

Assessment of Ocular Lesions in a Persian Cat Concurrently Infected with *Chlamydia felis*, Herpesvirus and Coronavirus

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Abstract: In this case report, *Chlamydia felis*, herpesvirus and coronavirus correlations were revealed in a Persian cat with some complaints related to the eye. Upon ophthalmological examination, there was a dark brown lesion on the right corneal surface, and some clinical signs observed in the left eye resembling limbal insufficiency. As a result of ELISA test in blood, the FCoV and chlamydia antibody titers were positive at the S4 level. Chlamydia infection was confirmed by real-time PCR analysis in blood and conjunctival samples. Tear samples were found positive upon the herpesvirus antigen test. The lesions regressed after treatment, and the test results for chlamydia were negative following the 7-week treatment period.

Keywords: *Feline chlamydia*, *Conjunctivitis*, *Limbus*, *Sequester*

Chlamydia felis, Herpesvirus ve Koronavirüs Enfeksiyonunun Eşzamanlı Seyrettiği Bir İran Kedisinde Oküler Lezyonların Değerlendirilmesi

Özet: Bu olgu sunumunda göze ilişkin şikayetleri olan bir İran kedisinde *Chlamydia felis*, herpesvirüs ve koronavirüs korelasyonu ortaya konuldu. Oftalmolojik muayenede, sağ gözün kornea merkezinde koyu kahverengi bir lezyon, sol gözde limbal yetmezlik benzeri klinik bulguların şekillenmiş olduğu görüldü. Kan ELISA sonucuna göre FCoV ve klamidya antikor titresi S4 seviyesinde pozitif çıktı. Kan ve konjunktival svap örneklerinde real-time PCR ile klamidya enfeksiyonu doğrulandı. Herpesvirüs antijen testi sonucunda gözyaşı örnekleri pozitif bulundu. Uygulanan 7 haftalık tedavi sonrasında lezyonların gerilediği ve klamidya test sonucunun negatife döndüğü görüldü.

Anahtar sözcükler: *Kedi klamidyası*, *Konjunktivitis*, *Limbus*, *Sekester*

INTRODUCTION

Chlamydia felis is an intracellular bacterium with zoonotic and immunosuppressive potential that affects various species. It is associated with severe respiratory system infections and has a special affinity to the conjunctiva in felines^[1]. Chlamydia produces the foregoing effect mostly by the contribution of herpesvirus. It was reported that herpesvirus not only caused conjunctivitis, but also severe keratitis. The virus especially invades the corneal epithelial cells, causing severe cytolysis followed by persistent corneal ulcers. Relevant studies suggested

that high concentrations of herpesvirus were present in corneal necrosis^[2].

Feline coronavirus (FCoV) is a highly contagious viral agent that causes infection in domestic and wild cats worldwide. Approximately 20-60% of domestic cats were positive for FCoV, while that rate reached up to 90% in animal shelters or multi-cat houses. FCoV is transmitted via faecal-oral route binds to aminopeptidase N (APN) receptors located in the intestinal mucosa, infecting enterocytes and then spreading from the intestine through monocyte-associated viremia. It can also replicate in

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the monocytes/macrophages of healthy cats [3,4] and is transported to target tissues, including the peritoneum, pleura and kidneys. It can also cause uveitis after the deterioration of the blood-eye barrier [5,6].

In this case report, concurrent *C. felis*, herpes, coronavirus ocular infection in a cat living alone in a home environment was pointed out, and their correlation was revealed.

CASE HISTORY

A one-year-old, male, Persian cat was brought to the ophthalmology clinic with eye complaints. An “informed consent form”, involving the whole process was obtained in the relevant case. According to the anamnesis, respiratory and ocular symptoms (i.e. severe eye itching, blepharospasm, conjunctivitis, and dark brown discharge) started subsequent to the vaccination at age of 3 months and thereafter recovered upon treatment. Similar symptoms reoccurred in the right eye at age of 9 months. In addition, there was a dark brown lesion, which was diagnosed as sequestrate approximately 2-3 mm in diameter, in the centre of the right cornea (Fig. 1). In addition, conjunctivalization resembling limbal insufficiency findings were observed on cornea of the left eye (Fig. 2). Slit lamp biomicroscopy before and after 2% sodium fluorescein dye was used to diagnose limbal defects. Findings of slit lamp examination under white light included corneal conjunctivalization and superficial vascularization. Examination under cobalt blue illumination manifested the presence of abnormal cells on the corneal surface.

