https://doi.org/10.17816/OV17731

OCULAR DIROFILARIASIS: THE INCREASING INCIDENCE IN A TEMPERATE ZONE

© N.G. Zumbulidze[1], J.S. Konenkova[2], A.V. Laskin[3], O.M. Kasatkina[4], D.F. Belov[2], D.V. Vigonyuk[5]

[1] North-Western State Medical University named after I.I. Mechnikov, Saint Petersburg, Russia;
[2] City Multi-Field Hospital No. 2, Saint Petersburg, Russia;
[3] S.M. Kirov Military Medical Academy, Saint Petersburg, Russia;
[4] Diagnostic center No. 7 (ophthalmological) for adults and children, Saint Petersburg, Russia;
[5] Regional clinical hospital of the Kaliningrad Region, Kaliningrad, Russia

For citation: Zumbulidze NG, Konenkova JS, Laskin AV, et al. Ocular dirofilariasis: the increasing incidence in a temperate zone. *Ophthalmology Journal*. 2019;12(4):101-106. https://doi.org/10.17816/OV17731

Received: 16.10.2019 Revised: 18.11.2019 Accepted: 18.12.2019

✧ Over the last years, there is a pronounced tendency of increase in number of dirofilariasis infected animals and humans in the temperate climate area. Earlier, we described five cases of ophthalmodirofilariasis from 2015 to 2018. This article presents four new cases. One of the clinical cases relates to extremely rare localization in the anterior chamber of the eye. Only few reports of *Dirofilaria* detection in sclera, vitreous and retina have been published.

✧ ***Keywords:*** dirofilariasis; transmissive; human; Russia; *Dirofilaria repens*.

ДИРОФИЛЯРИОЗ ОРГАНА ЗРЕНИЯ: УЧАЩЕНИЕ СЛУЧАЕВ ИНВАЗИИ В ОБЛАСТЯХ С УМЕРЕННЫМ КЛИМАТОМ

© Н.Г. Зумбулидзе[1], Я.С. Коненкова[2], А.В. Ласкин[3], О.М. Касаткина[4], Д.Ф. Белов[2], Д.В. Вигонюк[5]

[1] ФГБОУ ВО «Северо-Западный государственный медицинский университет им. И.И. Мечникова» Минздрава России, Санкт-Петербург;
[2] СПбГБУЗ «Городская многопрофильная больница № 2», Санкт-Петербург;
[3] ФГБВОУ ВО «Военно-медицинская академия им. С.М. Кирова» Минобороны России, Санкт-Петербург;
[4] СПбГБУЗ «Диагностический центр № 7» (глазной) для взрослого и детского населения, Санкт-Петербург;
[5] ГБОУ «Областная клиническая больница Калининградской области», Калининград

Для цитирования: Зумбулидзе Н.Г., Коненкова Я.С., Ласкин А.В., и др. Дирофиляриоз органа зрения: учащение случаев инвазии в областях с умеренным климатом // Офтальмологические ведомости. – 2019. – Т. 12. – № 4. – С. 101–106. https://doi.org/10.17816/OV17731

Поступила: 16.10.2019 Одобрена: 18.11.2019 Принята: 18.12.2019

✧ В последние годы выявляется стойкая тенденция увеличения числа инфицированных дирофиляриозом животных и человека в зоне умеренного климата. Ранее нами было дано описание пяти случаев офтальмодирофиляриоза за период с 2015 по 2018 гг. В данной статье представлены ещё четыре наблюдения за 2019 г. Одно из них относится к чрезвычайно редкой локализации паразита в передней камере глаза. В мировой практике опубликованы лишь единичные случаи обнаружения дирофилярий в склере, стекловидном теле и сетчатке глазного яблока.

✧ ***Ключевые слова:*** дирофиляриоз; трансмиссивный; человек; Россия; *Dirofilaria repens*.

Dirofilariasis (*Dirofilariasis*, from Lat. *diro, filum*, "evil thread") is a disease caused by infection with the parasitic nematode *Dirofilaria*. The sources of infection are typically infected domestic or stray dogs and cats, and less commonly, wild civets. The infection is transmitted through a vector-borne pathway via the bites of blood-sucking insects. The larvae of *Dirofilaria* mature in the Malpighian vessels of insects, primarily of mosquitoes of the genera *Aedes* (31%), *Culex* (17%), and *Anopheles* (2.5%) [6], until reaching the invasive stage [4–9]. The prevalence of this transmissible zoonotic infection has been increasing steadily in Russia since the 1990s [1–3]; numerous infections with *Dirofilaria repens* have been recorded in the Russian Federation.

