

INTRAOCULAR DIROFILARIASIS: SURGICAL APPROACHES, FEATURES OF THE CLINICAL COURSE (CLINICAL CASE)

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ABSTRACT

The aim. To present a clinical case of surgical treatment of parasitic invasion of the vitreous body caused by *dirofilaria*.

Material and methods. One patient with intraocular dirofilariasis underwent surgical treatment including vitrectomy, phacoemulsification with implantation of an intraocular lens. At the stage of vitrectomy, a whole helminth was removed from the vitreal cavity using collet tweezers for subsequent typing. The uncorrected visual acuity of the right eye at the time of treatment was 0.4, of the left eye – 0.45.

Results. The postoperative period had no signs of an active inflammatory reaction. Four months after surgical treatment, at a follow-up visit, visual acuity of the left eye reached 1.0. According to the parasitological study, a female *Dirofilaria repens* was identified. In the postoperative period, the areas of pronounced chorioretinal atrophy in the peripheral parts of the retina were visualized, which may be a consequence of mechanical contact of the parasite or the toxic effects of its metabolic products.

Conclusion. This clinical case demonstrates the possibility of infection with the ocular form of dirofilariasis in a region that is atypical for the presence of this helminth. Despite the positive outcome of the disease, in the presented patient, the long-term presence of the parasite in the vitreal cavity led to the formation of chorioretinal atrophy in the peripheral retina, which confirms the need for timely diagnosis and surgical treatment.

Key words: dirofilariasis, vitrectomy, zoonosis, ophthalmohelminthiasis

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ИНТРАОКУЛЯРНЫЙ ДИРОФИЛЯРИОЗ: ХИРУРГИЧЕСКИЕ ПОДХОДЫ, ОСОБЕННОСТИ КЛИНИЧЕСКОГО ТЕЧЕНИЯ (КЛИНИЧЕСКИЙ СЛУЧАЙ)

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РЕЗЮМЕ

Цель. Представить клинический случай хирургического лечения паразитарной инвазии стекловидного тела, вызванной дирофилярией.

Материал и методы. Прооперирована 1 пациентка с интраокулярным дирофиляриозом. Пациентке проведено оперативное лечение в объёме витрэктомии, факэмульсификации катаракты с имплантацией интраокулярной линзы. На этапе проведения витрэктомии цанговыми пинцетами произведено удаление цельного гельминта из витреальной полости для последующего типирования. Некорригированная острота зрения правого глаза на момент обращения составляла 0,4, левого – 0,45.

Результаты. Послеоперационный период протекал без признаков активной воспалительной реакции. Через 4 месяца после хирургического лечения, на контрольной явке, острота зрения левого глаза достигла 1,0. По данным паразитологического исследования идентифицирована самка *Dirofilaria repens*. В послеоперационном периоде у пациентки визуализировались зоны выраженной хориоретинальной атрофии периферических отделов сетчатки, что, возможно, является последствием механического контакта паразита либо токсического воздействия продуктов его жизнедеятельности.

Заключение. Данный клинический пример демонстрирует возможности заражения глазной формой дирофиляриоза в нетипичном для нахождения данного гельминта регионе. Несмотря на положительный исход заболевания, у представленной пациентки длительное нахождение паразита в витреальной полости привело к формированию хориоретинальной атрофии на периферии сетчатки, что подтверждает необходимость проведения своевременной диагностики и оперативного вмешательства.

