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J Case Rep Images Pediatr 2023;5(2):6–11.
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Aural myiasis by Sarcophagidae in a pediatric patient: A case report and literature review

Emery Mintz, Hannah Smitherman

ABSTRACT

Introduction: Physicians often treat patients in the urgent and non-urgent settings who present with various types of foreign bodies lodged in the external auditory canal (EAC). This can cause significant distress to the patient, as well as the caregiver in pediatric cases. Typically, these objects are inanimate and include beads, rocks, toys, craft supplies, food particles, and jewelry. However, sometimes the patient will present with biotic organisms in the ear that seem to cause considerably more distress and damage, including otalgia and otorrhea from abrasions to the EAC, or damage to the tympanic membrane. These creatures can present alive or dead in the EAC. The culprits can include crawling and flying species. However, even rarer, the larval stages have been reported. When an ear is infested by Diptera larvae, the juvenile stage of a fly, the parasitosis is known as aural myiasis.

Case Report: In this case, a 7-year-old boy in acute distress presented to the emergency department with left ear otalgia and pruritis. His ear canal was covered in dried blood, and he was found to have 15–20 maggots belonging to the Sarcophagidae family in the left EAC that were removed via lidocaine application and normal saline irrigation.

Conclusion: The patient and his caregivers were educated on hygienic practices and advised on outpatient follow-up. Further research is indicated for best practices treating aural myiasis and establishing environmental risk factors.

Keywords: Aural myiasis, Otalgia, Otic foreign body, Parasitosis

How to cite this article

Mintz E, Smitherman H. Aural myiasis by Sarcophagidae in a pediatric patient: A case report and literature review. J Case Rep Images Pediatr 2023;5(2):6–11.

Article ID: 100022Z19EM2023

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doi: 10.5348/100022Z19EM2023CR

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Received: 01 July 2023
Accepted: 01 September 2023
Published: 19 September 2023

INTRODUCTION

Otalgia is a very common chief complaint in Pediatrics. While the differential diagnosis of otalgia typically involves acute otitis media, serous otitis media, Eustachian tube dysfunction, and otitis externa, foreign bodies in the external auditory canal is not an uncommon etiology [1]. Of the 17,325 aural foreign bodies removed in England's NHS hospitals between 2010 and 2016, 14,875 (85.9%) of these cases occurred in children, with children aged 5–9 most responsible [2]. Jewelry (primarily beads) accounted for nearly 40% of aural and nasal foreign bodies, with cotton buds and pencils being second and third most common in the auditory canal [2]. Unfortunately, there is not significant data on the most common aural foreign bodies removed at health care facilities in the United States.

Although inanimate objects are by far the most common culprit, insects may account for up to 18% of aural foreign body cases [3]. Among insects found in the EAC, cockroaches appear to be the most common for adult and pediatric populations [4–6]. While cockroaches themselves are not venomous, they can bite and scratch, and their presence in the EAC can be extremely painful

and distressing, demanding prompt urgent care. Other organisms reportedly found in the EAC include other crawling and flying species such as ants and termites [7]. One subcategory of aural parasitosis involves parasitic fly larva as the invading culprit. This can occur when female flies lay eggs in the EAC. The resulting dipterous larvae can colonize this environment and feed on host tissue in a disease process known as aural myiasis. Aural myiasis is more commonly encountered in tropical and subtropical regions [8]. Of note, aural myiasis is far more common than nasal myiasis and ophthalmomyiasis, with aural myiasis believed to account for roughly 90% of ear-nose-throat (ENT) myiases [9].

The insect that induced the aural myiasis in this case belongs to the Sarcophagidae family. While these insects often colonize deceased carcasses and can even be used as forensic indicators to date a corpse's time of death, it is uncommon for them to habituate in a live human [10].

In this case report, a 7-year-old boy presented to a large (greater than 100,000 patient visits per year), tertiary, free-standing, urban pediatric emergency center staffed by board-certified pediatric emergency medicine specialists with the chief complaint of "something moving in [his] ear." Insects were identified within the EAC, removed successfully, and the patient was treated with full recovery. This case report reviews the presentation, removal processes, treatment variations, and post-removal environmental evaluation considerations for aural myiasis that have not been fully explored in the literature.

