Pemphigus foliaceus complicated by sepsis of the aetiology of *Yersinia enterocolitica* after eating cheesecake

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Yersinia enterocolitica is a bacterium that can be commonly found in water and soil [1]. People usually become infected with the bacteria through contact with farm animals and products made from them. Yersiniosis is a disease that may be manifested by food poisoning, enteritis, arthritis or even sepsis. There are non-specific symptoms of the disease such as abdominal pain, diarrhoea, and vomiting [2–4]. *Yersinia* spp. infection is most commonly manifested by reactive arthritis in consequence of an earlier diarrhoea [5]. Diarrhoea is usually mild. It is rarely associated with yersiniosis. It disappears spontaneously. Patients tend to associate diarrhoea with a viral infection or indigestion rather than yersiniosis. When patients with diarrhoea contact a family doctor, they are usually tested for *Salmonella* or *Clostridium difficile*. Doctors rarely suspect infection with *Yersinia* spp. and therefore do not test patients' stool for these bacterial cultures. Even when a patient has diarrhoea, it is difficult to culture *Yersinia* spp. under standard laboratory conditions for 24 h at a temperature of 37°C. It is almost impossible to detect *Yersinia* spp. in a standard stool test due to the multitude of other Gram-negative rods of the *Enterobacteriaceae* family in this material. Measurement of the concentration of *Yersinia* spp. antibodies does not indicate an active form of the disease but it shows that the patient had contact with these bacteria. *Yersinia* spp. may be ignored if there are no acute symptoms or if the patient has not been given standard tests for the presence of the bacteria. *Yersinia* spp. infection is usually taken into consideration when the patient suffers from a severe joint disease and when all other factors which may have caused the disease have been excluded. This form of yersiniosis usually occurs in consequence of diarrhoea, which was not treated with an antibiotic because the symptoms went away spontaneously, but *Yersinia* spp. remained in the patient's joints. *Yersinia* spp. may cause severe illness in patients with immunodeficiency [6, 7], like in the case of a patient with pemphigus foliaceus who developed sepsis. Recent observations have shown that the percentage of generalised infections caused by *Yersinia* spp. is increasing. These severe infections may develop in an increasing population of patients with diabetes [8], immunodeficiency or those undergoing immunosuppressive therapy.

A woman, 71, with pemphigus foliaceus was admitted to the Clinic of Dermatology to have the fifth course of intravenous immunoglobulins (*i.v.* Ig) administered. According to the case history, the patient had the first skin lesions in the form of blisters in April 2014. In February 2015, the patient was admitted to the Department of Dermatology at the Voivodeship Hospital in Poznań, where the disease was confirmed with immunopathological tests. Before the patient had been treated with doxycycline, dapsone, endoxan and topical medications (glucocorticoids, disinfectants). The patient also suffered from hypertension, type 2 diabetes, haemorrhoids, and deep vein thrombosis of the right lower limb. At present the patient takes the following drugs: rivaroxaban (20 mg once a day) and methylprednisolone (8 mg once a day). Before sepsis occurred the patient had received sandoglobulin P (fifth course) intravenously at a dose of 36 g once a day. The patient tolerated the therapy and did not complain of any problems. At night following the fifth day of the therapy the patient vomited, had diarrhoea, abdominal pain and headache. The patient underwent physical examination, which revealed high blood pressure. In the morning the patient complained of weakness and feeling worse. She had had a C-reactive protein (CRP) test at night – 43.2 mg/l. She did not receive the last dose of intravenous human immunoglobulins. The patient's discharge from hospital was postponed and she stayed for another day

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for observation. Due to the high CRP level, she had a blood culture test and PCT blood test. After 24 h, the follow-up examination revealed a CRP level of 292.0 mg/l and an elevated procalcitonin level of 3.65 (ng/ml). The patient's upper limbs were considerably swollen and her body temperature was slightly elevated – 37.4°C. Her general state worsened on the following day. The patient received empirically an intravenous dose of 1.2 g of amoxicillin and clavulanic acid three times a day. Neither the X-ray of the patient's chest nor the ultrasound of her abdominal cavity revealed the causes of her worse general state. The patient's upper limbs became increasingly swollen. She was urgently sent to a Doppler ultrasound test of the veins in her upper limbs and right lower limb. The result was consulted with a vascular surgeon, who excluded upper extremity deep vein thrombosis. The Hospital Central Microbiological Laboratory provided initial information about elevated counts of Gram-positive cocci and Gram-negative rods. Apart from the intravenous dose of 1.2 g of amoxicillin and clavulanic acid administered three times a day, the patient additionally received an intravenous dose of 600 mg of clindamycin once a day. Due to peripheral insertion problems and progressing deterioration of the patient's state, she had a central venous catheter inserted. The microbiological laboratory diagnosticians were surprised by the fact that apart from *Staphylococcus aureus*, Gram-negative *Yersinia* rods were cultured from the patient's blood. The result was consulted with the attending physician, who diagnosed sepsis induced by *Yersinia enterocolitica*. *Staphylococcus aureus* was the other pathogen cultured in the patient's blood. It may have been caused by superinfection of the skin lesioned by pemphigus foliaceus. According to the antibiogram, the patient received ciprofloxacin at a dose of 400 mg three times a day. The drug was applied according to recommendations [9]. After a week of antibiotic therapy, the patient's general state improved gradually. The swelling of the patient's upper limbs decreased considerably and the CRP level dropped to 110 mg/l. The central venous catheter was removed. The patient was recommended to take ciprofloxacin at an oral dose of 500 mg twice a day for 2 weeks. The patient was discharged from hospital in general good state and she was recommended to have a follow-up examination at the Dermatology Outpatient Clinic.

