood cultures were negative, while umbilicus culture was positive for *Staphylococcus aureus*. Aqueous penicillin was given for 14 days. There was no spasticity at rest after rocuronium treatment, but mild spasticity upon minor external stimuli was still apparent. The patient exhibited normal chest x-ray findings on admission, but lung collapse at the right upper lobe with unstable peripheral  $O_2$  saturation developed on day 8 of hospitalization (Figure 3). Complete resolution of lung collapse was noted on day 12 of



**Figure 1** Significant spasticity of the four extremities was shown in the baby before administration of neuromuscular agent.



**Figure 2** Erythema and discharge in the umbilicus was found at admission.



**Figure 3** (A) Chest X-ray of the baby was normal at admission. (B) Chest X-ray demonstrating right upper lung collapse on day 8 of hospitalization.

hospitalization. Phenobarbital and diazepam were discontinued on days 12 and 15 of hospitalization, respectively, following improvement of spasticity. Rocuronium discontinuation was unsuccessfully attempted on days 19, 29, 35, 43 and 50 of hospitalization. On each occasion, mild cyanosis became apparent within several hours of discontinuation. Rocuronium treatment was successfully discontinued on day 57 of hospitalization. The patient was extubated on day 58 and subsequently discharged 73 days after admission. Satisfactory oral feeding was evident after extubation. The patient was lost to follow-up after discharge.

### 3. Discussion

Approximately 515,000 neonatal deaths were attributed to tetanus worldwide in 1993.<sup>1</sup> The World Health Organization<sup>2</sup> aimed to achieve worldwide neonatal tetanus elimination by 2005, which was defined as the reduction of neonatal tetanus cases to less than 1 case per 1,000 live births in every district of every country. In 2000, neonatal tetanus was still not eliminated in 57 countries, including Vietnam and China.<sup>2</sup>

The incidence of neonatal tetanus in Taiwan was high in the 1950s, with a mortality of around 3 per 1,000 live births.<sup>3</sup> However, neonatal tetanus is a rare disease in developed countries because of mass vaccination, aseptic delivery and hygienic cord care. Neonatal tetanus has also become rare in Taiwan in recent years, with only few cases reported in 1993, 1994 and 2001.<sup>4</sup>

The symptoms of tetanus leading to its clinical diagnosis include an inability of the newborn to suckle at and shortly after birth, an inability to suckle between 3 and 10 days of age, spasms, stiffness, convulsions and death. These clinical manifestations may be confused with seizure. The major differentiating factor is that unlike seizure, consciousness is maintained with tetanus. Meningitis, hypocalcemia and hypoglycemia may also produce similar clinical manifestations. Neonatal tetanus cannot be confirmed by laboratory studies. However, signs of umbilical infection such as discharge, erythema, swelling, tenderness and local heat have been noted in 70% of patients with tetanus in a study by Lee and Lin.<sup>3</sup> The first symptoms of neonatal tetanus have been reported to be trismus (85 of the 91 cases, 93%), difficult feeding (76 of the 91 cases, 84%), risus sardonicus (73 of the 91 cases, 80%) and neck stiffness (61 of the 91 cases, 67%).<sup>3</sup> The reported incubation time is between 4 and 19 days.<sup>3</sup> Treatment for neonatal tetanus includes tetanus immunoglobulin, wound care (including debridement if indicated), benzodiazepine administration, neuromuscular blockade, mechanical ventilation, aqueous penicillin and

placement in a dim, quiet environment. In the present case, 500 IU tetanus immunoglobulin was administered intramuscularly; however, doses of 3000–6000 IU have been suggested previously.<sup>5</sup> Lee and Lin<sup>3</sup> found that early administration of tetanus immunoglobulin did not appear to improve the prognosis. Indeed, mortality was 72.5% (58 of 80 cases) when tetanus immunoglobulin was given within 3 days after onset; this was higher than the overall average mortality of 69%.<sup>3</sup> However, a study by Blake and colleagues<sup>5</sup> suggested that tetanus immunoglobulin could lower the case-fatality ratio significantly. Our patient exhibited symptom onset at 3 days of age and was admitted to hospital at 5 days. Rocuronium was administered for 57 days and mechanical ventilation was applied for 58 days. These long durations may have been necessary because of the early onset and 2-day treatment delay in this case.

The mortality due to neonatal sepsis declined in the 1970s, as mechanical ventilation and neuromuscular agents became available for its treatment. In the United States, all five infants with neonatal tetanus managed with neuromuscular blocking agents and positive pressure ventilation between 1975 and 1978 survived, with a mean mechanical ventilation time of 34 days (range: 25–45 days).<sup>6</sup> Similar findings were reported from Mexico,<sup>7</sup> where the overall mortality of neonatal tetanus in 1980–1990 was 12.9%, which was considerably lower than the mortality of 25% in 1970–1980. The authors attributed this improvement in mortality to mechanical ventilation and intensive care.<sup>7</sup>

The mortalities associated with neonatal tetanus at several medical centers in Taiwan were reported to be 69% (63 of the 91 cases) between 1953 and 1964, 34% (23 of the 67 cases) between 1970 and 1980, and 83% (5 of the 6 cases) between 1971 and 1990.<sup>3,8,9</sup> Shorter incubation times were associated with higher mortalities. All patients with symptom onset before 5 days of age died, most within 1 week of onset.<sup>3,9</sup> The predominant cause of death was apnea (35 of the 53 cases, 66%).<sup>2</sup> Bronchopneumonia, presumably resulting from aspiration, is a common complication and another frequent cause of death. Our patient had a collapsed right upper lung, which may have been the result of aspiration, but this condition resolved rapidly.

The minimum tetanus antibody concentration conferring protection against disease or death in humans has not been established. Tetanus antibody concentrations in the conventionally accepted protective range are  $>0.01$  IU/mL. The antibody concentration decreases with time. If full tetanus toxoid immunization is initiated from infancy, the protective antibody level is maintained in 96% of 6 year-olds, 90% of 7–9-year-olds, and 80% of 10–16-year-olds.<sup>10</sup> The transplacental transfer of tetanus

antibodies from mother to fetus results in a dilutional effect, as indicated by the finding that most newborns had lower antibody levels than their mother (the newborn-to-mother ratio was 0.59).<sup>11</sup> It has been reported that transfer of protective antibodies to newborns can occur if a mother has an antibody level >1.28 IU/mL.<sup>12</sup> However, some newborns still develop tetanus even when levels are 4–13 times higher than the protective level.<sup>13</sup>

Despite being rare in developed countries, neonatal tetanus remains common in some developing countries. The increase in international marriages in Taiwan means that some diseases common in other countries should be considered in differential diagnoses, to avoid delays or misdiagnosis.

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