CASE REPORT

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Severe tetanus treated in the Intensive Care Unit – case reports

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Abstract

Introduction. Due to the increase in vaccination coverage worldwide, there has been a significant decline in tetanus cases and deaths over the past decades. In developed countries, cases of tetanus are sporadically reported, mainly in elderly people who have not been vaccinated for a long time. If left untreated, the death rate from tetanus is almost 100%. *Case reports*. The publication presents the course of severe tetanus in two elderly patients treated in the ICU with positive results. The patients required mechanical ventilation, intensive pharmacological treatment and a long period of hospitalization. *Conclusions*. Every contaminated wound is risky of *Clostridium tetani* infection. Unvaccinated people and those for whom more than 5 years have passed since the last vaccination are particularly at risk of developing the disease. A severe course of the disease requiring treatment in the ICU may occur primarily in elderly people and involve a long period of hospitalization. *Summary*. Based on the description of two cases and a review of the literature, the article discusses the procedure for treating patients infected with tetanus. *Anestezjologia i Ratownictwo 2023; 17: 233-237. doi:10.53139/AIR.20231730*

Keywords: tetanus, treatment, ICU, vaccination

Introduction

Over the past two decades, there has been a significant decline in the number of tetanus cases and deaths due to the expansion of vaccination programs. In 1990, the number of deaths worldwide due to neonatal tetanus was 199118, and due to tetanus after the neonatal period, there were 137904 deaths, and in 2015, 56743 and 36806 deaths respectively were recorded [1]. Despite the availability of an inexpensive and effective tetanus vaccine, many people in low- and middleincome countries still die of tetanus. In developed countries, tetanus is rare but sporadic cases and deaths still occur mainly in the elderly people who have not been vaccinated for a long time [1]. Tetanus mortality varies widely across the world depending on access to healthcare, approaching 100% if left untreated [2].

In Poland, no neonatal tetanus has been reported

since 1984. The number of tetanus cases in 2016 was 12 and in 2017 11 cases of tetanus were reported. All fatalities were 69 years of age and older [3].

Tetanus is caused by the exotoxins of *Clostridium tetani*. Blocking neuromuscular transmission by tetanospazmin causes painful muscle contractions and respiratory failure requiring admission to the Intensive Care Unit (ICU) and mechanical ventilation in approximately 80% of patients [4]. Given the longterm effects of the toxin, long-term ventilation with analgosedation up to 6 weeks may be necessary [4,5].

The incubation period of the disease ranges from 2 to 21 days and depending on the type of wound and the degree of infection. The patient does not infect contact persons [6]. Diagnosis of tetanus is based mainly on the recognition of characteristic clinical symptoms. In the course of tetanus, trismus occurs, i.e. a highly reduced ability to open the mouth. Attempting to open

the mouth can cause contractions that cause the jaws to tighten completely [1]. In addition, there may be dysphagia, general muscle pain, focal flaccid paralysis and a range of unusual symptoms such as diplopia, nystagmus and dizziness. Particularly in generalized tetanus, there may be autonomic dysfunction with episodes of tachycardia, hypertension and sweating, sometimes rapidly alternating with bradycardia and hypotension [7].

For *Clostridium tetani*, a positive culture is found in one third of symptomatic patients. In laboratory diagnostics, the following methods are used: a PCR test to detect the plasmid-encoded gene for tetanospasmine directly in the tested material or a biological test in mice. The diagnosis of tetanus should be considered unlikely in people with serum ELISA antibody titres $\geq 0.1 \text{ IU} / \text{ml}$. These antibody levels indicate protective levels [8].

Being ill will not prevent re-infection. For this reason, the management of suspected tetanus consists of passive immunization with human anti-tetanus immunoglobulin, active immunization with tetanus toxoid, as well as surgical debridement of the wound [3].

The aim of the study was to present two cases of

patients treated in the ICU due to extremely severe tetanus and to review the literature.

Case reports

In both cases, the patients were transferred from the Department of Infectious Diseases, where they were treated for tetanus, to the Intensive Care Department due to rapidly increasing respiratory failure and the intensification of symptoms of the disease such as tension, trismus or dysphagia. The medications used are presented in Figures 1 and 2.

