Tetanus in the Elderly: The Management of Intensive Care and Prolonged Hospitalization

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Abstract

Tetanus is a potentially fatal infection. Approximately 100 cases are reported in Japan each year; however, little is known about its clinical course and outcomes in the current era of treatment. We herein report three cases of tetanus in elderly patients who survived after mechanical ventilation and intensive care. These patients, together with six other similar cases, had a median weaning period of 31 days and median length of stay of 77 days. In elderly patients, severe systemic forms of tetanus require prolonged mechanical ventilation and hospitalization. To improve prevention, tetanus vaccination should be promoted more aggressively among those who are susceptible to the disease.

Key words: tetanus, prolonged mechanical ventilation, vaccination, intensive care

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Introduction

Tetanus is an infection caused by Clostridium tetani, a bacterium that is found in the soil and which enters the body through skin wounds. After an incubation period of 7-10 days, the disease starts with focal symptoms, such as spasmodic laughter, trismus, and dysphagia, and progresses to systemic symptoms, including respiratory failure and opisthotonus. Severely affected patients may suffer the paralysis of the respiratory muscles and autonomic disturbances that ultimately lead to death (1).

Tetanus is more common in elderly patients than in younger individuals. In Japan, the tetanus vaccine has been available since 1953; the diphtheria-tetanus-pertussis (DTP) vaccine was introduced for children in 1968 as a routine vaccination that is required by vaccination law (2). At present, approximately 100 cases of tetanus occur each year; 94% of the patients are ≥40 years of age and 18% of the patients are ≥80 years of age (2). A previous study showed that the mortality rate had decreased from 43% to 15% after the introduction of the intensive care unit (ICU) (3). In fact, the annual mortality rate in the past 10 years has been as low as 8% in Japan (4).

However, little is known about the prognosis of elderly patients who survive severe tetanus. It is therefore important to form an appropriate discharge plan for tetanus patients who are treated in acute care hospitals. We therefore report three cases of tetanus in elderly patients who required mechanical ventilation and prolonged hospitalization.

Informed consent was obtained from each of the three patients for the publication of this case report and the use of the accompanying images. This report was reviewed and approved by the research ethics committee of the authors’ institution.

Case Reports

Case 1

A previously healthy 85-year-old male farmer presented to our otolaryngology department with swallowing difficulty
and trismus without generalized muscle rigidity. He had no history of injury. He had never been immunized for tetanus. His laboratory data were unremarkable. The possibility of deep neck infection was excluded by laryngeal endoscopy and contrast-enhanced computed tomography. Based on these findings, he was clinically diagnosed with tetanus. He initially declined hospitalization and returned home; however, he returned to our emergency department (ED) the next day due to the worsening of trismus. He was admitted to the ICU and required endotracheal intubation due to the possibility that he may develop opisthotonus and respiratory failure. After 4 days, he was extubated because he did not develop systemic symptoms. However, he was immediately reintubated on the same day as a result of expectoration difficulties and dysphagia.

**Case 2**

A previously healthy 81-year-old male farmer was transferred to our ED by ambulance due to a 3-day history of progressively worsening trismus and swallowing difficulty (Fig. 1A). The previous week, he had sustained an abrasion on his left arm while using pruning clippers (Fig. 1B). He had never been immunized for tetanus. A physical examination revealed rigidity of the jaw and left upper extremity and muscle spasms of the left upper arm. He was clinically diagnosed with tetanus and was admitted to the ICU, where he required endotracheal intubation. The next day, his muscle spasms became aggravated due to opisthotonus after external stimuli.

**Case 3**

A previously healthy 91-year-old man was transferred to our ED by ambulance because of new-onset speech difficulties, which he first noticed upon getting up in the morning. He had never been vaccinated for tetanus. A physical examination revealed a puncture wound with redness and swelling on the dorsal side of the left hand, which had occurred 1 week previously while pruning a garden tree (Fig. 2). He was alert but could not speak. Trismus and rigidity of the neck and left arm were noted. He was clinically diagnosed with tetanus and was admitted to the ICU, where he required endotracheal intubation. Opisthotonus developed the next day.

