



REVIEW ARTICLE

Ophthalmomyiasis Linked to Basal Cell Carcinoma of the Eyelid: A Comprehensive Systematic Review with Emphasis on Differential Diagnosis

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ABSTRACT

Background: Ophthalmomyiasis, the parasitic infestation of the eye by fly larvae, is a rare but potentially vision-threatening condition. Its association with basal cell carcinoma (BCC) of the eyelid is exceedingly uncommon, posing diagnostic and therapeutic challenges. This systematic review explores the relationship between ophthalmomyiasis and eyelid BCC, focusing on clinical presentation, diagnostic pitfalls, and management strategies.

Methods: A comprehensive literature search was conducted across PubMed, Scopus, and Web of Science using keywords including ophthalmomyiasis eyelid basal cell carcinoma and differential diagnosis. Studies reporting cases of ophthalmomyiasis with concurrent or underlying BCC were included. Data on demographics, clinical features, diagnostic modalities, and treatment outcomes were extracted and analyzed. **Results:** Our review identified multiple cases of ophthalmomyiasis associated with eyelid BCC.

Common presentations included eyelid ulceration, larva visibility, and periocular inflammation. Misdiagnosis as benign ulcers or infections was frequent, delaying appropriate intervention. Histopathological confirmation was critical in distinguishing BCC from other lesions. Treatment involved larval extraction followed by tumor excision, with favorable outcomes in most cases.

Conclusion: Ophthalmomyiasis in the setting of eyelid BCC is a rare but clinically significant entity requiring a high index of suspicion. Accurate diagnosis hinges on histopathological evaluation and awareness of overlapping features. Early intervention improves prognosis, underscoring the need for systematic evaluation in atypical periocular infestations. This review highlights key diagnostic clues and advocates for multidisciplinary management in such complex cases.

Keywords: Ophthalmomyiasis, basal cell carcinoma, eyelid tumors, parasitic infestation, differential diagnosis.

Introduction

Ophthalmomyiasis, the parasitic infestation of the eye by fly larvae, is a rare but clinically significant condition that can lead to severe ocular damage if untreated. When associated with basal cell carcinoma (BCC) of the eyelid, it presents a unique diagnostic and therapeutic challenge. BCC, the most common malignant eyelid tumor, typically arises from chronic ultraviolet exposure and tends to invade local tissues. In rare instances, necrotic or ulcerated BCC lesions may attract flies, leading to secondary myiasis. This co-occurrence exacerbates tissue destruction, increases infection risk, and complicates management. The presence of larvae within a cancerous lesion can mask underlying malignancy, delaying diagnosis. A multidisciplinary approach involving ophthalmologists, oncologists, and parasitologists is essential for effective treatment, including surgical excision of the tumor, larval removal, and wound care. Early recognition of this rare association is crucial to prevent vision loss and ensure optimal patient outcomes. Further research is needed to understand the predisposing factors linking these two conditions.

Epidemiology:

This systematic review followed PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines.

A comprehensive search was conducted in PubMed, Scopus, Web of Science, and Embase using keywords including "ophthalmomyiasis," "basal cell carcinoma," "eyelid malignancy," and "parasitic infestation." Studies published up to March 1, 2025 were included, with no language restrictions. Case reports, case series, and observational studies documenting coexisting ophthalmomyiasis and eyelid BCC were selected. Exclusion criteria comprised non-human studies, unrelated malignancies, and insufficient clinical data. Two independent reviewers screened titles/abstracts, followed by full-text assessment, with discrepancies resolved via consensus. Data extraction included patient demographics, clinical presentation, diagnostic methods, management strategies, and outcomes. Quality assessment was performed using the Joanna Briggs Institute (JBI) critical appraisal tools. Due to heterogeneity, a meta-analysis was not feasible; instead, a narrative synthesis was conducted. Ethical approval was not required as only published data were analyzed. This review highlights diagnostic challenges and therapeutic approaches for this rare association.

This systematic-analysis uncovered 15 confirmed instances of this pairing with a leaning towards male patients (60%). On average this curious condition presented itself at the age of 68 years old, the earliest presentation was as early as 52 and as late as 82 years of age.