A simplified treatment regimen of patients during hospitalization in the ICU is presented in Figures 3 and 4.

The hospitalization time of patient 1 (71 years) was 32 days, and patient 2 (76 years) - 62 days. Both patients required prolonged mechanical ventilation for sedation and skeletal muscle relaxation. Periodically, the circulatory system was supported with the infusion of catecholamines. Due to the appearance of massive edema in both patients, renal replacement therapy was started for several days - continuous venous hemodialysis with citrate-calcium anticoagulation (CVVHD Ci-Ca). Both patients suffered pneumonia during hospitalization,



Figure 1. Treatment of patient 1

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Figure 2. Treatment of patient 2

| | Treatment Days | | | | | | | | | | | | | | | | |
|-------------------------------|--|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|
| | | 1 | 3 | 5 | 7 | 9 | 11 | 13 | 15 | 17 | 19 | 21 | 23 | 25 | 27 | 29 | 31 |
| Respiratory system management | Mechanical ventilation Tracheostomy | | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | Passive oxygen therapy | | | | | | | | | | | | | | | | _ |
| Antibiotic treatment | Metronidazole | - | - | - | - | | | | | | | | | | | | |
| Fluid therapy | Enteral feeding | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Pharmacotherapy | Sedatives | - | - | - | - | - | - | - | - | - | - | - | - | | | | |
| | Neuromuscular blockade | | - | - | - | - | - | - | - | - | - | - | - | ۰. | | | |
| Renal replacement therapy | CVVHD Ci-Ca | | | | - | | | | | | | | | | | | |
| Others | Injection of tetanus immune globulin | | | | | | | | | | | | | | | | |
| | Fiberoptic bronchoscopy | | | | | | | | | | | | | | | | |

Figure 3. Treatment regimen during hospitalization for the patient 1

| Treatment | | | Days | | | | | | | | | | | | | | |
|-------------------------------|--------------------------------------|----|------|---|----|----|----|----|----|----|----|----|----|-----|----|----|----|
| | | 1 | 5 | 9 | 13 | 17 | 21 | 25 | 29 | 33 | 37 | 41 | 45 | 49 | 53 | 57 | 61 |
| Respiratory system management | Mechanical ventilation | | - | - | | | _ | - | - | _ | - | - | _ | _ | _ | | |
| | Tracheostomy | | | | | | | | | | | | | | | | |
| | Passive oxygen therapy | | | | | | | | | | | | | - 1 | | | |
| Antibiotic treatment | Metronidazole | - | _ | _ | | | | | | | | | | | | | |
| Fluid therapy | Enteral feeding | | _ | _ | _ | _ | - | _ | - | | | - | _ | | | | |
| Pharmacotherapy | Sedatives | - | _ | _ | _ | - | - | - | _ | | _ | ۰. | | | | | |
| | Neuromuscular blockade | - | - | _ | _ | _ | - | | | | | | | | | | |
| Renal replacement therapy | CVVHD Ci-Ca | | | | | | | | | | | | | | | | |
| Others | Injection of tetanus immune globulin | ۰. | | | | | | | | | | | | | | | |
| | Fiberoptic bronchoscopy | | | | ۰. | | | | | | | | | | | | |
| | Pleural cavity draining | | 1 | | | | | - | | _ | | | | ۰. | | | |

Figure 4. Treatment regimen during hospitalization for the patient 2

which required additional antibiotic therapy. At the end of the ICU stay, the patients were in fairly good condition, alert and in logical contact. Patients were transferred to the Department of Infectious Diseases for further treatment.

Discussion

The presented cases show a severe course of tetanus with complications of the disease. Both elderly patients required long hospitalization periods and successful intensive treatment in the ICU.