Ключевые слова: дирофиляриоз, витрэктомия, зооноз, офтальмогельминтоз

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Dirofilariasis (from Latin «*diro, filum*» – «evil thread») is a disease caused by parasitisation of nematodes of the genus *Dirofilaria* in the human body [1]. Dirofilariiae are thin, white-coloured helminths belonging to the class of roundworms-nematodes. About twenty species of Dirofilariiae are known, but *Dirofilaria repens* and *Dirofilaria limmitis* are particularly dangerous for humans. The female *Dirofilaria repens* reaches a length of 130–150 mm, *Dirofilaria limmitis* reaches a length of 180–300 mm, while male *Dirofilaria repens* reaches a length of 50–60 mm, male *Dirofilaria limmitis* reaches a length of 100–110 mm. Generally, the helminth can be 0.03 to 1.2 mm wide [2, 3]. *Dirofilaria limmitis* causes the pulmonary form of the disease, *Dirofilaria repens* the oculocutaneous form. An infected mosquito can infect humans with dirofilariasis from the genera *Culex*, *Aedes*, and *Anopheles* [1, 4, 5]. The mosquito is not the only vector of the disease; there have been known cases of invasion following bites from mites, horseflies, lice and fleas. Until recently, it was thought that the larva grows in tissues of the human body but does not undergo sexually mature changes. But the literature describes cases of microfilaraemia, which suggests the possibility of infection of the organism by at least two individuals of different sexes with their transition to the sexually mature stage of development and that a person can be the definitive carrier of *Dirofilaria repens* [5]. In 1566, the Portuguese physician Lusitano Amato (1511–1568) first described a case of a worm being removed from the eye of a little girl. In 1915, the Russian physician A.P. Vladychensky described a case of extracting a worm from a patient's eye tumour [6, 7, 8]. A significant contribution to the study of dirofilaria was made by the Soviet helminthologist K.I. Skryabin in 1917–1948. Ocular dirofilariasis with involvement of the visual organ accounts for 38 to 88 % of cases [8]. In 1996, T.I. Avdyukhina et al. compiled a registry of patients with dirofilariasis, in which 50 out of 110 cases accounted for dirofilariasis of the visual organ [9]. Intraocular localisation is considered a rare form of ocular dirofilariasis. For example, 5 cases of ocular dirofilariasis with intraocular localisation have been registered in the Russian Federation over the years [8].

Currently, the increasing incidence of dirofilariasis is again attracting the attention of physicians [10]. The main reasons for the increase in morbidity and expansion of the area of dirofilariasis spread, according to scientists, are changes in climatic, social and environmental conditions, as well as the growth of migration activity of the population [11]. Until recently, the disease was thought to be predominantly prevalent in Asia, Africa and Southern Europe, but in recent years there has been an increase in the number of cases of dirofilariasis in Nordic countries (Finland, Estonia), where the disease was previously extremely rare [12]. In the Russian Federation, cases of dirofilariasis were previously registered mainly in the southern regions, but now there are cases in St. Petersburg, Tomsk, Irkutsk, and Sverdlovsk regions [13]. Given the polymorphism of clinical manifestations of ocular dirofilariasis, diagnosis of the disease is complicated, and often the final diagnosis is made during surgical

treatment with extraction of the parasite and its subsequent typing. Thus, dirofilariasis is a complex and interdisciplinary disease that requires increased attention of physicians at the place of residence, especially in regions not endemic for this pathology.

THE AIM

To present a clinical case of surgical treatment of parasitic invasion of the vitreous body caused by dirofilaria.

MATERIALS AND METHODS

Patient T., 59 years old, came to the ophthalmological clinic at her place of residence with complaints of reduced vision in the left eye for several years and the presence of a floating formation in front of it in the form of a «thread» that had been bothering her for six months. Ophthalmological examination revealed a mobile formation in the lower segment of the vitreal cavity. The diagnosis was made: parasitic invasion of the vitreous body; the patient was referred for surgical treatment. A complete ophthalmological examination including visometry, intraocular pressure (IOP) measurement, autorefractometry, anterior eye segment biomicroscopy, perimetry, ophthalmoscopy of the ocular fundus and B-scan ultrasonography was performed at the time of presentation for surgery. The incorrigible (i.c.) visual acuity of the right eye (OD, oculus dexter) at the time of treatment was 0.4, of the left eye (OS, oculus sinister) – 0.45, IOP (p) of both eyes – 11 mmHg. Significant opacities in the cortex of the crystalline lens were revealed, during the examination of the eye fundus a floating conglomerate of the vitreous body with a translucent mobile formation of thread-like shape was diagnosed. Areas of chorioretinal atrophy were also revealed in the middle and extreme periphery, while the optic disc and macula remained within normal limits. Ultrasound B-scan confirmed the presence of a large focus of vitreous opacity, within which a mobile object was observed (Fig. 1). Diagnosis: vitreous opacity, parasitic invasion of the vitreous, incomplete complicated cataract of the left eye.

A clinical decision was made to perform combined treatment – posterior closed vitrectomy and cataract phacoemulsification with intraocular lens (IOL) implantation. In order to minimise the risks of inflammation when the parasite is destroyed in response to foreign antigens, and in order to typify the helminth, surgical approaches were used to remove the parasite without damaging it. Surgical treatment was performed using Alcon Constellation system (Alcon, USA). The first stage was cataract phacoemulsification without IOL implantation. Three 25-gauge ports were installed using standard technique, 3 mm from the limb. An infusion cannula was placed into the port in the lower outer segment. A 4 mm diameter posterior capsulorhexis was formed with a vitrectomy cutter to extract the parasite through it. When capsulorhexis was performed, the vitreous conglomerate with the parasite



FIG. 1.