CASE REPORT

In February, a previously healthy 7-year-old boy presented to the pediatric emergency department at 0625 complaining of a "wiggling" and "crawling" sensation in his left ear that began a few hours prior. The sensation started suddenly and became very itchy, so he scratched his left EAC persistently. The patient informed his father, who noticed blood and mobile organisms in the EAC. The patient and his family live in an inner-city apartment.

Upon arrival, the patient was in distress and reported left otalgia along with pruritis. He was then administered 200 mg of oral ibuprofen in triage. There was no reported hearing loss, observable purulent discharge, or facial weakness. The patient denied any fever, cough, congestion, vomiting, or diarrhea. His vitals were within normal limits. In the ED, dried bright red blood was visualized in the EAC without any active bleeding (Figure 1). Using an otoscope, 15–20 live, moving, gray-white vermicular organisms, approximately 3–5 mm in length each (Figure 2), were visualized in the EAC beyond the meatal opening. Initial clinical suspicion was that these organisms were *Enterobius vermicularis*, given the commonality of this parasite in the general population, the father's initial description of the organisms, and their appearance (small, thin, and vermicular) on otoscopic examination.

Figure 1: External auditory canal with dried blood.

Figure 2: Larvae irrigated from the patient's left ear.

Due to this suspicion, a stat dose of Albendazole (400 mg) was given. Of note, no literature on enterobiasis in the ear canal could be found for this report, despite the parasite's common pursuit of dark passages. The patient denied pruritus in locations other than the left ear. No additional foreign bodies were detected, and there was no visible cellulitis, necrosis, otitis media, or tympanic membrane perforation. Inspection of the right ear and the remaining general physical exam were unremarkable. 2 mL of a 2% lidocaine solution was administered topically in the left ear to anesthetize the organisms and provide local relief. Approximately 30 minutes later, the left EAC was gently irrigated with multiple 10 mL flushes of normal saline. About 15–20 larvae were irrigated from

the canal. The organism was noted to be slightly shorter and wider than pinworms. Specimens of the organism were sent to microbiology and identified as belonging to the Sarcophagidae family.

Following thorough irrigation, the patient denied any remaining pruritus or "crawling" sensation in his ear. On careful otoscopic re-examination, no further organisms were visualized in the left EAC or in the contralateral ear. Upon organism identification, further history was obtained. The family denied living on or near a farm, forest, or woods. They denied any knowledge of nearby dying animals or decaying carcasses. Nonetheless, not only were the patient and his parents educated on aural hygiene and skin care, but they were also asked to perform an inspection of their current living space for any possible vectors. Further, the hospital's infectious disease service was consulted. The infectious disease service recommended ethanol glycerin ear drops (ethyl alcohol 70% solution) to mitigate bacterial growth. The patient was prescribed ciprofloxacin-dexamethasone otic suspension ear drops to prevent secondary infection and inflammation due to the presence of blood on presentation and irritation of the EAC. A second, outpatient Albendazole order was discontinued upon identification of the organism. The patient's father was also advised to schedule an appointment with the patient's pediatrician for a one-week follow-up appointment to assess for any re-infestation or secondary complications. There were no further complications detected or interventions needed at follow-up.

DISCUSSION

Otic foreign bodies are a common chief complaint as well as incidental finding in pediatric populations. However, this case report focuses on insects, specifically those of the Sarcophagidae family, as inciting agents. This case is particularly interesting as aural myiasis seems to be much less common than other forms of aural parasitosis, even in the southern United States, based off reported and anecdotal evidence. As stated in the Introduction, cockroaches seem to be the most common insect found in the ear. However, it is presumed that in this patient, an adult fly laid eggs in the EAC, which then hatched in this location. Similar to the presence of other foreign objects in the EAC, aural myiasis can present with otalgia, hearing loss, pruritis, and otorrhea [11]. While often self-limiting, a diagnosis of aural myiasis, especially in children, should prompt evaluation for predisposing pathologic conditions, such as otitis externa, chronic suppurative otitis media, and diabetes mellitus [12]. Chronic otorrhea has been recognized as a risk factor for aural myiasis in generally healthy children [13].

