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CASE REPORT

Cowpox after a cat scratch – case report from Poland

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Abstract

Cowpox in humans is a rare zoonotic disease; its recognition is therefore problematic due to the lack of clinical experience. The differential diagnosis includes other poxvirus infections and also infections with herpesviruses or selected bacteria. The clinical course can be complicated and the improvement may take weeks. Late diagnosis is one of the causes of unnecessary combined antibiotic therapy or surgical intervention. A case of cowpox after a cat scratch in a 15-year-old girl is presented, with a summary of the available clinical data on cowpox infections.

Key words

orthopoxvirus, cowpox, skin lesion, eschar

CASE REPORT

A 15-year-old otherwise healthy girl was admitted to hospital in October 2012 because of cutaneous lesions with lymphadenopathy and fever. Three weeks earlier, she noticed a vesicular lesion on a dorsal surface of her left hand, where a kitten had scratched her a week before. The lesion turned from light yellow to a purple, haemorrhagic vesicle (Fig. 1) and partially formed a deep-seated hard, black eschar 3 cm in diameter, with erythema and oedema involving the forearm (Fig. 2). The eschar was painless. The axillary lymph nodes were enlarged and painful but no additional lesion developed. There was no history of a tick bite. In the second week of the disease, after the fever had risen to 39 °C, she was consulted by a general practitioner. The first course of antibiotics was administered, but without any improvement. She was then admitted to local hospital where a cat-scratch disease or cutaneous anthrax were suspected. The next course of antibiotics (doxycycline, ciprofloxacin) was started and the patient was transferred to our hospital. On admission, the patient was in good general condition, temperature was normal, the skin lesion was in a stage previously described.

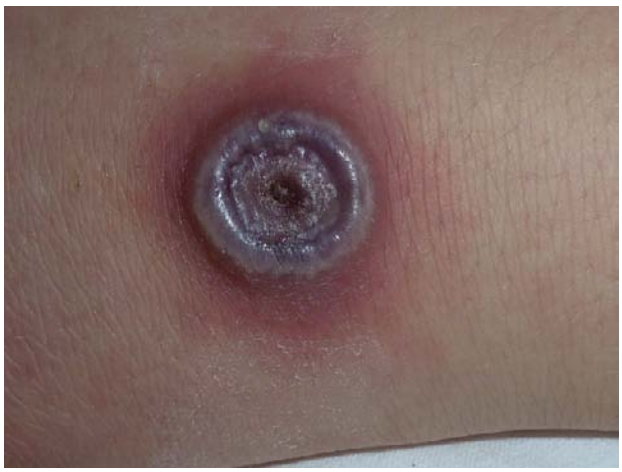

Figure 1. The lesion on admission (a third week of the disease) on a dorsal surface of the left hand

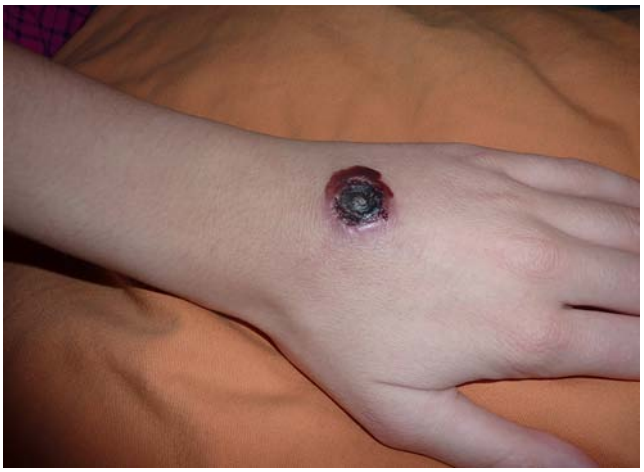

Figure 2. Black eschar in a fourth week of the disease

Laboratory investigations revealed a white blood cells count of 5,400 cells/μl with 9% of bands in differential, normal C-reactive protein (<5 mg/l), as well as procalcytonin (<0.5 ng/ml), D-dimer slightly elevated (680 ng/ml, normal range <500 ng/ml), normal results of electrolytes, liver function tests and coagulation tests. Ultrasound scan showed in the axillar region, enlarged, inflamed lymph nodes, with the biggest measuring 43 × 19 mm, oedema of the subcutaneous tissue in the cubital area. Ultrasound scan of the abdomen did not reveal enlarged lymph nodes or spleen enlargement. The results of serological tests for *Bartonella henselae* and *Francisella tularensis* were negative.

Samples were also send to the Robert Koch Institute in Berlin for serological tests specific for Orthopoxvirus. The results showed very high titers (IgG 1:20,4080 and IgM 1:1,280 from the sample taken during an early convalescent phase, and IgG 1:5,120 and IgM 1:1,280 from a sample taken two months later). These results were interpreted as positive antibody reaction to orthopoxviruses. Additionally, the

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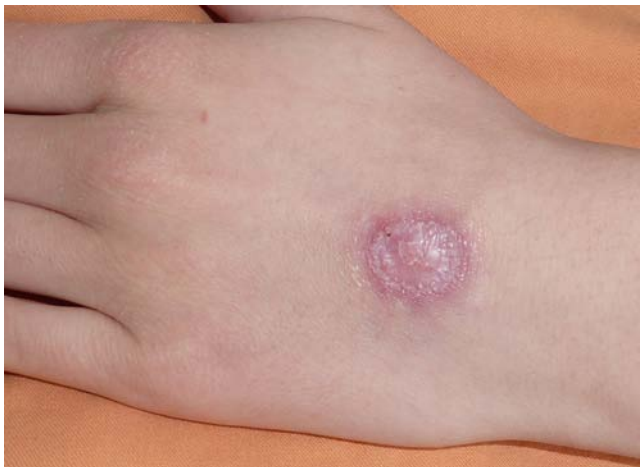

Figure 3. The remaining lesion in a third month since the beginning of the disease

results of serological tests for Lyme disease were positive for IgG in both ELISA and western blot tests.