B-scan. Vitreous body and parasite conglomerate: 1 - vitreous opacity; 2 - mobile hyperechogenic formation

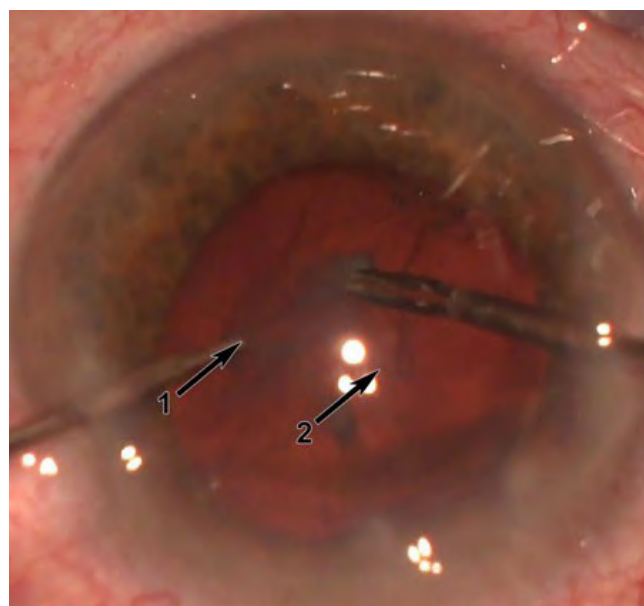


FIG. 2.

Photoregistration of the stage of surgical intervention: 1 – vitreous opacity; 2 – parasite embedded in the fibres of the vitreous body

migrated into the retrolenticular space. Through paracentesis, the conglomerate was fixed with 25G collet forceps and an attempt was made to remove the helminth with forceps from the vitreous body (Fig. 2). The attempt was unsuccessful, however, because of the pronounced fixation of the parasite in the fibres of the vitreous body. A decision has been made to change the helminth extraction technique. The fibres of the vitreous body fixed with conglomerate were resected with a vitrectomy cutter. At the time of vitrectomy, there was marked mobility of the parasite with a tendency to migrate to the vitrectomy cutter window and risk of damage.

It should be emphasised that intraoperatively the possibility of administration of 0.01 % carbachol solution was considered in order to reduce helminth mobility, but possible miosis and risks of reduced visualisation led to the rejection of this drug. With forceps, the conglomerate was partially withdrawn into the anterior chamber, from which the parasite was extracted through paracentesis (Fig. 3). The helminth was placed in a balanced saline solution and sent to a parasitology laboratory. Total vitrectomy with retinal revision was performed. The intraocular lens was implanted into the capsular bag. After the ports were removed, the surgery was completed.

RESULTS AND DISCUSSION

The postoperative period had no signs of an active inflammatory reaction. On the third day, the patient was discharged from the hospital. At the time of discharge, OS visual acuity was 0.8 and IOP was 10 mmHg. After 4 months, at the follow-up visit, OS visual acuity reached 1.0, and IOP remained at 10 mmHg. A female *Dirofilaria repens*

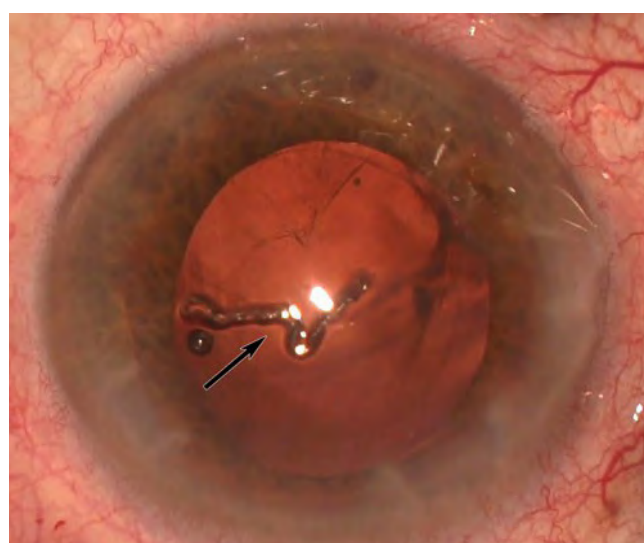


FIG. 3.

Photoregistration of the surgical intervention stage: view of the worm located on the cornea after extraction from the vitreal cavity

was identified by parasitological examination. The patient is appointed a consultation with an infectious disease physician.

