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# SHORT REPORT
# A case report and epidemiological investigation of axillary lymph node abscess caused by *Corynebacterium ulcerans* in an HIV-1-positive patient

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## SUMMARY

A human immunodeficiency virus-1 (HIV-1)-positive male undergoing antiretroviral therapy was diagnosed with an axillary lymph node abscess caused by *Corynebacterium ulcerans*, and an environmental survey revealed that the patient's cat as the source of infection.

**Key words**: AIDS, *Corynebacterium*, zoonoses.

We report an axillary lymph node abscess caused by *Corynebacterium ulcerans* in a 55-year-old man who had been taken taking combination antiretroviral therapy for 11 years. His last blood report before the abscess was diagnosed revealed a CD4 count of 252 cells/mm$^3$ and a plasma HIV-1 RNA level of <40 copies/ml.

The patient cared for several cats, one of which had an elevated skin lesion that had ulcerated with pus formation 15 days previously. Although the patient had a small wound on his left forearm, he cleaned the cat's ulcerated lesion with bare hands. The cat recovered thereafter. Five days before visiting our clinic, the patient developed dyspnoea and an elevated skin lesion in the left axilla. He developed a fever (38·5 °C) 1 day before seeking medical attention. The patient presented at our clinic complaining of fever, pain and swelling around the left axillary region. Physical examination revealed normal respiratory system findings and a swollen left axillary lesion measuring 3 cm in diameter. A computed tomographic scan of the chest showed an enlarged lymph node in the left axilla that exhibited contrast enhancement. No abnormal lesions were seen in the lung, mediastinum, and right axilla. Laboratory tests revealed a normal white blood cell count (8600 cells/mm$^3$) with slight neutrophilia (71%), and an increased C-reactive protein level (5·7 mg/dl, normal <0·5 mg/dl).

Microscopic examination of a smear preparation of pus obtained by lymph node puncture demonstrated Gram-positive rods and neutrophils. We suspected *Nocardia* infection and prescribed oral minocycline (100 mg b.i.d.) and sent the patient home. *C. ulcerans* was confirmed in a pus culture and identified by three different biochemical assays. The Vitek Automated Microbial Identification System (bioMérieux Vitek Inc., USA), the RapID CB Plus System (Remel, USA), and the API-Coryne System (bioMérieux, France). Further characterization was performed using a CAMP test that revealed the production of phospholipase D. To confirm this biochemical identification, we performed RNA polymerase beta subunit (*rpoB*) gene sequencing [1]. Sequence identities between the strain obtained from the patient's lymph node and the *C. ulcerans* reference strain and *C. pseudotuberculosis* were 100% and 92·0%, respectively. The causative agent was therefore identified

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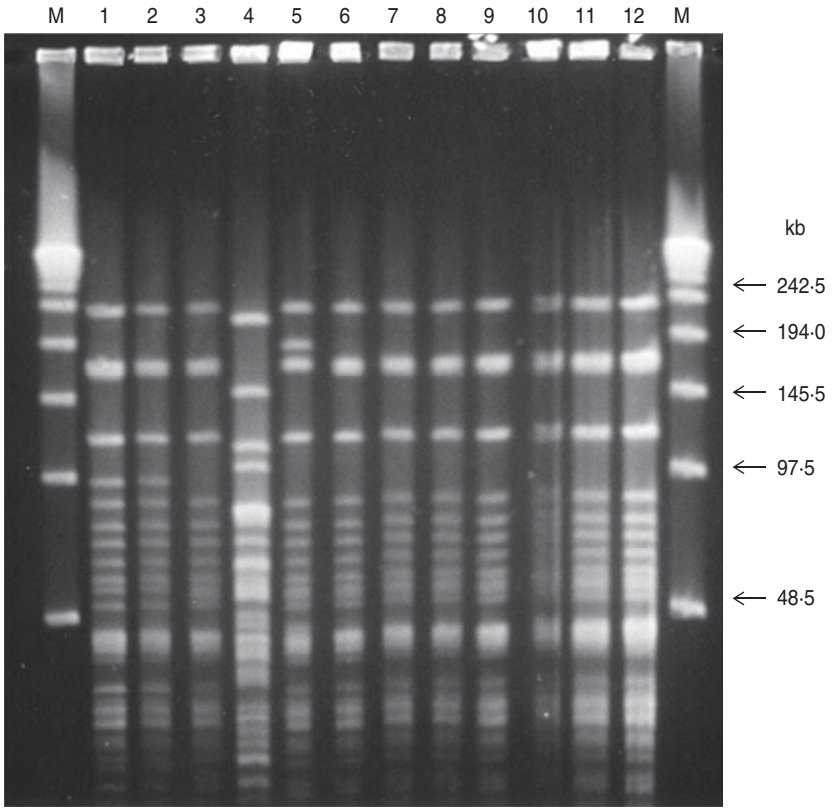


**Fig. 1.** Pulsed-field gel electrophoresis analysis showing the same pattern for the patient (no. 7) and the cat (no. 8, nasal secretion; no. 9, pharyngeal content) strains. M, Lambda DNA marker; 1, 2, human isolates from the Chiba prefecture; 3, Okayama human isolate; 4, Ohita human isolate; 5, Kanagawa human isolate; 6, Tokyo human isolate; 10, 11, Ibaraki human isolate; 12, Shiga dog isolate.

as *C. ulcerans*. The identities of the 16S rRNA sequence of the strain obtained from the patient's lymph node and the *C. ulcerans* and *C. pseudotuberculosis* strains were 99·0%.

