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Ophthalmia nodosa secondary to intraocular, white-marked tussock caterpillar setae (*Orgyia leucostigma*) in a 15-year-old

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Abstract

A 15-year-old female presented to the emergency department with a 1-day history of pain and swelling of her right eye following ocular contact with a caterpillar. Caterpillars of the white-marked tussock moth and other related species possess hairlike structures called setae, with angled barbs along their length, allowing them to travel linearly upon penetration of an enemy, resisting backward movement and becoming very difficult to extract once imbedded. When these fine, pointed hairs contact the surface of the eye, they can easily migrate in, eliciting movement of the globe, blinking, and rubbing of the eye in an attempt to remove the offending agent, potentially leading to ophthalmia nodosa. One of the most important aspects of ophthalmia nodosa diagnosis is a thorough history and prompt slit-lamp examination to identify the presence of foreign bodies and where they are located; this will help guide clinical management decisions. This case demonstrates that, depending on the number and location, more than one attempt may be required to remove all of the barbed setae. If ophthalmia nodosa is suspected, it is important to promptly refer to ophthalmology for a thorough eye exam, keep the eye clean, prescribe prophylactic topical antibiotics and/or steroids to reduce the potential for infection and inflammation, and emphasize the importance of keeping the eye protected during the healing process with an eye shield.

Keywords

Ophthalmia nodosa, caterpillar setae, ocular trauma, pediatrics

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Introduction

During the peak of spring, from March to April, in north central Florida, the larvae of the white-marked tussock moths are abundant (Image 1). Their morphology consists of a soft larval body entirely covered with short, 2- to 5-mm stiff bristles called setae, which are readily ejected from the caterpillars as a defensive mechanism against predators. The setae have angled barbs along their length called spicules which point toward their tips,[1] allowing them to travel linearly upon penetration of an enemy, resisting backward movement and becoming very difficult to extract once imbedded.[2,3] Upon contact with the surface of the eye, these setae can easily migrate in, causing irritation to various ocular and surrounding structures[4] in a granulomatous inflammatory process called ophthalmia nodosa.

Case

A 15-year-old female with no significant past medical history presented to the emergency department (ED) with a 1-day history of pain and swelling of her right eye following ocular contact with a caterpillar. The previous day, she looked skyward, and a caterpillar landed on her eye from the above foliage. She promptly closed her eyelid and brushed the insect from her face. Despite attempting to wash out her eye, it began to immediately swell, itch, and tear. Over the following 3 h, she developed increasing eye pain and edema, and it became difficult for her to open her eye; therefore, she presented to the ED for evaluation. Description of the species,

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Image 1. Caterpillar of the white-marked tussock moth.
Source: Photograph by Sydney Levy, Gainesville, Florida.

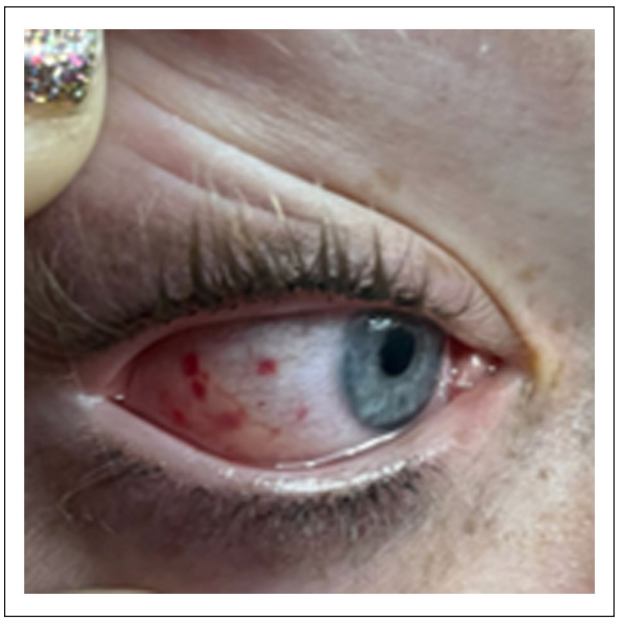

Image 2. Punctate hemorrhages developed within several hours after setae contact. Photo taken prior to presentation to emergency department.

and confirmation by the patient, identified it as a caterpillar of the white-marked tussock moth, *Orgyia leucostigma*.

