Ophthalmomyiasis interna posterior: report of case caused by the reindeer warble fly larva and review of previous reported cases

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SUMMARY A 13-year-old boy from northern Norway had a living reindeer warble fly larva in the vitreous and typical subretinal tracks in his right eye. The larva was removed alive and normal visual acuity was preserved. This is the first time the reindeer warble fly larva (*Oedemagena tarandi*) has been found to cause myiasis in man.

Ophthalmomyiasis interna posterior (OIP) often produces an acute illness with inflammation, pain, and reduced visual acuity. In some cases, however, the disease may cause few or no symptoms, and the signs of OIP in the form of pigmented tracks in the fundus or a dead larva in the vitreous are accidentally discovered.^{1–5}

We report the first case of OIP in which a larva was removed alive from the vitreous and the visual acuity of the eye was preserved. The larva was identified as a first-stage larva of the reindeer warble fly (*Oedemagena tarandi*). This fly has not previously been known to cause human myiasis.⁶ A complete survey of the literature of OIP is presented.

Case report

At the end of September 1980 a 13-year-old boy from the coast of northern Norway presented with photophobia, vitreous floaters, and reduced visual acuity. For 4 weeks he had been treated with chloramphenicol eye drops for conjunctivitis. The right eye had a moderate anterior and posterior uveitis. A living larva, approximately 4.5 × 1 mm (Fig. 1), was seen in the vitreous. In the temporal part of the fundus multiple retinal haemorrhages were seen (Fig. 2) and also pigment epithelium disturbances forming curved lines (Fig. 3). The left eye was normal. Visual acuity RE 5/12, LE 5/5. Intraocular pressure RE 26 mmHg,

LE 14 mmHg. The general physical examination was negative. There was no eosinophilia.

The anterior part of the eye gave no indication of where the larva had entered the eye. Treatment was with topical steroids, and on 7 October a pars plana vitrectomy was performed and the larva was freed from its vitreous connections. Through a separate pars plana opening the larva was removed alive with a

Fig. 1 The reindeer warble fly larva in the vitreous.

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Fig. 2 Retinal haemorrhages in the upper temporal quadrant.

Fig. 3 Composite postoperative picture showing the major part of the fundus and the cerclage. The pigmented track can be followed from 7 o'clock position to 5 o'clock position where a turn is made. The track gradually disappears at 2 o'clock. The round retinal hole, where it is believed that the larva penetrated into the vitreous, is in the middle of the pigmented scar on the local implant at 1 o'clock position. Below the macula the photocoagulation scar is seen.

foreign body forceps. By grasping the larva lying on the fundus the forceps came into contact with retina, causing a small haemorrhage. This area was photo-coagulated, because a retinal hole could not be excluded.

The operation was performed as a closed intra-ocular operation through the pars plana with corneal contact lens and operating microscope. During the operation it was noticed that the lens was subluxated with a defect in the zonular apparatus in the lower temporal quadrant. On 14 October a postoperative retinal detachment with a round equatorial hole at the 1 o'clock position was successfully operated on with a standard encircling procedure combined with extrac scleral silicone rubber implant, cryosurgery, and drainage of subretinal fluid. At 7 months the visual acuity was RE 5/6. All retinal haemorrhages were now absorbed. Fig. 3 is a composite postoperative picture of the fundus taken 3 months after the operation.

THE LARVA

The cylindrical larva (Fig. 4) measured 4.5×0.9 mm. Superficially it resembled *Hypoderma lineatum* and *Hypoderma bovis*. The cephalopharyngeal skeleton, which is the most important feature for separating the first-stage larva of warble flies, agreed with the description given by Natvig,⁷ Grunin,⁸ and Zumpt,⁹ of the first-stage larva of the reindeer warble fly (*Oedemagena tarandi*, order Diptera, family Oestridae). The specimen was also compared with material of *Oedemagena tarandi* and *Hypoderma lineatum*, collected by Natvig,¹⁰ from the Zoological Museum in Oslo, confirming the identification.

LIFE HISTORY OF OEDEMAGENA TARANDI

The oviposition occurs mainly in July and August. The eggs are attached to the fine woolly down which constitutes the undercoat of the reindeer. The larva

Fig. 4 The extracted larva of the reindeer warble fly (*Oedemagena tarandi*). (×16).

(0.7–0.8 mm) hatches after 4–7 days, penetrates the skin, and migrates in the connective tissue and the muscles towards the rump and spine of the host. The first larval stage lasts about 3 months, and the larva may reach a size of 9 mm. The larva moults its skin when it has ended its migration, becoming a second-stage larva. Small tumours, or warbles, appear when the larva first moults, mainly in October. The second and third larval stages last for 3–4 months each. The mature larva leaves the warble between April and July, falls to the ground, and pupates. The pupal stage lasts for 31–33 days and the new warble fly emerges.

REVIEW OF LITERATURE

In 1934 Anderson¹¹ referred to 8 previous cases of OIP and added a 9th case. Of these 9 eyes 6 were enucleated.