This diagnosis should also trigger inquiries into whether the child is being neglected or living in unacceptable conditions, as aural myiasis is more prevalent in children with these risk factors [14]. For the patient in this case, he had no known history of diabetes mellitus or any other immunosuppressive diseases. His vaccinations were up-to-date, and he was consistent with attending pediatric well-checks. He and his father appeared well-groomed. Given his stable and insignificant medical history and kempt appearance, there was not high suspicion of child neglect that could have provided a breeding ground for aural myiasis. It should be noted that this patient lived in a subtropical region, where aural myiasis is more common [8]. While this patient did not travel recently, recent travel to international locations from the western world should be recognized as a risk factor for aural myiasis and other forms of myiasis [15].

A systematic review of 63 aural myiasis cases across 24 countries found that insects of the Sarcophagidae family were the most common culprit (named in 23 of the 44 cases with an identified parasite) [16]. This review also found no predisposing patient risk factors in 30 of the 63 cases. So although there are known risk factors that foster development of aural myiasis, they are not obligatory; therefore, we suggest that a potential diagnosis of aural myiasis should not be disregarded if a patient does not have known risk factors. In 23 of the 63 cases, further complications, such as tympanic perforation, cellulitis, otitis media, and temporal bone involvement, were noted [12]. Given the reasonable possibility of ensuing complications, a diagnosis of aural myiasis should be followed up with examination for these potential complications and prompt treatment. In this case, there were no complications noted on physical exam, and there was no suspicion of temporal bone involvement, so no head imaging was performed. Even without clinical suspicion of mastoid extension, some articles reviewed mentioned performing head computerized tomography (CT) scans on the patient, likely for precautionary purposes. There are no clear guidelines on when to perform a head CT given a diagnosis of aural myiasis, but suspicion of mastoid invasion should prompt imaging [13].

An extremely rare consequence of aural myiasis is intracranial infestation (brain myiasis), which has an approximate fatality rate of 8% [9]. However, this outcome is particularly unusual and specific cases are not listed in any of the literature reviewed for this case report. One literature review of 34 manuscripts published between 1992 and 2012 detailed 45 incidents of aural myiasis and found that none of these cases involved intracranial myiasis or reported deaths. 11% of the patients in these manuscripts did, however, require surgery during follow-up treatment, often tympanoplasty [17].

Treatment considerations

Regardless of life stage, treatment of insects in the EAC follows a different process than the more non-urgent, mundane removal of inert objects. Pre-removal, we suggest that due to the severe pain and discomfort caused by insect movement, the insect should be initially

anesthetized with a topical anesthetic, such as 2% lidocaine. Consideration could be given to a dose of oral pain medication, such as acetaminophen or ibuprofen, as well. When insect movement and pain ceases, the patient can be more cooperative and comfortable for the removal procedure. For removal, in general, most practitioners' primary tool is forceps. However, there are some drawbacks to the use of forceps, starting with a child's fear of instrumentation, as well as potential discomfort if the child is not 100% cooperative or well restrained. Secondary damage is possible with forceps. Further, forceps are often only capable of removing tidbits of body parts, such as legs and wings, depending on the integrity of the insect's body and the insect's life stage. Irrigation of the EAC with sterile, warmed normal saline or water via angiocath and/or small butterfly tubing attached to a small syringe have been excellent alternatives in the authors' experiences. Post-removal inspection of the EAC and tympanic membrane should be very thorough as, anecdotally, live and active foreign bodies seem to cause injury, such as EAC abrasion and tympanic membrane perforation, even prior to the instrumental removal attempts. Hence, a topical otic antibiotic (with or without steroids) should be considered if irritation and trauma are present. Typically, systemic antibiotics are reserved for when a patient has concomitant otitis media [12]. In this case, the infectious disease consultant recommended ethanol glycerin ear drops (ethyl alcohol 70% solution) as well.