The peculiarity of this clinical case is the location of the patient's infection in an atypical area for this disease. The patient lives in the northern district of the Irkutsk region, beyond which she has not travelled for the last two years. Considering the timing of the complaints of decreased vision and the appearance of a mobile object in the field of vision, as well as the characteristics of the life cycle of the helminth, it can be assumed that

the infection occurred in the region of the patient's residence. This correlates with worldwide trends of a significant increase in the incidence of dirofilariasis in northern latitudes, which is associated with climatic warming and, consequently, with a longer life cycle of mosquito vectors of the disease, as well as the spread of stray cats and dogs, which are the final hosts of the parasite [14]. It is also worth noting that in one of the coldest and northernmost cities in Russia, Yakutsk, cases of dirofilaria infection in both domestic and wild animals have been revealed [13, 14].

Intraocular dirofilariasis is considered the rarest form of this disease and is sporadic. Surgery remains the generally accepted and the only treatment for this form of the disease. It is worth noting, however, that there is no consensus on the necessity of extracting the whole parasite and, if the parasite persists, the method of removing it from the eye. Some authors performing endovitreous intervention, simultaneously excise the dirofilaria, which significantly simplifies the intervention, reducing the duration of surgery. According to the literature, this method of parasite removal does not lead to the development of intraocular inflammation [6], but typing of the parasite in these cases becomes impossible. Domestic ophthalmologists follow the tactic of preserving the whole parasite, using various surgical approaches for this purpose. V.N. Kazaikin et al. described the technique of aspiration extraction of the parasite from the eye with preservation of the vitreous body [12]. R.R. Faizrakhmanov et al. used vitrectomy to mobilise the helminth with its further removal by forceps through a 23-gauge port [15]. In both cases, the integrity of the parasite was preserved for subsequent parasitological examination and for definitive diagnosis [12, 15].

The surgical treatment tactics used in this clinical case was conditioned by the presence of pronounced opacities in the crystalline lens, gross vitreous body opacities, which prevented adequate visualisation of the ocular fundus. In the postoperative period, the patient had visualised areas of pronounced chorioretinal atrophy of the peripheral retina, which may be a consequence of mechanical contact of the parasite or toxic effects of its products (Fig. 4). The absence of pathological changes in the macular region allowed to obtain high visual acuity.

Most publications that have presented the treatment of patients with this condition demonstrate obtaining high visual acuity without associated toxic and inflammatory reactions in the postoperative period. At the same time, clinical cases with catastrophic visual impairment caused by macular retinal atrophy as a consequence of prolonged presence of *Dirofilaria* in the eye have been described [16].

CONCLUSION

This clinical case demonstrates the possibility of infection with the ocular form of dirofilariasis in a region atypical for the presence of this helminth. Despite the positive outcome of the disease, in the presented patient,



FIG. 4.
Zones of pronounced chorioretinal atrophy of peripheral parts of the retina

the long-term presence of the parasite in the vitreal cavity led to the formation of chorioretinal atrophy in the peripheral retina, which confirms the need for timely diagnosis and surgical treatment.

Conflict of interest

The authors of this article declare no conflicts of interest.

REFERENCES

1. Reddy MV. Human dirofilariasis: An emerging zoonosis. *Trop Parasitol.* 2013; 3(1): 2-3.
2. Permi HS, Veena S, Prasad HK, Kumar YS, Mohan R, Shetty KJ. Subcutaneous human dirofilariasis due to *Dirofilaria repens*: Report of two cases. *J Glob Infect Dis.* 2011; 3(2): 199-201. doi: 10.4103/0974-777X.81702
3. Chistenko GN, Vedenkov AL, Dronina AM, Semizhon OA. Human dirofilariasis. *Medical Journal.* 2013; 3(45): 30-33. (In Russ.). [Чистенко Г.Н., Веденьков А.Л., Дронина А.М., Семижон О.А. Дирофиляриоз человека. *Медицинский журнал.* 2013; 3(45): 30-33.]
4. Kartashev V. Human subcutaneous/ocular dirofilariasis in the Russian Federation and Belarus, 1997–2013. *Int J Infect Dis.* 2015; 33: 209-211.
5. Bronshtein AM, Supryaga VG, Stavrovsky BI. Human dirofilariasis in the Moscow region. *Medical Parasitology and Parasitic Diseases.* 2003; 3: 51-56. (In Russ.). [Бронштейн А.М., Супряга В.Г., Ставровский Б.И. Дирофиляриоз человека в Московском регионе. *Медицинская паразитология и паразитарные болезни.* 2003; 3: 51-56.]