Initially the deterioration of the patient's state was attributed to exacerbation of skin lesions due to pemphigus foliaceus. It was intriguing that the symptoms of the infection occurred when the patient was receiving intravenous immunoglobulins. *Staphylococcus aureus* was the first pathogen cultured in the patient's blood. On the following day, *Yersinia* colonies were isolated as the second factor. For this reason the doctor carefully interviewed the patient about her contacts with animals and food products she had consumed recently. The patient said that apart from meals prepared in the hospital kitchen, she had eaten cheesecake of unknown origin, which another patient's family had brought. The patient seemed to have developed the infection due to the food consumed. It is most likely that the infection was caused by the cheesecake, because all other food came from the hospital kitchen and no other patient had similar symptoms. *Yersinia* spp. infections may be caused by products of animal origin, infected water or contact with animals [10–12]. *Yersinia* bacteria proliferate very rapidly and therefore the first symptoms occurred a short time after the patient had consumed infected food. *Yersinia* bacteria generate a heat-stable enterotoxin – lipopolysaccharide (LPS) [13]. *Yersinia* spp. are some of few microorganisms which can survive and proliferate in a refrigerator [14]. Another patient's family, who brought the cheesecake, may have stored the product in a refrigerator. People visiting hospitals usually bring the best products to patients. However, the cheesecake may have been made from cottage cheese without baking. Bacteria can proliferate even at refrigeration temperatures. Therefore, *Yersinia* bacteria are some of the most common pathogens found in refrigerated products [13]. There have been reports on cases of sepsis after blood transfusion due to the fact that these microorganisms can survive at refrigeration temperatures [15, 16]. The patient described in the case study developed not only intestinal infection but also sepsis. The infections were manifested so strongly due to the patient's immunodeficiency, which resulted in pemphigus foliaceus and caused the need to apply steroid therapy. *Staphylococcus aureus* was the other pathogen cultured in the patient's blood. It may have been caused by superinfection of the skin lesioned by pemphigus foliaceus. The patient received targeted drugs according to the antibiogram. After a few days of combination antibiotic therapy with amoxicillin and clavulanic acid + ciprofloxacin, the patient's state improved. She was still recommended to take ciprofloxacin orally for 2 weeks for her safety and to prevent reinfection. Quinolones are the first-line antibiotics applied to patients with *Yersinia* spp. infections [15]. There was a publication reporting a good therapeutic effect of ciprofloxacin applied to treat sepsis [15]. The authors of review papers proved that *Yersinia* spp. were fully sensitive to ciprofloxacin treatment [17, 18]. This example shows that patients with immunodeficiency may develop sepsis from infections that may be otherwise unnoticed. The results of microbial tests conducted on patients with immunodeficiency may be difficult to interpret as some pathogens might not be expected. Diarrhoeas may be very acute. Sometimes clinical assessment may be complicated by misleading diagnostics or by ignoring some pathogens. *Yersinia* spp. might not have been detected in our patient's blood if she had not been infected while staying at hospital. Yersiniosis is very difficult to diagnose due to its nonspecific symptoms. Acute yersiniosis requires specialist treatment due to the virulence of these pathogens. A large number of patients with the disease need to be hospitalised [19, 20]. The prognosis for the patient described in the case report was uncertain. Prompt intervention and cooperation between the physicians and microbiologists

resulted in the right and expected clinical effect. According to epidemiological recommendations in the Infectious Diseases Act, all infections with *Yersinia enterocolitica* need to be reported [21]. In each case of sepsis caused by this pathogen, the Infection Control Team and the attending physician should diagnose the epidemiological situation and identify the source of infection [1]. Due to the fact that bacteria are psychrophilic, there are more infections in autumn and winter [22]. Our patient developed the infection in January. It is necessary to pay attention to the problem of diarrhoeas caused by *Yersinia* bacteria so as not to ignore them due to the non-specific symptoms and diagnostic problems. Infections are particularly dangerous to patients with immunodeficiency [1]. As described in the case report, infection may develop into sepsis, which is the most acute form of yersiniosis [1]. Although the incidence is very low [15], it is a serious problem due to a death rate of about 30% [23, 24]. It is necessary to apply antibiotic therapy when a generalised infection is diagnosed [6]. In our case report, the bacterial strain was sensitive to most of the antibiotics applied. Due to the possible immune complications in the form of erythema [23, 25] the patient was recommended to have a follow-up examination at the Dermatology Outpatient Clinic. *Yersinia enterocolitica* bacteria were cultured under standard laboratory conditions on Columbia agar with 5% sheep blood and on MacConkey agar. The bacteria also grew with staphylococci on the agar with blood. When stool was cultured under standard conditions, *Yersinia* bacteria were almost undetectable due to the multitude of other Gram-negative rods of the *Enterobacteriaceae* family in this material. There were similar cases described in reference publications – *Yersinia* bacteria were not cultured despite diarrhoea [15].

In conclusion, the occurrence of diarrhoea, especially in patients with immunodeficiency, should increase physicians and laboratory diagnosticians' alertness to possible infection with *Yersinia* spp. Patients with immunodeficiency should be warned to take due care when consuming food of unknown origin. Yersiniosis is still a rarely diagnosed disease of the gastrointestinal system, which is particularly risky to patients with immunodeficiency caused by the primary disease and applied therapy.

Conflict of interest

The authors declare no conflict of interest.

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