In a search of the literature after 1934 we have found an additional 19 reports^{1–5 15–28} with a total of 22 cases (Table 1). Complete reports of 2 cases were not available (footnote, Table 1). As OIP we have listed all cases where a larva has been found behind the iris/lens diaphragm, or where characteristic tracks in the fundus have been seen. We have not included the case of Avizonis,²⁹ because the larva was not seen in the posterior part of the eye.

Of all the 31 reported cases a living larva has been observed in only 6 eyes^{5 18 20 25 30 31} (information was missing for the cases of Forniches¹⁵ and Biewers¹⁷). In one eye the larva died in the vitreous,³⁰ in one eye the living larva was removed from the vitreous by sclerotomy,³¹ and in one eye the living larva was destroyed by vitrectomy.²⁶ Vision was lost in all these 3 cases. In one eye the larva was seen to move from the posterior to the anterior chamber, where it was removed.¹⁸ In 2 eyes the living larva was subretinal,^{5 25} and in one of these the larva was destroyed by photocoagulation.²⁵

In 5 cases the larva died spontaneously without seriously damaging the eye^{1 2 4 11 16} (information was missing for the case of Forniches¹⁵). We have had the opportunity to re-examine the patient described by Haarr.¹⁶ After 38 years the remnants of the larva were still seen in the vitreous. The eye showed no sign of inflammation, and visual acuity was 5/5.

Of all 31 cases only one was bilateral,⁵ and in only one eye has more than one larva been seen.²⁴

Discussion

The reindeer warble fly is widely distributed over the range of its host in northern Eurasia and northern North America.⁶ Except for one record of larvae in the skin of a musk ox (*Ovibus moscatus*) in Canada¹² the reindeer (*Rangifer tarandus*) has been the only

animal known as host of the reindeer warble fly.⁹ Until now the larva has been unknown as a human parasite,⁶ though Natvig¹³ observed that the fly often attacked and deposited eggs in the hair of humans. Brejev and Brejeva¹⁴ tried to infect man with newly hatched larvae, without success. In our case the fly may have deposited eggs on the hair of the eyebrows or eyelids, and the hatched larvae then reached the eye on a short migration route.

Most authors have thought that the larva enters the eye through the ocular coats from the conjunctival sac. This view has been supported by histology.^{32–34} In the present case it is possible that the larva penetrated the sclera in the 8 o'clock position just behind the ora where the pigmented track starts, wandered in the subretinal space, and penetrated the retina in the 1 o'clock position, making the round hole that caused the postoperative retinal detachment (Fig. 3).

Some authors have discussed the possibility of a haematogenous entry of the larva,^{5 35} but proof of this has not yet been given. Byers and Kimura,³⁶ however, have reported haematogenous entry into the vitreous of a nematode.

In one case the larva entered the eye through the optic nerve head.³⁰ It has also been suggested that pigment lumps along the pigmented tracks in the fundus might represent spots where the larva has penetrated the eye.³ This seems unlikely, because usually only one larva is present, and there may be several pigmented spots.^{4 23} In a number of cases, haemorrhages in the fundus have been described.^{5 11 19 24 25 28 30} They were also present in our case. Some authors believe that the haemorrhages could be explained by mechanical action of the larva.^{25 28} In our case this is probably not true, as they had no connections with the pigmented tracks and no lesions in the retina could be seen. In our opinion these haemorrhages may be the result of a toxic, enzymatic, or immunological reaction caused by the larva. The larva seems to move easily between the retina and the pigment epithelium, making the pigmented tracks that are considered pathognomonic of OIP.^{3–5 27 28} The larva may also wander in the choroid without producing any visible tracks.⁵

Lens dislocation has been reported in several cases of OIP,^{16 18–20 26} including the present. This may be mechanical damage produced by the larva,^{16 19} but the larva may also produce zonulolytic enzymes.^{37 38}

A larva may wander between the anterior and posterior part of the eye,^{18 19 23 24 29 35 39–41} and some authors consider the division between OIP and OIA (ophthalmomyiasis interna anterior) to be artificial.^{19 42} However, the division between OIP and OIA is probably justified because of differences in diagnosis, treatment, and prognosis.^{20 21}