6. Kalogeropoulos CD, Stefaniotou MI, Gorgoli KE, Papadopoulou CV, Pappa CN, Paschidis CA. Ocular dirofilariasis: A case series of 8 patients. *Middle East Afr J Ophthalmol*. 2014; 21(4): 312-316. doi: 10.4103/0974-9233.142267
7. Molyneux DH. Control of human parasitic diseases: Context and overview. *Adv Parasitol*. 2006; 61: 1-45. doi: 10.1016/S0065-308X(05)61001-9
8. Gushchina MB, Tereshchenko AV, Yuzhakova NS. Clinical forms of ocular dirofilariasis. *Vestnik Oftalmologii*. 2019; 135(4): 113-120. (In Russ.). [Гущина М.Б., Терещенко А.В., Южакова Н.С. Клинические формы глазного дирофиляриоза. *Вестник офтальмологии*. 2019; 135(4): 113-120.]. doi: 10.17116/oftalma201913504113
9. Sergiev VP, Supryaga VG, Bronshtein AM, Ganushkina LA, Rakova VM, Morozov EN, et al. Results of the study of dirofilariasis in Russia. *Medical Parasitology and Parasitic Diseases*. 2014; 3: 3-4. (In Russ.). [Сергиев В.П., Супряга В.Г., Бронштейн А.М., Ганушкина Л.А., Ракова В.М., Морозов Е.Н., и др. Итоги изучения дирофиляриоза в России. *Медицинская паразитология и паразитарные болезни*. 2014; 3: 3-4.].
10. Pietikäinen R, Nordling S, Jokiranta S, Saari S, Heikkinen P, Gardiner C, et al. *Dirofilaria repens* transmission in southeastern Finland. *Parasit Vectors*. 2017; 10(1): 561. doi: 10.1186/s13071-017-2499-4
11. Baytinger VF, Kurochkina OS, Poltoratskaya TN, Poltoratskaya NV. Clinical cases of surgical treatment of dirofilariasis in the Tomsk region. *Issues of Reconstructive and Plastic Surgery*. 2023; 26(2): 56-63. (In Russ.). [Байтингер В.Ф., Курочкина О.С., Полторацкая Т.Н., Полторацкая Н.В. Клинические случаи хирургического лечения дирофиляриоза в Томской области. *Вопросы реконструктивной и пластической хирургии*. 2023; 26(2): 56-63.]. doi: 10.52581/1814-1471/85/07
12. Kazaykin VN, Guryev AV, Lizunov AV, Mazein DA. Rare case of intraocular dirofilariasis. Surgical removing method. *Ophthalmology in Russia*. 2019; 16(4): 556-560. (In Russ.). [Казайкин В.Н., Гурьев А.В., Лизунов А.В., Мазейн Д.А. Редкий случай интраокулярного дирофиляриоза. Способ хирургического удаления. *Офтальмология*. 2019; 16(4): 556-560.]. doi: 10.18008/1816-5095-2019-4-556-560
13. Riebenbauer K, Weber PB, Walochnik J, Karlhofer F, Winkler S, Dorfer S, et al. Human dirofilariasis in Austria: The past, the present, the future. *Parasit Vectors*. 2021; 14(1): 227. doi: 10.1186/s13071-021-04696-4
14. Kolesova GG, Reshetnikov AD, Sleptsov ES, Barashkova AI. Dirofilariasis of carnivorous in Yakutia, the method of isolation filarial larvae from the blood of dogs. *Russian Journal of Parasitology*. 2013; (3): 87-91. (In Russ.). [Колесова Г.Г., Решетников А.Д., Слепцов Е.С., Барашкова А.И. Дирофиляриоз плотоядных животных в Якутии, способ выделения из крови микрофилярий. *Российский паразитологический журнал*. 2013; (3): 87-91.].
15. Fayzrakhmanov RR, Bogdanova VA, Lebed'ko MS, Bosov ED. Dirofilariasis in the vitreal cavity. *Clinical Cases in Ophthalmology*. 2023; 1: 25-29. (In Russ.). [Файзрахманов Р.Р., Богданова В.А., Лебедько М.С., Босов Э.Д. Дирофиляриоз витреальной полости. *Клинические случаи в офтальмологии*. 2023; 1: 25-29.]. doi: 10.25276/2949-4494-2023-1-25-29
16. Gupta P, Pradeep S, Biswas J, Rishi P, Muthusamy R. Extensive chorio-retinal damage due to *Dirofilaria repens* – Report of a case. *Ocul Immunol Inflamm*. 2021; 29(6): 1142-1144. doi: 10.1080/09273948.2020.1727532

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