Humans are accidental hosts for these nematodes; larval survival in human subjects is extremely low, and as such, humans serve as a biological "dead end" for *Dirofilaria*. Only two cases of simultaneous infection with several *Dirofilaria* organisms have been reported in the literature; in all remaining cases, only one organism develops and ultimately remains immature. Interestingly, in 99.7% of the cases, a single immature female was identified [4].

Typically, the infection is not recognized by health care practitioners, and the patient is provided with another diagnosis, such as atheroma, phlegmon, fibroma, boils, cyst, tumor, and/or one of several granulomatous diseases [1]. The most common complaint related to *Dirofilaria* infection are migrating painful swellings, which often occur at night. In some cases, this is accompanied by neurological pain of varying degrees of intensity [6]. In the ocular form, which accounts for 50% of all cases of human dirofilariasis, infection typically involves the subcutaneous tissue of the eyelid or the conjunctiva and can present with symptoms of acute conjunctivitis [3, 8, 9]. Helminth infections of the sclera, vitreous body, retina, or retrobulbar space are extremely rare and can be accompanied by serious complications [5, 10].

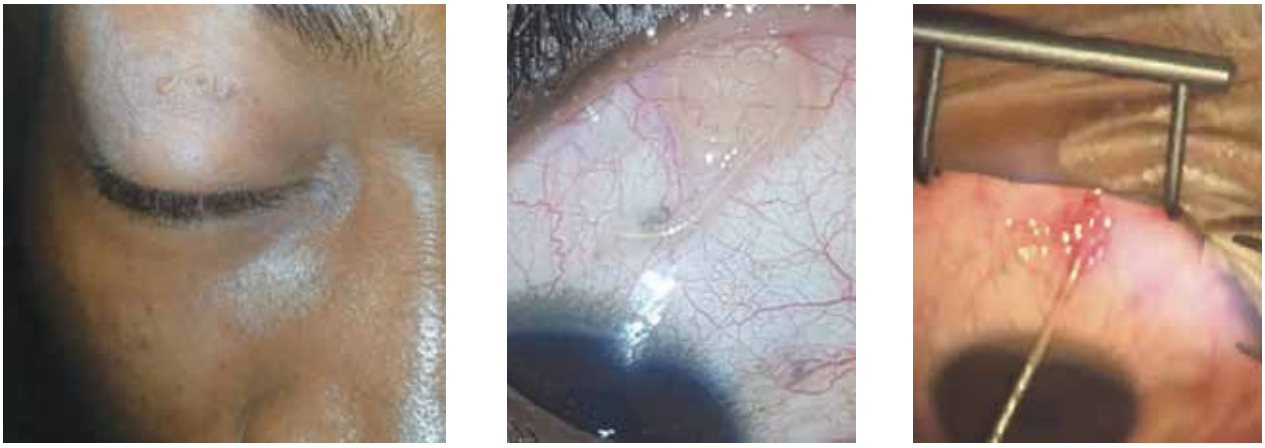
Due to the fact that many physicians are not aware of the prevalence of this disease, arriving at a correct diagnosis can be complicated. There are no specific laboratory tests for humans, and as such, an epidemiological history is of critical importance. Symptoms and clinical manifestations in association with a history of travel to or residence in endemic areas, especially during the season of prominent mosquito activity, should suggest the possibility of this infection [4]. The diagnosis is largely based on clinical manifestations, which are variable in subcutaneous dirofilariasis in humans, and associated with the localization of *Dirofilaria* in subcutaneous tissue. The cyclical nature of the symptoms is a striking characteristic, the most important of which is the constant movement of the parasite as well as the overall ineffectiveness of antiallergic and antiinflammatory therapies. In the absence of a visibly detectable helminth (as one would see with subconjunctival localization) or moving induration (associated with subcutaneous localization), an ultrasound scan or computed tomography may shed clarity on the diagnosis [12]. However, it is critical to recognize that the use of ultrasound can accelerate helminth migration, which can generate further difficulties with respect to its removal. For the same reason, physiotherapeutic procedures, such as heating with compresses or warming ointments, are also contraindicated. In some cases, the diagnosis is made when a live helminth emerges on its own, as a result of an incision made in a cyst wall, affected node, or granuloma, or upon direct surgical excision [11].

