Cerebral Myiasis Secondary to Burr Hole Evacuation: A Rare Illustrative Case Report

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Abstract
Myiasis (maggot infestation) is a condition in which fly maggots feed off and develop in the tissues of living organisms. Most common in tropical and subtropical regions, human myiasis, is prevalent among individuals in close association of domestic animals and those inhabiting the unhygienic conditions. We, hereby, describe a rare case of cerebral myiasis (17th in the world, 3rd in India) that presented to our institution in Eastern India secondary in the operated site of craniotomy and burr hole few years back. Cerebral myiases are exceedingly rare conditions, especially in high-income countries with only 17 previously published cases with the reported mortality as high as 6 out of 7 cases dying of the disease. We additionally also present a compiled review of previous case literatures to highlight the comparative clinical, epidemiological features and outcome of such cases. Although rare, brain myiasis should be a differential diagnosis of surgical wound dehiscence in developing countries where conditions do exist in this country that permit myiasis. This differential diagnosis should be remembered, particularly when the classic signs of inflammation are not present.

Keywords
► cerebral myiasis
► encephalitis
► maggots
► seizures
► wound dehiscence

Introduction
Myiasis (maggot infestation) is a condition in which fly maggots feed off and develop in the tissues of living organisms.1 Most common in tropical and subtropical regions, human myiasis is prevalent among individuals in close association of domestic animals and those inhabiting the unhygienic conditions.3,4 Other factors like immunocompromised status, diabetes, unhygienic conditions, and delay in seeking medical attention, may contribute to its prevalence.5 In developed nations, it is typically associated with travel or immigration from endemic areas. Cerebral localization of myiasis is exceedingly rare2,5,6 and the involvement of a large area of brain tissue can result in very severe manifestations. Till date, only 17 such cases of cerebral myiasis have been reported.

We, hereby, describe another such rare case of cerebral myiasis that presented to our institution in Eastern India. We additionally also present a compiled review of previous case literatures to highlight the comparative clinical, epidemiological features and outcome of such cases.
Case Report

In November 2022, a 64-year-old male was brought to us with the complaint of multiple episodes of focal seizures and altered sensorium for the past 5 days, nonresponsive to medications. He presented with a large cranial lesion over the left temporal region with exposed brain and severe maggot infestation.

Tracing back the history, the patient was diagnosed with left frontoparietal chronic subdural hematoma in March of the year 2014. Hematoma evacuation with burr hole was done and the patient was discharged thereafter under satisfactory conditions. Two months postoperatively, he developed acute onset right-sided hemiplegia with slurring of speech. Repeat neuroimaging (noncontrast computed tomography [CT] brain) was done. It was suggestive of large hematoma with mass effect with midline shift. Hence, craniotomy and repeat hematoma evacuation were done through the same site as before. He improved postsurgery and improved over period of 15 to 20 days and was asymptomatic over the next 4 years. He was on regular medications but did not follow up thereafter. Unfortunately, due to improper hygiene, care and missed clinical appointments, the patient developed a small sinus at the operated site of burr hole with serous discharge. He showed to a local physician and the sinus apparently healed with medications. The lesion recurred with continuous foul-smelling bloody discharge for the past 10 days with enlarging left temporal extensive ulcerative lesion over the flap. As the patient clinically worsened, he was brought to our department.

The patient lived alone and was negligent to his wound. He had been taken to seek medical attention repeatedly but had always been partly compliant. Maggot infestation went unrecognized by family.

Physical examination revealed left temporal scalp and cranial calvarium erosion (4 cm × 5 cm; Fig. 1). The edges of the skin were hypertrophied and erythematous with eroded frontal dura, exposed cortex, and massive cortical maggot infestation. A cluster of approximately 20 to 30 motile maggots was found at the center of the defect with apparent serosanguinous discharge. The lesion smelled of rotten eggs (Video 1). A plain CT scan of head was done (Fig. 2) that revealed an extensive left frontotemporal defect with brain exposure.

Fig. 1 A large temporal cranial lesion with exposed brain and severe maggot infestation.

Video 1

A cluster of approximately 20 to 30 motile maggots was found at the center of the cranial defect. Online content including video sequences viewable at: https://www.thieme-connect.com/products/ejournals/html/10.1055/s-0043-1769895.