On initial physical exam, the patient was well-appearing with normal vital signs. Her ophthalmological exam demonstrated significant right eye subconjunctival injection with clear discharge and photophobia (Image 2). A Wood's lamp examination confirmed increased fluorescein uptake along the right lateral bulbar conjunctivae. Her intraocular right eye pressure was 18 mm Hg, compared to her unaffected left eye which was measured to be 13 mm Hg (normal intraocular pressure for 15-year-old females is 7.46–18.54). The remainder of her physical exam was normal. She was prescribed erythromycin 5 mg/g ophthalmic ointment and moxifloxacin 0.5% ophthalmic solution one drop each in right eye four times daily, over the counter pain medication, and warm compresses. In addition, she was referred to pediatric ophthalmology.

The patient's right eye pain and eyelid swelling continued to worsen over the following day, at which point she presented to the ophthalmologist for further evaluation. External examination revealed protective ptosis and mild edema of the right upper eyelid. Slit-lamp examination of the right eye revealed 2+ injection of the bulbar conjunctivae temporally and pseudomembrane of the upper lid and temporal palpebral conjunctivae. In addition, numerous caterpillar setae were present on right upper lid palpebral conjunctiva, embedded in bulbar conjunctiva, and lower lid palpebral conjunctiva. Topical anesthetic (lidocaine 2%) was instilled on the corneal surface and numerous conjunctival caterpillar setae were removed successfully. Unfortunately, several conjunctival setae were unable to be removed in clinic; these setae required surgical removal in an operative setting the following day. After surgical removal, the patient was prescribed neomycin–polymyxin–dexamethasone 3.5–10,000–0.1 ophthalmic suspension one drop in right eye four times daily and moxifloxacin 0.5% ophthalmic solution one drop in right eye four times daily.

One week later, the patient returned to the ophthalmologist's office with concerns for continued eye discomfort. Slit-lamp examination of the right eye demonstrated two short setae (Image 3) remaining in the upper palpebral conjunctiva temporally, which appeared to be epithelialized, and two small temporal conjunctival cysts near the limbus. Visualization of the temporal cornea revealed superficial horizontal and vertical linear scratches likely caused by retained foreign bodies; however, no intraocular hair was identified, as the anterior chamber remained without evidence of penetration. Given the potential difficulty of accessing the small remaining setae, the patient opted to forgo a removal attempt and continue with close monitoring. A bandage contact lens was placed to prevent eye rubbing and reduce the risk of further migration of the hair into the anterior chamber, while promoting epithelialization of dissolution of any remaining foreign bodies. The patient was instructed to continue moxifloxacin for prophylaxis, stop neomycin–polymyxin–dexamethasone due to mild ophthalmic hypertension, start lubricating eye drops, avoid touching her eye, and continue use of her protective eye shield as needed. The patient reported resolution of her symptoms 2 weeks later at her follow-up appointment; thus, the moxifloxacin and bandage contact lens were discontinued. It is pertinent to recognize that throughout this patient's course, the fundus and vitreous cavity remained quiet, with no

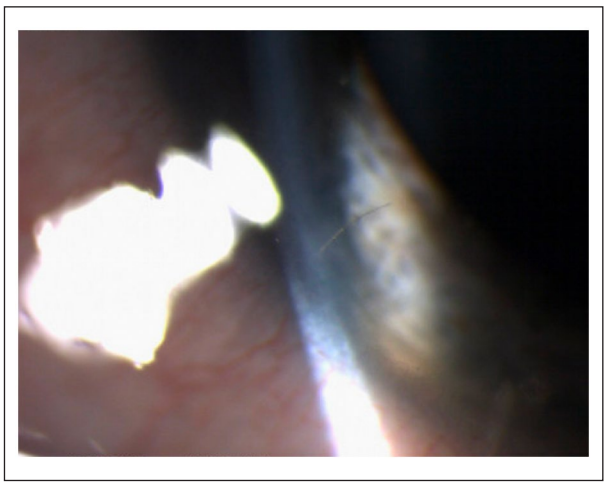

Image 3. Intraoperative image from slit-lamp exam of right eye, showing caterpillar setae embedded in deep cornea, resting on Descemet's membrane (arrow).

known damage caused by setae invasion. Re-examination of the eye is recommended for this patient in several months, to evaluate whether any setae migrated further into the vitreous cavity and posterior segment, since it is likely that unidentified setae remained even though her symptoms were largely resolved.