Treatment ultimately includes the removal of the helminth. Antiparasitic drugs are unnecessary given that one is typically infected by a single parasite, which in most cases is an immature female that does not generate larvae [7].

Currently, the incidence of dirofilariasis is growing both in endemic areas with warm and humid climate and in regions with a more temperate climate as well.

CLINICAL CASE NO. 1

The first case was a 30-year-old male who presented in January 2019 with a chief complaint of an unusual sensation under the upper eyelid of the right eye. He was a citizen of Congo; however, he had not left the Russian Federation for five years and was currently residing in the Leningrad region. He reported that five months prior to presentation, he visited a reservoir where there were many mosquitoes. In the ophthalmic trauma center, a helminth was discovered under the conjunctiva upon inversion of the upper eyelid which could not be removed due to its rapid migration. The patient was referred to the city multi-field hospital No. 2 in St. Petersburg. After one unsuccessful attempt to remove the parasite, it migrated to a position under the conjunctiva of the right eye; it was successfully removed through conjunctiva surgery (Fig. 1). A parasitological study identified the pathogen as a 7.6-cm immature *D. repens* female.



a *b* *c*

Fig. 1. Patient N., 30 years old. *a* — the parasite is visualized under the skin of the upper eyelid OD; *b* — helminth under the conjunctiva OD; *c* — helminth extraction

Рис. 1. Пациент Н., 30 лет. *a* — паразит визуализируется под кожей верхнего века OD; *b* — гельминт под конъюнктивой OD; *c* — извлечение гельминта

CLINICAL CASE NO. 2

The second patient was a 52-year-old female resident of St. Petersburg who presented to a primary health care facility in March 2019 with a chief complaint of a painful node in the right temporal region. The clinical presentation initially resulted in a diagnosis of allergic/inflammatory reaction to an insect bite. After 10 days, the node disappeared, but within two months it appeared periodically in the region of the right temple, right zygomatic arch, and upper eyelid of the right eye. One month later, she presented to the eye trauma center with sharp burning pains at the outer corner of the upper eyelid and pronounced edema of the eyelids and periorbital tissues. She also noted progressive weakness and fatigue. A tumor-like formation was identified under the skin of the upper eyelid of the right eye (Fig. 2) in association with edema of the eyelids, minor hyperemia, and chemosis; the parasite was visualized at that time. She was diagnosed with parasitic subcutaneous granuloma of the right eye. The skin of the upper eyelid was dissected along the path of the migrating parasite. An incision was made through a dense area of granulation tissue and a mobile 10-cm long helminth was removed, which was subsequently identified as an immature specimen of *D. repens*.

a *b*

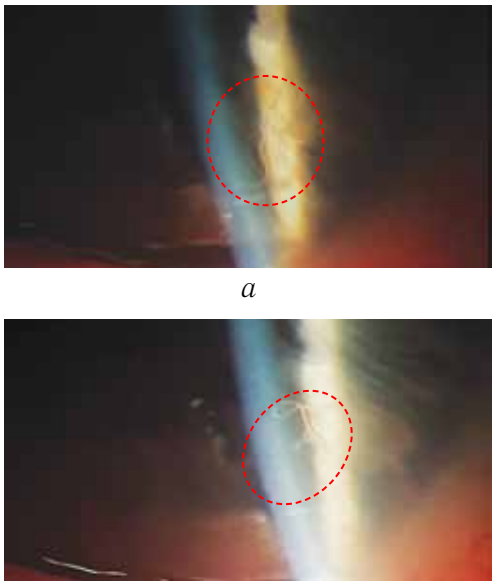
Fig. 2. Patient N., 52 years old. *a* — the parasite under the skin of the upper eyelid OD; *b* — Female *D. repens* extracted from under the skin of the upper eyelid

Рис. 2. Пациентка Н., 52 года. *a* — паразит под кожей верхнего века OD; *b* — Самка *D. repens* извлеченная из-под кожи верхнего века