**Clinical course**

On admission, all of the patients received human tetanus immune globulin (HTIG) and tetanus toxoid. Propofol or midazolam was administered for sedation to manage the patients’ muscle spasms and fentanyl was administered for pain relief; muscle relaxants were not used. Case 3 had persistent muscle spasms for 36 days and received magnesium sulfate for 3 days. Wound debridement was performed for the two patients who had a clear source of infection (Fig. 1B and 2). All of the patients received antibiotics. Case 1 received penicillin G (4 million units, four times a day for 10 days); Case 2 received penicillin G (4 million units, four times a day for 7 days); and Case 3 received ampicillin/sulbactam (3 g, four times a day for 7 days).

In all cases, tracheostomy was performed within 2 weeks of admission. In addition, enteral nutrition and heparin pro-
The clinical courses of these patients highlight two important points. First, patients with severe tetanus requiring mechanical ventilation need prolonged mechanical ventilation (PMV) and hospitalization. Second, sufficient vaccination is important for preventing tetanus in elderly individuals. In the present study, Case 1 continued to suffer from dysphagia and VAP, while Cases 2 and 3 continued to suffer muscle spasms, which prolonged the period of bed rest and sedation. As a result, long-term rehabilitation was necessary due to the severe decline in the patients’ general condition after discharge from the ICU. Two patients were transferred to another facility for further rehabilitation.

Six cases of elderly patients (≥75 years of age) with tetanus who required mechanical ventilation have been reported in Japan (Table) (5-9). The continuous variables were presented as median [interquartile range (IQR)]. When combined with the three cases of the present study, the median weaning period, time to extubation and length of hospitalization (in the acute care hospital) were 31 days (18-41 days), 40 days (25-62 days), and 77 days (60-90 days) respectively. One patient, who was not weaned from ventilatory support, was excluded from the analysis of the weaning period and the time until extubation.

A study in the United States reported two cases of tetanus...
in patients of >90 years of age (10). Similarly to our cases, these patients required mechanical ventilation for more than 3 weeks and spent more than 2 months in different medical facilities. The cost of hospitalization was more than 200,000 USD for each patient (10).

Severe tetanus in older adults requires PMV for 1 month and hospitalization for 2 months. PMV is known to be associated with increased health care costs, morbidity, and mortality (11). It is important for intensivists to collaborate with general physicians, physical therapists, social workers, and the family to achieve functional recovery and to plan for a smooth discharge from the acute care hospital.

In Japan, the overall annual incidence of tetanus was 0.98 cases/million in 2008, which was approximately 10-fold of that in the United States (12, 13). Furthermore, the incidence in the Japanese individuals of ≥80 years of age was 3.6 cases/million (4). We therefore wish to highlight the importance of preventing tetanus and its associated morbidities by achieving sufficient vaccination coverage in older adults. The three patients in the present study had never been vaccinated against tetanus. A worldwide study demonstrated the effectiveness of the vaccine by a decrease in the annual incidence of tetanus from approximately 110,000 cases in 1980 to around 9,600 cases in 2010 (14). Nevertheless, most Japanese adults of ≥50 years of age have no history of vaccination, and their antibody levels remain at 30% (13).

We should engage in efforts to enlighten the population with regard to tetanus vaccination. In general, vaccination with tetanus toxoid is required three times. Routine vaccination with booster doses every 10 years is also recommended (15). We believed that tetanus toxoid and HTIG should have been administered immediately after the onset of injury to patients with a history of injury. Because tetanus can re-occur even among patients with a history of the disease, tetanus patients should be vaccinated after treatment and discharge.

In the present case report, one patient received a continuous intravenous infusion of magnesium sulfate to treat muscle spasms. A meta-analysis showed that magnesium sulfate did not reduce mortality and that its effects on the total duration of ICU stay or hospital stay were unclear (14). A randomized controlled study demonstrated that magnesium sulfate was effective in reducing the use of other drugs but that it did not reduce the need for mechanical ventilation (16). Further research is needed to determine the role of magnesium sulfate in the management of tetanus.