Since the dryness of the corneal surface was noted in the examination, hyaluronic acid and artificial tears were applied to each eye. By the 10th day of treatment, brown eye discharge, blepharospasm and conjunctivitis

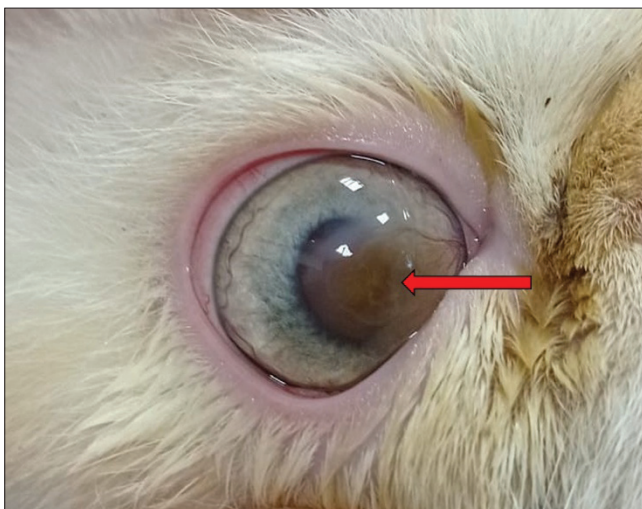


Fig 1. Corneal sequestra (arrow) and superficial vascularization around the lesion in the center of the right cornea

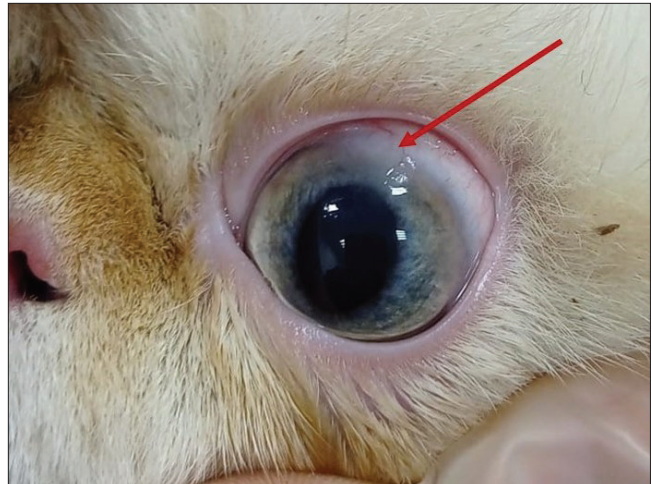


Fig 2. Conjunctivalization of the left cornea (arrow)

were decreased. Fluorescein test indicated the presence of an ulcerative area around the brown corneal lesion. Tobramycin and acetylcysteine eye drops were added to the treatment. Viral and bacterial tests of the blood and tear samples were performed due to the chronicity and persistent recurrence of the condition. As a result of the ELISA test in blood, the FCoV and chlamydia antibody titers were positive at S4 level. Chlamydia infection was confirmed by positive real-time PCR analysis in blood and conjunctival samples. Tear samples tested positive upon the herpesvirus antigen test.

Following the test results, doxycycline was prescribed (10 mg/kg, po) for a 21-day therapy. A marked demarcation area around the corneal lesion was revealed and the symptoms have regressed. The animal underwent a real-time PCR test after 21 days with an aim to follow up the chlamydia infection and treatment, and the test result was still positive. Doxycycline treatment was continued for another 4 weeks, then the animal tested as chlamydia negative. Concurrently, the FCoV antibody test indicated a decrease in antibody titer to S1 level after the chlamydia treatment. Food supplements (Vetomune, Vet Expert) intended for viral diseases and changes in home layout to minimize stress were proposed. While no special treatment was preferred for herpesvirus, it was thought that the aforementioned applications would provide viral control.