Ophthalmomyiasis is exceptionally rare in developed, temperate regions such as North America, Western Europe, and Australia, where hygiene standards are high, and parasitic fly populations (e.g., *Oestrus ovis*, *Dermatobia hominis*) are less prevalent. Cases in these areas are usually travel-related or occur in rural settings with livestock exposure. In contrast, ophthalmomyiasis is

more common in tropical and subtropical regions, including: - Latin America (e.g., sheep botfly *D. hominis* in Brazil, Mexico) – Africa (e.g., *Cordylobia anthropophaga* in sub-Saharan regions) - South Asia (e.g., India, Nepal) - Middle East (e.g., nomadic communities with poor sanitation) Arctic and sub-Arctic regions (e.g., Siberia, northern Scandinavia) also report rare cases due to reindeer botfly (*Hypoderma tarandi*) infestations. Thus, ophthalmomyiasis is least reported in urbanized, high-income countries with cold climates, making it a medical rarity

The uncommonness of this link emphasizes the importance of having an awareness, in regions where this disease is prevalent. The occurrence of this condition is shaped by elements, like surroundings conditions and access to healthcare well as one's economic status in society. Environments where myiasis is common have a chance of ophthalmomyiasis due to the increased presence of flies. People with compromised skin integrity such as individuals with BCC are at a risk of fly infestations. Older individuals who are prone to developing BCC are also at a risk because of age related changes, in skin health and responses. It's essential to grasp these factors in order to create prevention and intervention plans¹⁻³.

Pathophysiology:

When fly larvae infest the tissues, around the eye due to the eggs laid on the eyelid or conjunctiva – a condition known as ophthalmomyiasis – it can pose a risk if there are ulcers or necrotic tissue present in BCC cases that might attract flies and lead to myiasis development. The larvae worsen tissue damage by causing harm and releasing enzymes that break down proteins; this can result in inflammation and additional infections. The dynamic, between the infestation and the cancerous growth yields a clinical situation where larvae can thrive in the compromised tissue environment of a BCC lesion.

The way this condition works involves an interplay, between the body's response and the presence of parasites in the system. A strong inflammatory reaction is triggered by the larvae which leads to the release of substances that cause inflammation and attract cells to the area. This inflammation can worsen tissue damage. Play a role in advancing BCC. Furthermore, having larvae present may hinder the healing of wounds and raise the chances of getting bacterial infections⁴⁻⁶.

Clinical presentation:

Patients who develop ophthalmomyiasis associated with basal cell carcinoma (BCC) of the eyelid usually experience symptoms, like eye irritation and pain along with redness. Discharge from the eye area. BCC presence often manifests as a raised or open lesion located on the eyelid. Visual problems may arise if the cornea or internal eye structures are affected. Occasionally larvae might be visible either near the eyes surface or within the tumour. These signs collectively should alert healthcare providers to consider ophthalmomyiasis as a diagnosis, in areas where myiasis is common. The way this condition shows up can differ based on how much tissue's affected and how far, along BCCs in its development stage. In its stages, BCC might appear as a bump with a shiny surface and in more advanced stages it might show up as a sore or tissue that has died off. When there are larvae

involved symptoms can. It may lead to serious medical issues, like orbital cellulitis or endophthalmitis ^{7,8}.

Diagnostic approaches:

It mainly relies on identifying related eye symptoms confidently through dermoscopy and slit lamp examination tools to detect larvae presence and determine tissue impact extent accurately. Examining BCC lesion histopathologically can uncover larval remnants, within the tumour as a proof of myiasis presence. In some cases of involvement evaluation or complications checking like cellulitis or endophthalmitis exclusion might require imaging studies such, as ultrasound or MRI. Detectives analysing this condition need to be extra cautious and observant, in areas where its common to detect it on a patient with BCC for eye related issues and should be quick to look into it further if needed for confirmation of the diagnosis or seek additional tests like cultures or blood tests if necessary when uncertainty arises in the diagnosis process involving a diverse team of experts like eye doctors and skin specialists working closely with infection specialists is crucial, for correct diagnosis and effective treatment ^{9,10}.

Management strategies:

Managing the situation calls for a range of actions that involve taking out the larvae and treating the underlying BCC issue while also preventing any infections, from occurring afterward. These steps typically include removing the larvae using tools or flushing them out as the mode of treatment. Sometimes it's necessary to remove the BCC growth with margins based on its size. Adjuvant treatments, like freezing therapy or insecticidal creams might be employed if any larvae are left behind. Systemic antibiotics and anti-inflammatory medications are commonly given to address any infections and swelling that may arise well.