Discussion

Ophthalmia nodosa is an ocular granulomatous reaction[3] which can be caused by any small, hairlike foreign bodies from arthropods or vegetation, including caterpillar setae, as seen with our patient. Unlike many other moth species, the setae of white-marked tussock moth caterpillars are not inherently venomous;[5] however, the presence of a foreign body within the eye is sufficient to elicit an inflammatory response that can manifest as chronic palpebral and bulbar conjunctivitis, anterior uveitis, vitritis, chorioretinal lesions, or macular edema.[6]

Microscopy of the caterpillar setae has demonstrated series of barbs or spike-like structures that are fixed to the central stalk and oriented toward the tip, which allows the setae to move unidirectionally and resist backward translation upon penetration of a surface such as the conjunctiva, and this particular process is thought to be pathognomonic.[7] When the setae make contact with the eye, this elicits movement of the globe, blinking, and rubbing of the eye in an attempt to remove the offending agent. The setae can subsequently be propelled into intraocular structures, from the anterior chamber into the lens, vitreous humor, and retina.[4] A retrospective analysis published in 2010 by Sengupta et al.[8] found that the only significant risk factor for intraocular penetration of caterpillar hair was the presence of deep intracorneal hair at diagnosis, and the removal of intracorneal hairs was only possible in 36% of cases. This illustrates that once setae or hairs have traveled intraocularly, it is exceedingly difficult to remove them and these cases require close interval follow-up to monitor for further serious complications.

Treatment consists of topical corticosteroids with or without ophthalmic antibiotics or can be as invasive as microsurgical foreign body removal in the operating room.[6] Initially, our patient had conjunctival and corneal setae removed using slit-lamp examination in outpatient ophthalmology clinic, but ultimately required microsurgery to remove retained setae that caused persistent pain and inflammation. In addition, our patient was prescribed topical antibiotics and steroids including neomycin–polymyxin–dexamethasone 3.5–10,000–0.1 ophthalmic suspension and moxifloxacin 0.5% ophthalmic solution along with a protective patch and bandage contact lens to prevent infection and prevent further irritation and inflammation. The two foreign remnants remained after surgery, but within 2 weeks, were no longer causing her pain or itching, likely having epithelialized.

Conclusion

One of the most important aspects of ophthalmia nodosa diagnosis is a thorough history and prompt slit-lamp examination to identify the presence of foreign bodies and where they are located; this will help guide clinical management decisions. Cases such as this one demonstrate that, depending on the number and location, more than one attempt may be required to remove all the barbed setae. It can be challenging to visualize and subsequently access such small foreign bodies while minimizing damage to ocular structures, especially if the setae are embedded beyond the anterior chamber. If ophthalmia nodosa is suspected, it is important to promptly refer to ophthalmology for a thorough eye exam, keep the eye clean, prescribe prophylactic topical antibiotics and/or steroids to reduce the potential for infection and inflammation, and emphasize the importance of keeping the eye protected during the healing process; this will help prevent further migration of any retained setae. In our case, a bandage contact lens was an effective physical barrier worn by the patient, which helped her avoid further irritating the affected eye and prevented further migration of any retained foreign bodies intraocularly. Close interval follow-up is planned for the patient in the coming months to monitor for resolution or further complications.

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Ethical approval

Our institution does not require ethical approval for reporting individual cases or case series.

Informed consent

Written informed consent was obtained from a legally authorized representative(s) for anonymized patient information to be published in this article.

Patient consent

Written consent was obtained by the patient's legal caregiver approving this case report.

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