As it is impossible to see subretinal tracks of a

Table 1 Cases of ophthalmomyiasis interna posterior reported after 1934

Year of publication	Author	Country	Age/ Sex	Symptoms and findings	Treatment and result
1943	Forniches don A ^{*15}	Spain	—	Larva found in the vitreous	(<i>Hypoderma bovis</i>)
1945	Haarr M ¹⁶	Norway	12/M	Uveitis. Sublux. of lens. Dead larva in vitreous. No subretinal tracks	Conservative. Vision 5/5 at re-examination in 1981
1948	Biewers ^{†17}	Germany	10/F	Uveitis. Sublux. of lens	Enucleation (<i>Hypoderma bovis</i>)
1952	Vesely L ¹⁸	Czechoslovakia	10/M	Sublux. of lens. Subretinal tracks. Uveitis. Vision hand movements. Larva seen to migrate from posterior to anterior chamber	Larva removed from anterior chamber (<i>Rhinoestrus purpureus</i>). Vision 1/60
1954	Kiel E ¹⁹	Germany	9/M	Uveitis. Sublux. of lens. Larva seen in vitreous. Retinal haemorrhages	Corticosteroids. Enucleation (Larva not found at necropsy)
1957	Eickemeyer KA ²⁰	Germany	11/M	Uveitis. Sublux. of lens. Living larva seen in vitreous	Enucleation. Larva found in ciliary body. (<i>Hypoderma bovis</i> ?)
1958	Guadalupi U, Pampiglione S ²¹	Italy	7/M	Uveitis. Larva not seen	Enucleation. Larva found in ciliary body. (<i>Hypoderma bovis</i>)
1958	Musial A ²²	Poland	15/F	Panophthalmia.	Enucleation. Larva found at necropsy
1969	Dixon JM <i>et al.</i> ²³	USA	45/F	Uveitis. Numerous winding trails in fundus. Larva moved from posterior to anterior chamber	Larva removed from anterior chamber. Vision 20/40 at 6 months follow-up. (<i>Cuterebra larva</i>)
1970	Hunt EW ¹	USA	43/F	Floater in the field of vision. No inflammation. Dead larva in the vitreous. Subretinal tracks	None. Vision 20/20 at 18 months follow-up
1970	Rakusin W ²⁴	S. Africa	29/F	Uveitis. Retinal oedema with haemorrhages. 2 larvae	Corticosteroids. Larvae removed, vision lost. (Probably <i>Oestrus ovis</i>)
1972	Brown JW ²	USA	43/F	Disturbance of vision. Larva seen in the vitreous	Conservative
1974	Fitzgerald CR, Rubin ML ²⁵	USA	21/M	Anterior uveitis. Subretinal tracks. Larva seen to move subretinally. Retinal haemorrhages	Systemic prednisone and thiabendazole. Photocoagulation of larva. Vision 20/40 at 6 months follow-up
1976	Gass JDM, Lewis RA ³	USA	19/M	Mild visual dimness. Subretinal tracks. No inflammation. Vision 6/6. No larva seen	
			15/F	Blurred vision. Subretinal tracks. No inflammation. Vision 6/12. No larva seen	None
			55/F	Subretinal tracks discovered by routine examination. Vision 6/6. No larva seen	
1977	Haut J <i>et al.</i> ²⁶	France	4/F	Uveitis. Sublux. of lens. Larva seen behind lens/iris diaphragm	Phacophagy, vitrectomy and subtotal retinectomy. Larva destroyed. Vision lost
1979	Slusher MM <i>et al.</i> ⁴	USA	3	Subretinal tracks. Subretinal scar presumed to be a dead larva. No inflammation. Vision 20/25	None
			49/M	Floater in the field of vision. Dead larva in the vitreous. Subretinal tracks. Vision 20/200	
1979	Potgieter F, Scheuer JA ²⁷	S. Africa	12/M	Loss of vision. Uveitis. Subretinal tracks. No larva seen	Systemic corticosteroids. Vision 6/24 at 6 months follow-up
1980	Ziemianski MC <i>et al.</i> ²⁸	USA	15/M	Sudden loss of vision. No inflammation. Dead larva in vitreous. Subretinal tracks. Retinal haemorrhages. Vision: counting fingers at 1.5 m	Larva not removed. Photocoagulation of exit wound in retina
1981	Mason GI ⁵	USA	33/M	Distortion in the central vision left eye. Bilateral subretinal tracks. Subretinal haemorrhages. A larva was seen to move subretinally in left eye. Vision RE 20/25, LE hand motions	Ultimate fate of larva unknown
1981	Syrdalen P <i>et al.</i>	Norway	13/M	Uveitis. Living larva in vitreous. Subretinal tracks. Retinal haemorrhages	Larva removed alive from vitreous (<i>Oedemagena tarandi</i>). Vision 5/6 at 7 months follow-up

^{*} Report not available. Case mentioned by Fernandez.¹⁵
[†] Report not available. Case mentioned by Eickemeyer.²⁰

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larva, the diagnosis of OIP may be very difficult. In a case of exudative uveitis and suspected foreign body, OIP should be considered.⁴² In doubtful cases the determination of IgE in aqueous humor and corresponding serum may help in the diagnosis.³⁷

The treatment of OIP can be summarised as follows: a dead larva should not be removed if the eye is quiet.^{3,28} A living larva in the vitreous should be removed if there is an inflammatory reaction which does not respond to steroid therapy.³ If there is no inflammation, the larva can be watched inside the eye and developments followed.³ If removal is considered, the pars plana technique probably offers the best chances of success. A living subretinal larva should be destroyed by photocoagulation if outside the macular area.^{3,25,28} It may also be possible to kill the larva in the vitreous by photocoagulation, but this has not yet been done. To prevent retinal detachment an entry passage should be photocoagulated.²⁸ Steroids should be given according to the degree of inflammation.^{3,27}

With the present means of diagnosis and treatment, the prognosis seems much more favourable today than at the beginning of the century.

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