Antimicrobial susceptibility was tested using the microdilution method. The isolate was susceptibile to erythromycin, ampicillin, rifampicin, cefotaxime, vancomycin, imipenem, and tetracycline, but had intermediate resistance to clindamycin according to the Clinical and Laboratory Standards Institute (CLSI) guidelines. The patient's symptoms did not resolve at home and the node enlarged to 4 cm over the next 7 days. He visited our clinic again after a week. We then prescribed erythromycin (300 mg q.i.d.) for 21 days. His fever resolved quickly and the swollen lymph node returned to normal size in 3 weeks. Diphtheria antitoxin was not administered because of the comparatively mild symptoms. However, Elek's test, Vero cell toxicity, and polymerase chain reaction for the gene encoding the diphtheria-like toxin all showed that the patient's *C. ulcerans* strain produced a diphtheria-like toxin [2–4].

We investigated the environment in which the patient resided. He kept seven cats in his own home, and was occasionally visited by three additional cats that belonged to a neighbour. We cultured nasal and pharyngeal swabs from the patient's wife and daughter as well as from the 10 cats. *C. ulcerans* producing a diphtheria-like toxin was detected in one of the 10 cats examined.

Using pulsed-field gel electrophoresis (PFGE) [5], the isolate was genetically compared to 11 other *C. ulcerans* isolates that were representative of four groups used in a previous study to classify strains in the Japanese population [6]. The four groups of *C. ulcerans* strains had been reported in patients in the cities of Chiba, Okayama, Oita, and Kanagawa. Analysis of the PFGE results by the unweighted pair-group method with arithmetic mean (UPGMA) revealed that the genotype pattern of this patient's isolate was 100% identical to that of an isolate obtained from a patient from Okayama. Most Japanese *C. ulcerans* isolates have been included within the Okayama group [6]. Although this isolate belonged

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to the most frequent group in Japan, the PFGE pattern was different from that of strain isolated from the Kanagawa reference patient. PFGE analysis also showed (Fig. 1) that isolates in two samples (nasal secretion and pharyngeal content) from the patient's cat exhibited 100% identity to the patient's strain, suggesting that the cat was the source of infection.

The main reservoirs of *C. ulcerans* are livestock and household pets such as dogs and cats. It can cause mastitis in cows and upper respiratory diseases in pets. In a survey of 500 dairy herds, *C. ulcerans* was present in 0·03% of quarters in 12 herds [7]. In our survey, 7·4% (43/583) of feral dogs in Osaka prefecture had toxigenic *C. ulcerans*, while those in other prefectures did not [6]. Geographical and genotypic diversity must be one of the reasons why only small numbers of people in a limited area present with *C. ulcerans* infection.

In this case, the patient was infected with *C. ulcerans* that was presumably transferred from his cat. Transmission might have occurred through the skin injury in the patient's forearm as he cleaned the cat's wound. The only area involved was the left axillary lymph node, while the neck and other lymph nodes were spared. The patient experienced transient dyspnoea; however, this was not evident during his visit to our clinic. Moreover, no signs of infection were observed in the respiratory system or other organs.

Only a few reports of infection with *C. ulcerans* producing a diphtheria-like toxin in humans have been published; some are from the UK while others are from Europe, the USA, and other countries. *C. ulcerans* and *C. pseudotuberculosis* produce diphtheria-like toxins that cause a clinical condition similar to that seen in *C. diphtheriae* infection. The toxins from *C. diphtheriae* and *C. ulcerans* are about 95% identical at the nucleotide and amino-acid levels [8]. Respiratory tract inflammation, especially pharyngitis and tonsillitis, is the most common feature of infection with *C. ulcerans*, but cutaneous manifestations have also been reported. Prognosis is usually good, but Wellinghausen *et al*. [9] reported a fatal case of sinusitis. Antibiotics and diphtheria antitoxin are generally effective treatments; however, there have been no clinical trials of the effectiveness of diphtheria antitoxin in patients with toxigenic *C. ulcerans* infection. A laboratory study that evaluated toxigenic *C. ulcerans* and diphtheria antitoxin in cytotoxicity assays demonstrated a protective effect of diphtheria antitoxin [8]. Therefore, diphtheria antitoxin should be used for severe cases in much the same way as for cases of *C. diphtheriae* infection. There are no proven vaccines against *C. ulcerans*, but diphtheria toxoid vaccine has attenuated clinical symptoms in some cases. It is reasonable to administer diphtheria toxoid vaccine to people at a high risk in order to prevent *C. ulcerans* infection as well as *C. diphtheria* infection.

The reason for the development of an abscess in this case is uncertain; however, the patient's immunological condition might be associated with the occurrence of infection. The patient had not been immunized against diphtheria and he was HIV-1 positive. His CD4 count was 252 cells/mm$^3$, although his plasma HIV RNA level was well controlled. Abnormalities of neutrophils, B cells, T cells and immunoregulation in patients with HIV-1 are well known. The immunosuppressed status of the patient may have been responsible for *C. ulcerans* infection via the skin wound and for its proliferation in the axillary lymph node. The presence of a lymph node abscess due to *C. ulcerans* in an HIV-1-positive patient has not been previously reported. Keeping pets is very common, and cats are a popular choice. *C. ulcerans* strains isolated from cats and their owners have also been documented [10]. Immunocompromised individuals are thought to be at a high risk of *C. ulcerans* infection. In addition, direct contact with infectious secretion from the cat's wound is another important reason for the occurrence of the infection in this patient. Immunocompromised patients should avoid animals known to cause zoonotic infections, especially cats.

## DECLARATION OF INTEREST

None.

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