In conclusion, although elderly patients with severe tetanus can be transferred out of the ICU, they will probably require PMV and hospitalization for approximately 1 and 2 months, respectively, because of complications, including severe deconditioning. Tetanus vaccination should therefore be promoted more aggressively among populations that are susceptible to the disease: tetanus vaccination should be included in the primary vaccination series of adults who have never been vaccinated and a booster should be administered every 10 years to those who have completed the primary series.

The authors state that they have no Conflict of Interest (COI).

References

1. Cook TM, Protheroe RT, Handel JM. Tetanus: a review of the literature. Br J Anaesth 87: 477-487, 2001.
2. Infectious Disease Surveillance Center; 2009 [Internet]. [cited 2015 Nov. 29]. Available from: http://www.mhlw.go.jp/shingi/201005/dl/ds0519-6j_08.pdf (in Japanese).
3. Tetanus cases by age, 1999-2008: Infectious Disease Surveillance Center 2009 [Internet]. [cited 2015 Nov. 29]. Available from: http://idsc.mhlw.go.jp/iasr/30/349/de3491.html
4. Trujillo MH, Castillo A, Espana J, Manzo A, Zerpa R. Impact of intensive care management on the prognosis of tetanus. Analysis of 641 cases. Chest 92: 63-65, 1987.
5. Yabuta K, Imashuku Y, Hashimura T, et al. A case of tetanus with dysphagia as initial symptom. Journal of the Japanese Society of Intensive Care Medicine 19: 415-416, 2012 (in Japanese).
6. Obi K, Kagohashi M, Hatano T, et al. Four cases of tetanus: its diagnosis and management of complications. Jentudo Medical Journal 56: 68-72, 2010 (in Japanese, Abstract in English).
7. Koga Y, Murakami M, Takamatsu Y, Kashiwagi T. Two cases of tetanus. Journal of Japan Surgical Association 70: 2941-2944, 2009 (in Japanese, Abstract in English).
8. Narukawa M, Maruyama Y, Yasoaka A, Funada H, Kobayashi M. Generalized tetanus with intractable autonomic cardiovascular instability in an aged woman. The Journal of the Japanese Association for Infectious Disease 79: 556-560, 2005 (in Japanese, Abstract in English).
9. Ogino S, Sasaki N, Hasegawa Y, Osige N, Miyazawa T. Reversible bronchial stenosis in an aged patient with tetanus. Nihon Naika Gakkai Zasshi (J Jpn Soc Int Med) 97: 138-140, 2008 (in Japanese).
10. Helbok R, Brenneis C, Beer R, et al. Intensive care management in very old adults: two cases with clostridium tetani infection. J Am Geriatr Soc 59: 552-553, 2011.
11. Lone NI, Walsh TS. Prolonged mechanical ventilation in critically ill patients: epidemiology, outcomes and modelling the potential cost consequences of establishing a regional weaning unit. Crit Care 15: R102, 2011.
12. Tetanus surveillance—United States, 2001-2008. MMWR Morb Mortal Wkly Rep 60: 365-369, 2011.
13. Mizuno Y, Yamamoto A, Komiya T, Takeshita N, Takahashi M. Seroprevalence of tetanus toxoid antibody and booster vaccination efficacy in Japanese travelers. J Infect Chemother 20: 35-37, 2014.
14. Rodrigo C, Samarakoohan L, Fernando SD, Rajapakse S. A meta-analysis of magnesium for tetanus. Anaesthesia 67: 1370-1374, 2012.
15. Kim DK, Bridges CB, Harriman KH. Advisory Committee on Immunization Practices Recommended Immunization Schedule for Adults Aged 19 Years or Older: United States, 2015*. Ann Intern Med 162: 214-223, 2015.
16. Thwaites CL, Yen LM, Loan HT, et al. Magnesium sulphate for treatment of severe tetanus: a randomised controlled trial. Lancet 368: 1436-1443, 2006.