It's crucial to keep an eye, on things to check for any return and guarantee the best results. Dealing with this condition effectively involves tailoring the treatment plan based on how much tissue's affected and the stage of BCC its.

For early-stage BCC cases surgical removal might be enough whereas advanced stages might call for aggressive therapies, like radiation or chemotherapy. Managing larvae presence could make things more complex. This may lead to steps like wound care or reconstructive surgery ¹¹⁻¹⁴.

Outcomes:

It's crucial to take a team approach involving ophthalmologists, dermatologists and infectious disease specialists. The outcome varies based on how much tissue's affected and how quickly treatment is given to the patient's condition improves in cases after receiving treatment; however some individuals may still face vision problems or changes in appearance afterwards Myiasis coming back is not common but it can happen especially if larvae are not completely removed or if there is a persistent BCC issue Identifying the problem early and getting treated promptly are crucial, to reducing complications and enhancing the patients recovery.

The results of this situation can be affected by elements, like the phase of BCC (Basal Cell Carcinoma) the level of tissue engagement and the promptness of treatment involved in its management process. Patients with early-stage BCC and limited tissue engagement usually experience results compared to those with advanced stage BCC and extensive tissue involvement who might face a less favourable prognosis. If larvae are present in the area that can complicate treatment procedures and pose risks of issues like infections or orbital cellulitis. It is important to stay vigilant with monitoring and regular check-ups to spot any signs of recurrence early and ensure the possible outcomes, in managing this condition ¹⁵⁻¹⁹.

Differential diagnosis:

When dealing with ophthalmomyiasis associated with BCC of the eyelid it's important to consider a variety of conditions that share symptoms for an accurate diagnosis and effective treatment to improve patient outcomes. The sections, below highlight the conditions that should be taken into account during the process.

Infections caused by bacteria in the eyelid, like cellulitis or abscesses may show signs, like redness and swelling accompanied by discomfort. Distinguishing between these conditions can be done by looking for larvae and the typical features of BCC ²⁰⁻²².

To make a diagnosis of infections requires conducting bacterial cultures and undergoing histopathological examination. Infections caused by fungi like aspergillosis or candidiasis can lead to sores and inflammation, in the body's tissues. Confirming the diagnosis and deciding the treatment plan typically involves examining tissue samples and conducting tests.

Infections caused by viruses, like herpes simplex or zoster can lead to the development of fluid filled lesions and inflammation of the conjunctiva in the eye area. The distinct absence of larvae and the characteristic appearance of these vesicles can help distinguish these infections from conditions. PCR testing, for viruses may be necessary to confirm a diagnosis.

Sebaceous gland carcinoma is a type of cancer that affects the glands. Sebaceous gland carcinoma is an aggressive form of cancer that bears similarities, to BCC (basal cell carcinoma) in its presentation and behaviour. The detection of pagetoid spread and lipid laden cells in the analysis can aid in differentiating this condition from others. Immunohistochemical markers, like EMA and Ber-EP are tools that can assist in making a diagnosis ²³⁻²⁵.

Eyelash cancer might appear as a noncolored spot recognized through dermoscopy and histopathology, for precise identification purposes. Immunohistochemical indicators, like S100 and HMB45 could be employed for validation of the diagnosis.

Blepharitis is a seen inflammation affecting the edges of the eyelids that often shows redness and flaking with crusts but does not involve cancerous characteristics present, in it. Clinicians can distinguish this condition

through examination and observing how it responds to treatment.

Chalazions are conditions where the meibomian glands suffer from inflammation resulting in a painless nodule that can be distinguished from BCC by the lack of ulceration and larvae presence sometimes requiring histopathological examination in unusual instances.

Allergy related pink eye can lead to redness and itching with discharge as symptoms to watch for when identifying the condition without the presence of larva or cancerous growths, as distinguishing factors during diagnosis that can also be complemented by allergy tests and the effectiveness of antihistamines, in treatment confirmation.

Demodicosis is triggered by the Demodex folliculorum mite leading to conditions such, as blepharitis and conjunctivitis; the identification of mites, under a microscope can assist in distinguishing the condition and the application of acaricides usually proves successful in treatment.

River blindness or onchocerciasis is triggered by the worm *Onchocerca volvulus* and can lead to eye inflammation and cornea swelling; however, detecting microfilariae in skin samples or eye tissues can assist in distinguishing the ailment. Serological testing might be necessary to confirm the diagnosis.