It should be noted that although there was clinical suspicion of aural enterobiasis, our literature review has found zero confirmed cases of this diagnosis. While there have been isolated cases of extraintestinal enterobiasis in the nose, eyes, and salivary glands, there are no known reports of *Enterobius vermicularis* in the ear [18]. Therefore, although larvae of the Sarcophagidae family may appear visually similar to roundworms of the *Enterobius* genus, treating clinicians should not suspect enterobiasis when a patient presents with vermicular organisms in the EAC.

Consideration should be taken to formal identification of the specimen. Identification and classification of the organism can help direct treatment and suggest what the underlying vector for infection may be [19]. In some confirmed cases of aural myiasis, molecular tools have been used to further identify the insect to the subgenus level [9]. The treating facility's laboratory may have insect identification capabilities, as well as local extension offices, universities, and online platforms. These advanced confirmatory measures could help direct evaluation of the patients' home environments. From the treating providers' end, diagnosis of a specific insect can be facilitated by obtaining details about the patient's living environment and recent areas visited, along with the climate conditions of these regions [13]. Patient education on vector control and hygiene, and follow-up to confirm that the infestation and resulting damage have resolved are also highly recommended. Deep space infections and tissue necrosis are rare and would potentially require imaging with recommended ENT consultation.

Home environment considerations

In this case, the infectious disease specialist inquired about any nearby dead animals or decaying carcasses. The family denied any known vectors, but the caregivers were instructed to search their home and areas where the child plays in search of a possible source. With pediatric aural myiasis cases, we should question whether a more formal investigation of the home environment is warranted. We should also consider in-depth evaluation of the child's well-being. Of note, the family in this case reported a stable, good housing situation with running water and electricity. Transportation was reliable, and they had a well-documented history of timely well-child checks. No further investigation seemed warranted at the time, and primary provider follow-up was assured. For clinicians with a suspicion of aural myiasis in a patient, lack of associated risk factors, such as nearby deceased livestock, unsanitary living conditions, diabetes, and mental disability should not lead to exclusion of aural myiasis from the differential. There are a few studies that focus on the relationship between insect infestations/home living conditions and aural parasitosis that recognize these conditions as a risk factor, but the research is limited and mainly focused in endemic areas [13]. Epidemiologists could potentially address environmental risk factors for aural myiasis in the United States in greater depth.

Future considerations

Aural parasitosis and, in particular, aural myiasis present as unusual subsets of otic foreign bodies. Certain aspects of this case's presentation highlight potential differences when compared with inanimate otic foreign bodies and suggest the potential for new studies and considerations. For example, geography and the local living environment could have an impact on the commonality of certain presentations. Further, this case presented in the late night/early morning hours; it is possible that time of day and season contribute to aural parasitosis presentations. Although presentation can be variable, especially given the extent of infestation, we hypothesize based off current evidence that otic foreign bodies consisting of live agents, when compared to inert foreign bodies, often present more dramatically, with urgency in the late night or early hours of the morning, and tend to be more traumatic due to pain from secondary aural trauma as well as emotional distress for the patient and caregiver.

CONCLUSION

Although the patient in this case was treated, his treatment plan was not based on any protocol, and the source of his infection remains unknown. Future studies could elaborate and help with pattern identification,

environmental risk factors (particularly in the western world), anticipatory guidance for caregivers regarding home environments, imaging recommendations, and potential protocol development (e.g., lidocaine drops in triage) for suspected aural myiasis.

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Acknowledgments
We would like to thank Wizzie Brown, BCE, Senior Program Specialist with IPM and Entomology at Texas A&M AgriLife for assistance and Dr. James Marshall, MD for critical review prior to submission.

Author Contributions

Emery Mintz – Conception of the work, Design of the work, Acquisition of data, Analysis of data, Interpretation of data, Drafting the work, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Hannah Smitherman – Conception of the work, Design of the work, Acquisition of data, Analysis of data, Interpretation of data, Drafting the work, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Guarantor of Submission
The corresponding author is the guarantor of submission.

Source of Support
None.

Consent Statement
Written informed consent was obtained from the patient for publication of this article.

Conflict of Interest
Authors declare no conflict of interest.

Data Availability
All relevant data are within the paper and its Supporting Information files.