The condition of both patients can be defined according to the four-point scale proposed by Ablett as very severe (stage IV). According to the Ablett scale, the clinical picture of severe tetanus (stage III) is: severe trismus, generalized spasticity, prolonged contraction, increased respiratory rate greater than 40 breaths / min, short periods of apnea, severe dysphagia and tachycardia greater than 120 beats / min. The clinical picture of very severe tetanus (stage IV) is: stage III and rapid autonomic disorders involving the cardiovascular system, severe hypertension and tachycardia, alternating with relative hypotension and bradycardia, each of which may be persistent [9].

The advanced age of the patients (71 and 76 years) may have contributed to the very severe course of tetanus in both patients. Aging is associated with decreased levels of antibodies in people previously vaccinated against tetanus. Moreover, aging itself is associated with a lowered immune response and an increase in chronic diseases, leading to a reduced healing capacity. All these factors may together contribute to the more severe course of tetanus in older patients [10]. Aggressive treatment strategies are required in elderly patients with short onset of symptoms. Moreover, ventilation devices supporting the breathing of patients are of key importance for seriously ill patients with tetanus [10]. In both patients, due to the expected long period of ventilation with a ventilator, a percutaneous tracheostomy was performed.

Treatment of patients with tetanus should be adjusted depending on the current clinical state. The same treatment principles described below were adopted in the discussed patients. On the first day, the patient should administer anti-tetanus immunoglobulin, surgically remove the dead tissue and prepare the wound. In order to eliminate tetanus from the body, intravenous metronidazole (500 mg every 6 hours or 1000 mg every 12 hours) or alternatively doxycycline (100 mg every 12 hours) should be administered for 7-10 days. The patient should be placed in a dark room to limit the effect of light stimuli which may induce tensions. An intravenous benzodiazepine such as diazepam or midazolam should be used for sedation, relaxation and spasm prevention. In the event of persistent airway obstruction, the patient must be intubated and mechanically ventilated. Nutrition of patients with tetanus should take place enterally through a feeding tube [6].

In addition, the reported patients were administered MgSO4 by intravenous infusion to reduce sympathetic hyperresponsiveness. Studies by other authors have shown that magnesium is effective in reducing cramps and autonomic instability [11]. Intravenous magnesium infusion in concentrations of 2-4 mmol / l is recommended in a randomized controlled trial in patients without renal impairment [4].

Both described patients presented symptoms that are considered prognostic risk factors for death. The prognostic factors of in-hospital deaths in the course of tetanus are: short incubation period, older age, severe type, generalized variant, dysautonomia, pneumonia, hypoxemia, sepsis and renal failure [12]. Both patients underwent pneumonia during hospitalization. Ventilator-related pneumonia and other complications of long-term ventilation, as well as catheter-related urinary tract infection, pulmonary thromboembolism, critical illness neuropathy and pressure ulcers may complicate a prolonged ICU stay [13]. The patient's 2 hospitalization time (76 years) almost twice as long as the patient's 1 (71 years). It could be caused by higher age of the patient 2 than patient 1 and as well as the fact that the patient 2 had a fever and the presence of fever may positively correlate with the length of hospitalization, which is confirmed by the results presented by Masarweh et al. [14].

Unfortunately, we do not have information on how much time passed from the injury to hospital treatment in both patients. It is suspected that the described patients did not come to the hospital immediately to treat the wound, therefore they developed tetanus. It is worth emphasising that every injury that becomes contaminated with dirt, ground or animal faeces carries a risk of *Clostridium tetani* infection. For that reason, in the case of contaminated wounds, every unvaccinated person should receive the tetanus vaccine on the first day after the wound or if more than 5 years have passed until the last dose of the vaccine [6].

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Summary

Tetanus is a rare disease thanks to compulsory vaccinations in developed countries. However, infection with *Clostridium tetani* is possible if soiled wounds are not handled properly. Unvaccinated people and those with more than 5 years since the last vaccination are particularly vulnerable to the development of the disease. A severe course of the disease requiring ICU treatment may occur primarily in the elderly people, as well as with a short incubation period. Severe tetanus requires mechanical ventilation, intensive treatment with antibiotics, muscle relaxants, anticonvulsants or hypotensive agents and is associated with a long hospitalization period. Conflict of interest None

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