Since all serological results were obtained later and cat-scratch disease could not be excluded, and there were positive results for Lyme disease, therapy with a combination of antibiotics doxycycline, azitromycin, metronidazol was introduced for 4 weeks, 12 days and 5 days, respectively.

At the end of the sixth week of the disease, moderate improvement was noticed. However, the evident recovery, with total regression of lymph nodes enlargement and healing of the lesion, was observed during a follow-up visit in the third month since the beginning of the disease (Fig. 3). A slight scar remained on the skin surface.

DISCUSSION

Poxviruses are the largest and most complex viruses. Their particles contain double-stranded DNA and replicate in the cytoplasm of a host cell. Some vertebrate poxviruses can infect both humans and animals. The poxviruses pathogenic for humans belong to four genera: *Orthopoxvirus*, *Parapoxvirus*, *Yatapoxvirus* and *Molluscipoxvirus*. In *Orthopoxvirus* genus known to infect humans are: variola virus (a causative agent of smallpox), vaccinia virus, cowpox virus and monkeypox virus [1]. Cowpox viruses comprise a heterogeneous group of viruses that infect a broad spectrum of hosts, but seem to be restricted to the Old World [2]. They may be subdivided into at least five genetically diverse clusters of different virulence [3].

In the 19th century, Edward Jenner observed that inoculation with cowpox virus induced smallpox immunity. As a result, vaccination was introduced in order to replace the risky variolization (cutaneous exposure to dried material of smallpox lesion) and in the 20th century began the practice of vaccination with vaccinia virus.

Human cowpox is a relatively rare zoonotic infection. About 200 human cases were recorded with less than 150 cases described in literature [5]. The largest case review was published in 1994 and based on 54 cases investigated from 1969–1993 [5]. However, it is highly probable that less severe cases have not been diagnosed and /or not published.

Human cowpox can be acquired by implantation of a virus into broken skin after contact with infected animals, mostly cats or rats. The seroprevalence among cats is about 2–4% [6, 7]. Small rodents, such as bank voles and wood mice, are considered a natural reservoir. No transmission between humans has been reported so far. A case linked to contact with a scarf from an ethnic specialty shop has been described [8].

The incubation period lasts 8–12 days. In immunocompetent humans cowpox remains a localized skin disease with local lymphadenopathy healing after several weeks to months, with scar formation. More severe cases have been described in patients with atopic dermatitis [9], Darier's disease [10], under steroid therapy [5] and a fatal infection was reported in a patient with atopic dermatitis and allergic bronchial asthma who was receiving systemic steroids at the time of infection [11]. Most of the reported cases involve children and teenagers. Fingers and hands are most commonly affected, the face is also a quite common localization [5]. There are also documented cases of complicated eyelid involvement and bilateral pneumonia from a cluster of infections among owners of white rats in Germany in 2008 [4, 5].

The diagnosis is problematic because the disease is rare, specific tests are not widely available, therefore clinical assessment is essential. In differential diagnosis there is a broad spectrum of infectious diseases: bacterial (cat scratch disease, cutaneous anthrax, rickettsial infections presenting with eschar, ecthyma or actinomycosis), fungal (sporotrichiosis), viral (smallpox, monkeypox, Herpes simplex and Varicella zoster infections, milker's nodules or orf). A skin lesion in an initial phase can resemble a drug eruption or insect bite. For biosafety reasons, a prompt diagnosis is essential in cases with multifocal presentation similar to smallpox.

Laboratory methods to detect orthopoxviruses include electron microscopy, direct immunofluorescence assay, PCR, antigen-capture ELISA, cell culture or virus propagation on chicken embryo chorioallantoic membrane. The indirect detection method is an identification of specific antibodies and an increase of a titer post-infection [12]. In the interpretation of serological results, the history of vaccination against smallpox with vaccinia virus should be considered (performed up to the 1970s in Europe). Comprehensive testing is nowadays available in specialized laboratories (Robert Koch Institute in Berlin-Wedding, Germany, and the US Centers for Disease Control and Prevention – CDC).

The treatment in most cases is supportive. Steroids are contraindicated and may exacerbate the illness. The potential benefit of antivirals, such as cidofovir, CMX001 (lipid derivative of cidofovir of improved oral bioavailibility) and ST-246 was demonstrated *in vitro* and *in vivo* in mice [3, 13, 14, 15]. However, these drugs have not yet been approved by the US Food and Drug Administration (FDA) nor the European Medicines Agency (EMA) for the treatment of orhopoxvirus infections.

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