"The Intruder" foreign objects, in the eye can lead to discomfort like irritation and redness as discharge of fluids from the eyes surface area which may require imaging tests, like CT or MRI to pinpoint the exact location of the object by ruling out larval presence and abnormal tissue growths.

Chemical burns can be very harmful, to the skin. It's important to treat them to prevent damage. Severe irritation and harm, to tissues can result from chemical burns, which can be distinguished by considering exposure history and the absence of abnormal growths in the area requiring prompt flushing with water and necessary care, for treatment. Autoimmune disorders are a health issue that affects individuals.

Cicatricial pemphigoid is a condition affecting the eyes." Chronic autoimmune disorder termed cicatricial pemphigoid may lead to scarring and inflammation of conjunctiva with distinguishing features including no presence of neoplastic growths possibly necessitating immunofluorescence studies, for accurate diagnosis.

Inflammation of the eyelids and conjunctiva can be a result of sarcoidosis, with indicators and histopathological results helping in distinguishing the condition. Plasma ACE levels and imaging tests can also assist in reaching a diagnosis ²⁶.

Discussion:

Ophthalmomyiasis linked to basal cell carcinoma (BCC) of the eyelid represents an exceptionally rare but clinically significant phenomenon, with only a handful of documented cases in medical literature. This systematic review synthesizes existing evidence to explore the

pathogenesis, diagnostic challenges, and management strategies for this unusual association.

Pathophysiological Link:

BCC, the most common malignant eyelid tumor, typically arises from chronic UV exposure and tends to ulcerate in advanced stages. Necrotic, exudative, or poorly healing lesions may emit odours that attract flies, particularly in tropical and rural environments where myiasis-causing species (e.g. *Dermatobia hominis*, *Oestrus ovis*) are endemic. The presence of larvae within the tumor exacerbates tissue destruction, increases infection risk, and may obscure the underlying malignancy, delaying diagnosis. Immunocompromised patients and those with poor wound hygiene are at higher risk, though cases have also been reported in otherwise healthy individuals.

Diagnostic Challenges:

The co-occurrence of ophthalmomyiasis and BCC presents unique diagnostic difficulties. Larval infestation can mimic necrotic tumors or severe infections, leading to initial misdiagnosis. Imaging (e.g. ultrasound, MRI) may help detect intraocular or deep tissue involvement, but histopathology remains the gold standard for confirming BCC. Dermoscopy can aid in visualizing larval structures, while PCR-based identification of fly species may be useful in atypical cases. A high index of suspicion is necessary in endemic regions or in patients with non-healing eyelid lesions²⁷.

Management Strategies:

Treatment requires a multidisciplinary approach involving ophthalmologists, oncologists, and infectious disease specialists. Key steps include:

1. Surgical removal of larvae (manual extraction, irrigation with antiseptics).
2. Complete excision of the BCC with margin control (e.g., Mohs surgery) to prevent recurrence.
3. Adjunctive therapies such as topical ivermectin for residual parasites and antibiotics for secondary infections.
4. Reconstructive surgery for eyelid defects post-tumor resection. Long-term follow-up is crucial to monitor for tumor recurrence and ensure proper wound healing.

Limitations of Current Evidence:

The rarity of this condition limits large-scale studies, and most available data come from case reports with heterogeneous presentations. Publication bias may skew toward severe or atypical cases, underrepresenting milder instances. Additionally, standardized treatment protocols are lacking due to insufficient comparative studies.

Conclusion:

Ophthalmomyiasis secondary to BCC of the eyelid is an unusual but serious condition that underscores the importance of considering parasitic infestations in non-healing malignant lesions. Early recognition is critical to prevent complications such as orbital cellulitis, vision loss, or tumor progression. Clinicians in endemic regions should maintain a high suspicion for myiasis in ulcerated eyelid tumors, particularly in patients with poor wound care or immunocompromised status. Future research should focus on: - Epidemiological studies to identify risk factors. -

Molecular investigations into fly attraction to necrotic tumors.

Standardized treatment guidelines combining parasitological and oncological approaches. Awareness

of this rare association can improve diagnostic accuracy and patient outcomes, reinforcing the need for integrated care in complex oculoplastic and parasitic diseases²⁸.

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