CLINICAL CASE NO. 3

The third patient was an 88-year-old resident of St. Petersburg who presented with chief complains of severe acute pain and a sharp decrease in vision in his right eye. In October 2019 he was sent to hospital No. 2 from a primary care facility for emergency diagnosis and care. He was initially diagnosed with acute anterior iridocyclitis with posterior synechia; the examination was also notable for open-angle IIIa postoperative drug-controlled glaucoma and an immature cataract. The patient reported the recent onset of aching pains that were aggravated by pressure on the right eye. Findings at admission included pronounced, mixed injection of the eyeball; the cornea was smooth and slightly edematous with small-point precipitates on the endothelium and on the single folds of the Descemet's membrane. The

anterior chamber was of medium depth and contained fibrin fibers. At the 12 o'clock position, there was postoperative coloboma of the iris. The reflex from the fundus was pink-colored; the fundus could not be evaluated ophthalmoscopically due to diffuse opacities in all layers of the lens. A translucent helminth, approximately 1.5-cm long, was visualized in the meridian in the 5 o'clock position; the helminth was moving unusually fast and chaotically, while one of the ends of its body was fixed to the stroma of the iris (Fig. 3). Visual acuity was tested by hand movement in the face and intraocular pressure was 5 mmHg. A preliminary diagnosis was made of ophthalmic dirofilariasis of the right eye and anterior uveitis. The ultrasound examination revealed vascular detachment from the equator with moderate bubbles and small-point opacities in the vitreous body; no other pathology was detected. Surgery was performed to remove the helminth from the anterior chamber of the right eye. After instillation of an anesthetic agent and standard preparation of the surgical field at the 12 o'clock position, corneal paracentesis was performed. Viscoelastic gel was administered, and the helminth was removed from the anterior chamber with sterile forceps. The helminth was identified at the Department of Infectious Diseases of the S.M. Kirov Military Medical Academy an immature *D. repens* female.

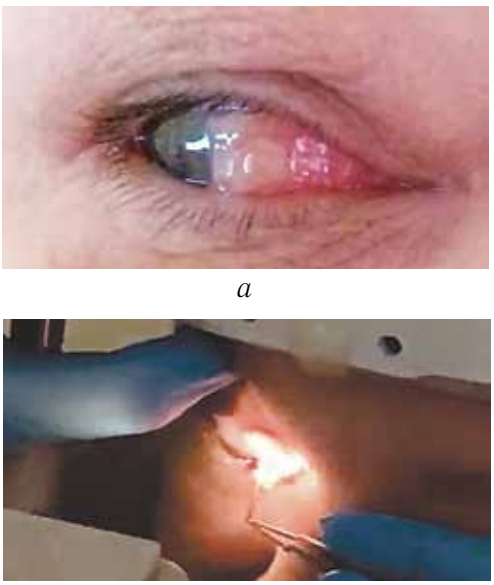


a

b

Fig. 3. Patient H., 88 years old. *a* — helminth in the anterior chamber of the eye OD; *b* — helminth is fixed by the end portion of the body to the stroma of the iris OD

Рис. 3. Пациент Х., 88 лет. *a* — гельминт в передней камере глаза OD; *b* — гельминт фиксирован концевым участком тела к строме радужки OD



a

b

Fig. 4. Patient T., 59 years old. *a* — subconjunctival localization of helminth OD; *b* — stage of surgical removal of the parasite

Рис. 4. Пациентка Т., 59 лет. *a* — субконъюнктивальная локализация гельминта OD; *b* — этап хирургического удаления паразита

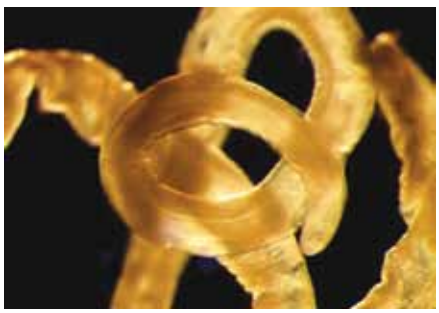


Fig. 5. Photo of the end area of the extracted *D. repens* female executed with a stereomicroscope digital camera

Рис. 5. Фото концевого отдела извлеченной самки *D. repens*, выполненное цифровой камерой стереомикроскопа