The patient was immediately planned for surgical debride ment. He was anesthetized with regional scalp block and sterile turpentine oil-soaked gauge was placed within

Fig. 2 Noncontrast computed tomography head revealed an extensive frontotemporal bony defect with brain exposure.
the wound for the maggots to come out of the wound site. They were then handpicked using a forceps and around 25 to 30 maggots were removed. The osteomyelitic calvarial bone was debrided (►Fig. 3). The maggots were live and motile. Attendants were shown the organisms.

Thereafter, the patient was managed conservatively with broad-spectrum intravenous antibiotics and started showing signs of recovery. Daily dressings were done. His seizures gradually improved as the focus of cerebral irritation were excised. Repeat wound examination and neuroimaging showed no signs of new larvae development.

The maggots were sent for microbiological examination and were classified as Sarcophaga carnaria species (►Video 2). The cerebrospinal fluid (CSF) cultures sent were sterile. The patient almost reached normal sensorium and had no seizures for past 48 hours post which he was discharged and cranial reconstruction is planned on next visit after 6 weeks.

**Table 1** List of worldwide reported cases of cerebral myiasis.

<table>
<thead>
<tr>
<th>Sl. no.</th>
<th>Case</th>
<th>Year</th>
<th>Place</th>
<th>Age/Sex</th>
<th>Setting</th>
<th>Location</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Froomin15</td>
<td>1939</td>
<td>Russia</td>
<td>50 y/F</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Unknown</td>
</tr>
<tr>
<td>2.</td>
<td>Semenov16</td>
<td>1969</td>
<td>Russia</td>
<td>4 y/M</td>
<td>Scalp wound</td>
<td>Occipital</td>
<td>Death</td>
</tr>
<tr>
<td>3.</td>
<td>Zucoloto and Rossi17</td>
<td>1971</td>
<td>USA</td>
<td>53 y/M</td>
<td>Facial myiasis</td>
<td>Frontal</td>
<td>Death</td>
</tr>
<tr>
<td>4.</td>
<td>Rossi and Zucoloto11</td>
<td>1973</td>
<td>USA</td>
<td>5 m/F</td>
<td>No prior lesion</td>
<td>Frontal</td>
<td>Death</td>
</tr>
<tr>
<td>5.</td>
<td>Gilly et al18</td>
<td>1976</td>
<td>France</td>
<td>7 y/M</td>
<td>ICH</td>
<td>Frontal</td>
<td>Death</td>
</tr>
<tr>
<td>6.</td>
<td>Pouillaude et al19</td>
<td>1980</td>
<td>France</td>
<td>6.5 y/M</td>
<td>ICH</td>
<td>Frontal</td>
<td>Death</td>
</tr>
<tr>
<td>7.</td>
<td>Arbit et al13</td>
<td>1986</td>
<td>Canada</td>
<td>63 y/M</td>
<td>Scalp SCC</td>
<td>Frontal</td>
<td>Recovered</td>
</tr>
<tr>
<td>8.</td>
<td>Kalkoçi et al20</td>
<td>1989</td>
<td>Turkey</td>
<td>8 y/M</td>
<td>ICH</td>
<td>Parieto-occipital</td>
<td>Recovered</td>
</tr>
<tr>
<td>9.</td>
<td>Cheshier et al5</td>
<td>2007</td>
<td>USA</td>
<td>75 y/M</td>
<td>Angiosarcoma</td>
<td>Frontal</td>
<td>Death</td>
</tr>
<tr>
<td>10.</td>
<td>Marco de Lucas et al12</td>
<td>2008</td>
<td>Spain</td>
<td>11 y/M</td>
<td>Cutaneous myiasis</td>
<td>Frontal</td>
<td>Unknown</td>
</tr>
<tr>
<td>11.</td>
<td>Teterov et al14</td>
<td>2010</td>
<td>USA</td>
<td>42 y/M</td>
<td>Post-traumatic</td>
<td>Frontal</td>
<td>Recovered</td>
</tr>
<tr>
<td>12.</td>
<td>Giri et al10</td>
<td>2016</td>
<td>India</td>
<td>38 y/M</td>
<td>Postcranioplasty</td>
<td>Frontotemporal</td>
<td>Recovered</td>
</tr>
<tr>
<td>14.</td>
<td>Piña-Tornés et al2</td>
<td>2016</td>
<td>Ecuador</td>
<td>30 y/M</td>
<td>Cutaneous myiasis</td>
<td>Parieto-occipital</td>
<td>Unknown</td>
</tr>
<tr>
<td>15.</td>
<td>Aggarwal and Maskara6</td>
<td>2018</td>
<td>India</td>
<td>26 y/M</td>
<td>Scalp burn wound</td>
<td>Parietal</td>
<td>Recovered</td>
</tr>
<tr>
<td>16.</td>
<td>Curzi et al1</td>
<td>2020</td>
<td>Italy</td>
<td>72 y/M</td>
<td>Basal cell carcinoma scalp</td>
<td>Frontal</td>
<td>Recovered</td>
</tr>
<tr>
<td>17.</td>
<td>Algahtany et al122</td>
<td>2021</td>
<td>Saudi Arabia</td>
<td>24 y/M</td>
<td>Post-traumatic</td>
<td>Temporal and cerebellar</td>
<td>Recovered</td>
</tr>
<tr>
<td>18.</td>
<td>Current case</td>
<td>2022</td>
<td>India</td>
<td>64 y/M</td>
<td>Postcraniotomy</td>
<td>Frontotemporal</td>
<td>Recovering</td>
</tr>
</tbody>
</table>