DISCUSSION

Chlamydia felis has a relatively higher host specificity in comparison with other *Chlamydiaceae* species. Although it was reported as cat-specific for many years, now it has been also detected in the canines as well as in a Eurasian lynx with conjunctivitis [7]. *C. felis* can cause keratoconjunctivitis or follicular conjunctivitis in males with the potential risk for people with close contact with infected animals [8].

Chlamydia infection is highly prevalent among the felines living in closed and crowded spaces under neglected conditions, among pedigreed cats subject to continuous reproduction and among stray cats with conjunctivitis^[9,10]. As the present case was an indoor cat with no connection with exteriors, living alone in a house under favorable care conditions, it may have inherited *C. felis* from the mother. Such that the occurrence of the first ophthalmological symptoms upon administration of the combination vaccine may be indicative of the fact that *C. felis* infection became opportunistic as a result of the alteration in the immune system due to vaccination.

Serological research demonstrated that 10% or above of the pets without vaccination also had antibodies. Cats aging less than 9 months is the most affected age group as regards to *C. felis*.^[10] The infection history of the presented case is consistent with those reports.

There are many types of chlamydia, which primarily target mucosal tissues. *C. felis* is the most common among these species, and its primary target is conjunctiva. Severe ocular discharge, hyperemia in the third eyelid, chemosis, and blepharospasm are typical in cases of *C. felis* ocular infection. As a result of the fact that *C. felis* did not show affinity to the cornea, the direct corneal symptoms, especially including keratitis and corneal ulcer, were not associated with *C. felis* infections^[1-7]. Relevant studies did not suggest conclusive evidence that *C. felis* was a primary pathogen or a source of secondary infection in cats with corneal sequestrate^[11]. The PCR examinations on sequestrate samples and conjunctival cells did not provide any evidence of bacterial antigen, while viral DNAs and especially the herpesvirus DNA were abundant^[12]. In the present case, there were remarkable lesions, which could be associated with herpesvirus in the cornea of the right eye.

There are a number of feline upper respiratory tract infections with ocular manifestations. Therefore, the viral and bacterial diseases should always be included in the differential diagnosis list in patients presented with the above-mentioned symptoms. Laboratory tests are essential for the detection of infectious agents during the differential diagnosis. The affinity of the pathogens to the ocular and adnexal tissues allows for the chosen tests to be diagnostically decisive. PCR techniques are the method of choice for the diagnosis of many infections since they are more sensitive compared to the isolation techniques^[10].

Feline chlamydia infection can well respond to antibiotic treatment. Doxycycline is the treatment of choice for *C. felis* infection^[13] and is most frequently used at a daily dose of 10 mg/kg orally, but 5 mg/kg oral twice daily can be used in cases of vomiting with single-day dosing. Relevant studies suggested that treatment should

be continued for a 4-week time period to ensure the elimination of targeted organism. It was recommended to continue the treatment for another two weeks upon improvement of the clinical symptoms as recurrence might occur occasionally after early discontinuation of treatment^[14]. In the present case, while chlamydia was totally eliminated the level of coronavirus antibody also decreased (S1), which indicates that treatment for a single factor in concurrent infections may also be efficient on other factors.

In conclusion, *C. felis*, herpesvirus, and coronavirus infections are predominantly seen in poor care conditions, especially in multi-cat environments, and therefore the present case is remarkable for detecting *C. felis*, herpesvirus, and coronavirus infections in a fully vaccinated cat under good care conditions, living as a single individual at home. It was suggested that while ophthalmological symptoms were associated with active concurrent *C. felis*, herpesvirus and coronavirus infections, coronavirus carriage might also have a suppressive effect on immunity, increasing the resistance of *C. felis* and herpesvirus to treatment.

Availability of Data and Materials

The authors declare that data supporting the study findings are also available to the corresponding author (İ. Ergin).

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Competing Interest

The author declared that there is no conflict of interest.

Author's Contributions

The authors have equally contributed to the preparation of this manuscript

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