

Case Report

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A case of *Helcococcus kunzii* infection

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Abstract

Helcococcus is a resident bacteria in human and animal skin. It is a rare opportunistic pathogen in humans. *Helcococcus kunzii*, which causes mainly skin infection, was first discovered by Collins in 1993 [1]. At present, there are few case reports of infection caused by *Helcococcus kunzii*. Here, we report a case of *Helcococcus kunzii* infection admitted to our department, to increase the understanding of its diagnosis and treatment in the clinic.

Keywords: *Helcococcus kunzii*; mNGS; Antibiotic therapy; Incision drainage.

Case presentation

A 39-year-old man was admitted to the hospital on July 29, 2022, with "skin swelling of the left lower extremity, multiple blisters, ruptured left little toe, and 3 days fever". The patient's left lower limb was scratched by an object while fishing by the river on July 26. The affected skin was swollen, and multiple blisters quickly appeared. The left fourth and fifth toes were ulcerated and purulent. Furthermore the patient developed a fever accompanied by chills and weakness. The highest reported temperature was 39.5°C. Oral antipyretic drugs were not effective. The patient presented to the local hospital for treatment on July 28, with persistent high fever, which did not reduce even after intravenous antibiotics ("cephalosporin").

On July 29, the patient's temperature was 39.0°C, and he was transferred to our hospital for further diagnosis and treatment. The patient had a long history of alcohol consumption, approximately 300 mL to 500 mL daily. Physical examination results on admission were: temperature: 39.8°C, pulse: 123 bpm, respiration: 33 bpm, and blood pressure: 85/55 mmHg. The patient was acutely febrile and conscious. Cyanosis was apparent. Slightly coarse breath sounds were detected in both lungs. A 10 cm × 5 cm soft and tender mass was palpable in the left inguinal area. Swelling of the left lower limb below the knee joint and numerous blisters, measuring 2 cm - 3 cm, were evident. The af-

ected area showed local skin redness, ulceration, and swelling, which was accompanied by severe pain. The skin temperature of the distal limb of the left knee joint was cold. The superficial sensation of the extremities of the left fourth and fifth toes was decreased. A subcutaneous ecchymosis was observed in the left thigh. The activity of the left lower limb was limited and the skin tension was increased. A wound, 2 cm in length, was observed in the anterior tibia of the left lower limb, and yellow purous discharge was observed in the space between the fourth and fifth toes of the left foot (Figure 1). The results of a routine blood test on July 29 are as follows. White blood cell count: $14.2 \times 10^9/L$. Platelet count: $91 \times 10^9/L$. C-Reactive Protein (CRP): 178.6 mg/L. Procalcitonin (PCT): 14.39 ng/mL. Interleukin-6 (IL-6): 1197.04 pg/mL. The superficial lymph node ultrasound highlighted the lymph nodes in the left groin, and some of them were enlarged. Reactive hyperplasia was considered. The dorsal foot ultrasound demonstrated edema and thickening of the subcutaneous soft tissue of the left dorsal foot. No abnormal sonography was found in the blood vessels of both lower extremities. The diagnoses on admission were: 1. necrotizing fasciitis of the left lower limb and 2. septic shock. Considering the severe infection and rapid disease progression of the patient, peripheral blood and fluids from the affected area were sampled for Metagenomics Next -Generation Sequencing (mNGS) and common culture. Empirical antibiotics (cefoperazone-sulbactam