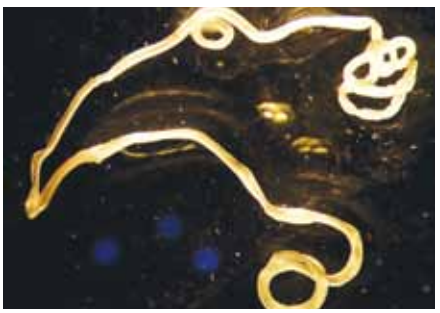


Fig. 6. Photo of a helminth executed with a stereomicroscope digital camera

Рис. 6. Фото гельминта, выполненное цифровой камерой стереомикроскопа

CLINICAL CASE NO. 4

The final patient was a 59-year-old resident of St. Petersburg who presented to a primary health care facility in October 2019 with a chief complaint of a swollen eyelid and burning pain at the bridge of her nose. Her past history was notably for a trip taken during the summer of 2019 to a cottage in the Leningrad region. She was sent to hospital No. 2 with suspected dirofilariasis. A helminth of 5.7 cm in length was discovered and removed from underneath the bulbar conjunctiva of the right eye in the lower external section. The helminth was later identified at the Department of Infectious Diseases of the S.M. Kirov Military Medical Academy as an immature *D. repens* female (Figs. 4–6).

The following two features were common to all four patients in this report, as well as the previous five cases of this infection reported from 2015–2018: (1) initial right-sided localization. A similar and yet unexplained tendency for infection in the right eye is observed in global practice for both the ocular and skin and visceral forms of human dirofilariasis; and (2) patients remained within the Russian Federation for more than two years until the diagnosis of dirofilariasis was established.

Given the history of the disease and the development cycle of the parasite, all cases of invasion are local infections. Likewise, many of the recent cases can be traced epidemiologically to territory within the Leningrad region. This finding is in accordance with the global trend of northward expansion of the regions endemic for dirofilariasis [11]; as such, ophthalmologists need to be especially alert to this disease.

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Information about the authors

Nataliya G. Zumbulidze — MD, PhD, Assistant Professor, Ophthalmology Department. North-Western State Medical University named after I.I. Mechnikov, Saint Petersburg, Russia. SPIN: 4439-8855. E-mail: guramovna@gmail.com.

Janina S. Konenkova — MD, Head of Department, Microsurgery Department No. 4. City Hospital No. 2, Saint Petersburg, Russia. E-mail: krocon@mail.ru.

Alexandr V. Laskin — MD, PhD, Senior Lecturer, Department of Infectious Diseases (with a Course of Medical Parasitology and Tropical Diseases). S.M. Kirov Military Medical Academy, St. Petersburg, Russia. E-mail: lar_vma@mail.ru.

Olga M. Kasatkina — Ophthalmic Surgeon. Outpatient Surgery Department of Diagnostic Center No. 7 (Ophthalmological) for Adults and Children, Saint Petersburg, Russia. E-mail: kasatik-2101@mail.ru.

Dmitrij F. Belov — Ophthalmic Surgeon. Microsurgery Department No. 4. City Hospital No. 2, Saint Petersburg, Russia. E-mail: belovd1990@gmail.com.

Dmitrij V. Vigonyuk — Ophthalmic Surgeon. Regional Clinical Hospital, Kaliningrad Region, Kaliningrad, Russia. E-mail: vigonyk@gmail.com.

Сведения об авторах

Наталия Гурамовна Зумбулидзе — канд. мед. наук, доцент кафедры офтальмологии. ФГБОУ ВО «Северо-Западный государственный медицинский университет им. И.И. Мечникова», Санкт-Петербург. SPIN: 4439-8855. E-mail: guramovna@gmail.com.

Янина Станиславовна Коненкова — заведующая отделением микрохирургии глаза № 4. СПбГБУЗ «Городская многопрофильная больница № 2», Санкт-Петербург. E-mail: krocon@mail.ru.

Александр Викторович Ласкин — канд. мед. наук, старший преподаватель кафедры инфекционных болезней (с курсом медицинской паразитологии и тропических заболеваний). ФГБВОУ ВО «Военно-медицинская академия им. С.М. Кирова» Министерства обороны Российской Федерации, Санкт-Петербург. E-mail: lar_vma@mail.ru.

Ольга Михайловна Касаткина — заведующая отделением амбулаторной хирургии. СПбГБУЗ ДЦ №7 (Глазной диагностический центр для взрослого и детского населения), Санкт-Петербург. E-mail: kasatik-2101@mail.ru.

Дмитрий Федорович Белов — врач-офтальмолог, отделение микрохирургии глаза № 4. СПбГБУЗ «Городская многопрофильная больница № 2», Санкт-Петербург. E-mail: belovd1990@gmail.com.

Дмитрий Витальевич Вигонюк — врач-офтальмолог. ГБОУ «Областная клиническая больница Калининградской области», Калининград. E-mail: vigonyk@gmail.com.