**Discussion**

The term myiasis was first coined by Hope in 1840.7 There are two types of myiasis based on its incidence: the primary and the secondary. In primary myiasis, the larvae penetrate the skin via a puncture wound, while in the secondary variety, fly eggs are laid into a skin ulcer. Benign or malignant dermatological or traumatic conditions have been associated with secondary myiasis,5,6,8,9 mostly attributable to inadequate wound care.6,10,11 Cerebral myiases are exceedingly rare conditions, especially in high-income countries2,3,8 with only 17 previously published cases (►Table 1), and may lead to:

**Video 2**

to life-threatening complications with the reported mortality as high as six out of seven cases dying of the disease. 10

In India, myiasis is commonly caused by common housefly Musca domestica nebulo. Sixteen out of eighteen cases showed male preponderance. More than half the cases (11 out of 18) are from developing nations. Only three cases (including the current case) have been reported from India. The frontal parenchymal involvement was common (66% of all cases). The age of presentation varied from 5 months to 75 years. Cases prior to the last two decades showed 96% mortality, while most cases recovered thereafter, probably to effective recent advances in antibiotics and antisepsis. Forty-four percent cases showed invasive cutaneous myiasis, while 64% was postcraniotomy.

A contrast-enhanced CT or magnetic resonance imaging is recommended to rule out venous sinuses integrity. 9 The deeper the brain involvement, lesser was the survival. The larvae may penetrate the brain and spread via CSF to the subependymal space. 12 Treatment relies on larvae removal, debridement of necrotic/malignant tissue, and reconstruction of the defect. In the case of massive erosion and brain exposition, gentle irrigation with saline solution and mechanical removal is suggested. A sodium hypochlorite solution is also recommended, both intraoperatively and as a dressing. Intra-venous broad-spectrum antibiotics are mandatory. Even in the setting of an open skull erosion with prolonged cortical exposure, in all available reports, surprisingly, there was absence of any secondary meningitis or encephalitis or sepsis. Maggot infestation may have reduced bacterial infection risk by protecting the tissue surface area and by eating dead tissues, leading to more prolonged survival. 5, 9, 13, 14

Conclusion

Human cerebral myiasis is an exceedingly rare condition and is almost never encountered by physicians. There is only one report of postcraniotomy brain myiasis in the literature. Although rare, brain myiasis should be a differential diagnosis of surgical wound dehiscence in developing countries where conditions do exist in this country that permit myiasis. This differential diagnosis should be remembered, particularly when the classic signs of inflammation are not present and brain CT shows hypodense round and regular lesions on imaging.

Informed Consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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References

7. Laurence SM. Dipterous larvae infection. BMJ 1909;9:88

Conflict of Interest

None declared.