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and levofloxacin) were commenced. On July 30, the patient was still febrile, with a peak temperature of 39.4°C. Results from routine blood examination were as follows. White blood cell count: $12.60 \times 10^9/L$. Platelet count: $82 \times 10^9/L$. Liver function: alanine aminotransferase, 243 U/L, aspartate aminotransferase, 389 U/L. Total protein: 58.46 g/L. Albumin: 35.36 g/L. Erythrocyte sedimentation rate: 25 mm. Renal function: creatinine, 275.4 mol/L and lactic acid: 5.8 mmol/L. The skin tension of the patient's left lower extremity was higher than that at admission. A 4 cm × 4 cm tension blister was seen on the back of the left foot (Figure 2), and a 4 cm × 2 cm blister was seen below the ankle joint in the left lower extremity. After surgical consultation, incision, and drainage of the abscess in the fascial space of the left foot were performed (Figure 3). *Helcococcus kunzii* and *Streptococcus pyogenes* were identified from the blood (Figure 4) and secretion (Figure 5) samples. Considering the patient's history of river fishing and left lower limb scratches, as well as the identification of *Helcococcus kunzii* as the main pathogenic bacteria, considering *Helcococcus Kunzii* as the main pathogenic bacteria, the diagnoses were updated: 1. Necrotizing fasciitis of the left lower extremity due to *Helcococcus kunzii*, 2. *Helcococcus kunzii* sepsis, 3. impaired liver function, 4. acute kidney injury. Meanwhile, the patient's peak temperature decreased and the infection markers also decreased. As the treatment was effective, cefoperazone-sulbactam plus and levofloxacin were continued. On July 31, the patient's peak temperature dropped to 38.2°C and his chills resolved. Peripheral T lymphocyte subsets showed CD3+ cells/lymphocytes of 70%, CD3+CD4+T cells/lymphocytes of 24%, CD3+CD8+T cells/lymphocytes of 44%, and the ratio of CD3+CD4+T cells /CD3+CD8+T cells was 0.55. On August 1, the patient's temperature measured 37.7°C. Results from routine blood examination were as follows. White blood cell count: $8.9 \times 10^9/L$. Platelet count: $126 \times 10^9/L$. CRP: 146.5 mg/L. PCT: 10.14 ng/mL. IL-6: 36.29 pg/mL. On August 2, the peak temperature measured 37.5°C. Swelling of the left lower extremity also improved. Moreover, the skin tension of the left dorsum of the foot was decreased. There was no purulent discharge from the incision of the left dorsum of the foot and discharge from the left toe space was reduced. The patient's temperature was normal on August 3. On August 4, both blood and wound secretion cultures were negative. Results from routine blood tests on August 5 showed a white blood cell count of $8.7 \times 10^9/L$, platelet count of $245 \times 10^9/L$, CRP of 15.2 mg/L, PCT of 1.33 ng/mL, and IL-6 of 7.10 pg/mL. Redness, swelling, heat, and pain subsided from the patient's left lower limb. No secretions were found in the left toe space and there was no obvious exudation or bleeding on the left foot dressing. The patient requested to be transferred to the local hospital for further treatment. He was discharged from our hospital on August 6.

Discussion

In 1993, British scholar, Collins, during the clinical separation of some gas "aureus" with undetermined taxonomic status which presented as catalase enzyme-negative and Gram-positive cocci, proposed a possible new species. After the 16S rRNA sequence homology, Collins suggested that these bacteria had the low G+C content of Gram-positive bacteria, and thus, proposed the new bacteria genus of *Helcococcus*. Currently, *Helcococcus* has five species, namely, *Helcococcus kunzii*, *Helcococcus ovis*, *Helcococcus pyogenica*, *Helcococcus sueciensis*, and *Hel-*



Figure 1: The appearance of the left foot on July 29.



Figure 2: The appearance of the left foot on July 30.



Figure 3: The left foot following incision and drainage on July 30.

1. 细菌 (Bacteria)

属 (Genus)				种 (Species)		
类型	名称	序列数	相对丰度%	名称	序列数	相对丰度%
G+	链球菌属 <i>Streptococcus</i>	34	0.76	酿脓链球菌 <i>Streptococcus pyogenes</i>	32	0.71
Q index (校正人源背景后该微生物的含量)				Q index 在同类标本中的分布		
2381.41, 高于 28.33% 的同类标本						
G+	创伤球菌属 <i>Helcococcus</i>	2	0.05	孔氏创伤球菌 <i>Helcococcus kunzii</i>	2	0.05
Q index (校正人源背景后该微生物的含量)				Q index 在同类标本中的分布		
337.03, 高于 14.35% 的同类标本						

Figure 4: July 30 Blood mNGS.

coccus seattlensis [2], *Helcococcus kunzii* is one of the most common species [3-6]. As Gram-positive, facultative, anaerobic, non-sporulating cocci, *Helcococcus kunzii* are arranged in couplets, tufted, and with no power [7].

Helcococcus kunzii is a resident bacteria in human and animal skin, especially in the lower limbs. *Helcococcus kunzii* can cause a variety of opportunistic infections, often occurring in patients

1. 细菌 (Bacteria)

属 (Genus)				种 (Species)		
类型	名称	序列数	相对丰度%	名称	序列数	相对丰度%
G+	创伤球菌属 <i>Helcococcus</i>	368322	28.14	孔氏创伤球菌 <i>Helcococcus kunzii</i>	368085	28.13
G+	链球菌属 <i>Streptococcus</i>	360495	27.55	酿脓链球菌 <i>Streptococcus pyogenes</i>	296624	22.67

Figure 5: July 30 Secretion mNGS.

Table 1: Infection markers over time.

	July 29	July 30	August 1	August 5
White blood cell count ($\times 10^9/L$)	14.2	12.6	8.9	8.7
Platelet count ($\times 10^9/L$)	91	82	126	245
Neutrophil percentage (%)	87.63	89.28	80.81	65.21
Neutrophil count ($\times 10^9/L$)	12.404	11.249	7.202	5.648
Lymphocyte percentage (%)	7.88	7.74	13.40	23.20
Lymphocyte count ($\times 10^9/L$)	1.116	0.975	1.194	2.009
CRP (mg/L)	178.6		146.5	15.2
PCT (ng/mL)	14.39		10.14	1.33
IL-6 (pg/mL)	1197.04		36.29	7.10

with underlying diseases-(diabetes, hypertension) or immune deficiency (chronic alcohol consumption, malignancy) [8]. Our patient has a long history of drinking. The peripheral blood T lymphocyte subsets confirmed immune deficiency. There was a history of injury to the left foot after fishing by the river (the skin was scratched by an object). Subsequently, his left leg swelled, local tension increased, tension blisters appeared on the left foot, and the blood and secretion mNGS detected *Helcococcus kunzii*. Thus, *Helcococcus kunzii* infection was established.

In the cases of *Helcococcus kunzii* infection reviewed by Caliend [9], other strains were detected in all specimens at the same time, including *Staphylococcus aureus* and *Enterobacteriaceae*. The blood and secretion mNGS from our patient identified *Helcococcus kunzii* and *Streptococcus pyogenes*, which is consistent with the co-existence of *Helcococcus kunzii* and other pathogens. At present, there are few case reports of *Helcococcus kunzii* infection worldwide. To date, only 2 cases have been reported in China, including 1 case of breast abscess and 1 case of the diabetic foot [10,11]. This patient was the first case of *Helcococcus kunzii* infection diagnosed by mNGS in China. The common blood culture and wound secretion culture were negative. The diagnosis of *Helcococcus kunzii* infection was finally verified by mNGS.

Helcococcus kunzii resistance to the antibiotics used to treat the infection, including trimethoprim sulfamethoxazole, macrolides, clindamycin, fluoroquinolones, aminoglycosides, and penicillin have been reported [12]. The clinical symptoms of our patient, a middle-aged man with immune deficiency, were relieved significantly after cefoperazone-sulbactam and levofloxacin. Following treatment, the infection markers were reduced, which confirmed the effectiveness of this combination of antibiotics. This treatment plan has a certain reference value for the clinical treatment of future cases.

Katrin [13]. Pointed out that any infected wound requires

appropriate surgical debridement. Timely correct use of antibiotics combined with surgical removal of the necrotic tissues can greatly reduce the risk of amputation and mortality. The patient's left leg was inflamed, hot, and painful. The local tension increased. The left foot quickly developed tension blisters. On the second day of admission, the patient's left foot fascia space abscess was incised and drained, followed by, postoperative wound irrigation with hydrogen peroxide and physiological saline, and dressed with 0.5% iodine volts gauze hydropathin compress. After treatment, the patient's left lower limb swelling, heat, and pain subsided, and the partial tension returned to normal. In this case, early surgical debridement combined with wound dressing led to significant clinical improvement of a for local abscess caused by *Helcococcus kunzii*.

The successful treatment of this patient with *Helcococcus kunzii* infection can be summarized as follows [1]. Early diagnosis of *Helcococcus kunzii* infection was made according to the patient's history and clinical manifestations [2]. As a new precision medicine technology, mNGS was advantageous for the detection of rare pathogens, and was superior to common culture [3]. For immunodeficient patients, the possibility of opportunistic disease caused by a resident bacteria must be considered [4]. After the diagnosis was ascertained, sensitive antibiotics must be administered promptly [5]. For wound abscesses, early incision and drainage is recommended to prevent further expansion of the wound and maximize the preservation of limb function and the patient.

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