CASE REPORT

Traumatic myiasis from *Sarcophaga (Bercaea) cruentata* Meigen, 1826 (Diptera, Sarcophagidae) in a hospital environment: reporting of a clinical case following polytrauma

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Key words

Parasitosis • Traumatic myiasis • Sarcophaga cruentata • Larvae • Nosocomial myiasis

Summary

We present a case of cutaneous myiasis occurring in a hospital environment (nosocomial myiasis) in an patient with serious multiple traumas sustained in a motorcycle accident. The agent responsible for the myiasis was identified as Sarcophaga cruentata (Meigen 1826). The larvae found in the necrotic wound were removed and the necessary environmental measures were taken to avoid further infestation. Although nonocomial myiasis is a form of parasitosis already cited in the in literature, it is a rare event and worthy of attention to aid in identifying parasitosis in hospitalized subjects in order to expedite proper diagnosis and treatment.

Introduction

In parasitology, myiasis is considered a well-defined pathological situation deriving from the infestation of part of the body by Diptera larvae. The term myiasis was introduced by Hope in 1840 [1] and the most widely accepted definition is that proposed by Frederick Zumpt in 1965: *"the infestation of live human and vertebrate animals with dipterous larvae, which at least for a period, feed on the host's dead or living tissue, liquid body substances, or ingested food"*.

Myiases are classified primarily according to two criteria: (i) the specificity or myiasigenic propensity of the species responsible for the parasitosis, taking into consideration if the species in the larval stage is obliged to live in healthy or necrotic tissues or whether it can develop in other substrates, and (ii) the infested anatomical area and the type of injury caused by the parasite's presence [2-4].

The latter classification is that most frequently used in the medical field as it provides a description of the pathological situation [5], whereas the former classification provides biological data on a given species that is less useful from a clinical and therapeutic standpoint, especially in the case of semi-specific or optional myiasegenic species that can infest several anatomic districts consequently generating a heterogeneous series of clinical situations.

However, classification based on specific myiasegenic propensity is useful, once the species has been determined, in reconstructing the dynamics of the parasitosis and when educating the host (i.e. patient) in order to prevent recurrence. On a practical level, myiases can be grouped into six categories: (i) cutaneous myiasis, (ii) furuncular myiasis, (iii) intestinal myiasis, (iv) cavity myiasis, (v) migratory or rampant myiasis and (vi) pseudomyiasis.

Cutaneous myiasis involves the dermis and epidermis and in some cases the subcutaneous and even deep tissue; this category includes traumatic myiasis which involves the infestation of wounds. Furuncular myiasis is characterized by the formation of an 'inhabited' furuncular lesion with a central breathing hole in which the larva resides; this category can also be considered as a subgroup of cutaneous myiasis. Intestinal myiasis involves the infestation of the gastric or intestinal tract; in these cases symptoms can be more or less evident.

Cavity myiasis is essentially any infestation of the anatomical cavities and openings and there are therefore several subcategories depending on the site of infestation: ocular myiasis, pharyngeal myiasis, aural myiasis, oral myiasis, nasal myiasis, ecc.

In migratory myiasis, the larva journeys throughout the host's body, and is expelled to the external environment prior to completing its development.

It is important not to overlook pseudomyiasis, in which larvae travel symptomatically or asymptomatically in the gastrointestinal tract and may be detected dead or alive in the host's vomit or feces; parasitosis is caused by ingesting contaminated food. In pseudomyiases the parasite does not complete its development inside the host whereas it does so in myiases.

In European countries, myiasis is a relatively unknown parasitosis and most cases are a result of importation by tourists returning home [6], particularly myiases caused by *Dermatobia hominis* [7]. There does not appear to

be evidence of possible autochthonous myiases in live hosts in Europe. We find relevant our analysis of a case of traumatic cutaneous nosocomial myiasis occurring in a hospitalized subject.

Case presentation

On 2 August 2008, a 43 year-old female subject was taken by helicopter to the Emergency Department (ED) at the Santa Croce and Carle hospital in Cuneo in northwest Italy following a frontal collision between two motorcycles. Upon arrival at the ED, the subject was unconscious and had been intubated by the emergency staff. The subject had an exposed fracture of the right tibia and the skin had been scraped off the limb with extensive lacerations extending to the lower right quadrant of the abdomen. The tissue lacerations showed significant amounts of dirt and tarmac debris as a result of the patient having slid across the ground at the moment of the accident. In the ED, the lacerations were washed using pressurized sterile saline solution in order to remove as much of the foreign fragments and debris as possible. This was followed by an initial reduction of the fracture and loose suturing of the wound. The patient was then admitted to the intensive care unit until 4 August, when she was transferred to the orthopedic unit in an isolated room used to accommodate subjects at risk of sepsis.
Pharmacological treatment included morphine and systemic antibiotic treatment with various active ingredients, given the various antibiotic resistances that emerged from swabs. The wounds were protected using abundant non-constrictive bandaging with sterile gauze compresses and gauze bandages; daily medication included thorough washing with quaternary ammonium and povidone-iodine disinfectants.
During medication on 7 August, 48 diptera larvae were observed and removed from the wounds to the peroneal muscles. The same day the ED requested an entomological consultation.
On the following day there was a pungent smell in the patient's room and the wounds were necrotic. Upon removal of the bandages the entomologist found (again on the peroneal muscles) 11 more larvae. Five were disposed of in 70% ethanol and set aside for identification; the remaining six were kept alive for breeding purposes in order to further confirm the species. In the meantime, the entomologist advised that the room be completely isolated and fitted with a UV-A trap and air conditioning in order to allow air changeover with the windows closed. No further larvae were observed during daily medication on 9 August. However, the local wounds gradually worsened in association with the patient's general clinical conditions: onset of fever elevated ESR, CRP and leukocytes.
On 27 August, given the high risk of sepsis, the limb was amputated above the knee. The patient experienced anemia during the following days but the ESR, CRP and leukocyte values dropped rapidly.

Discussion

The larvae collected were identified by analyzing the respiratory spiracles and cephalo-pharyngeal skeleton; all were third-stage *Sarcophaga* larvae. Confirmation of *S. (Bercaea) cruentata* Meigen, 1826 (= *S. haemorrhoidalis* Fallen) was affirmed from hatched adult specimens derived from the six larvae specimens which had been set aside.
On several occasions, species of the genus *Sarcophaga* have been indicated as responsible for enteric [8], oral [9], nasal [10], urogenital, aural [11, 12] and cutaneous (traumatic) [13, 16] human secondary myiases (semi-specific myiasis).
In the last forty years, approximately 30 cases of human myiasis have been attributed to *Sarcophaga*. Only in three or four cases has the species responsible been identified as *Sarcophaga haemorrhoidalis*; in the remaining cases identification has been limited to a generic level.
In the case we have presented it is presumed that wound infestation took place inside the hospital environment as no larval stage would have been able to survive the thorough, pressurized washing performed in the ED.
The cause of this case of myiasis must be sought out in the patient's transfer to the intensive care unit through an unprotected area adjacent to the exterior of the hospital where sarcophages (recognized semi-specific myiasegenic diptera known as a source of myiasis) were likely attracted by the smell of necrotic tissue [14-16].
It should also be noted that the wounds were never directly exposed to the hospital environment and were duly protected, however the bandage was probably unable to prevent the entry of first-stage larvae laid by females that were most likely situated on the bandages.
The presence of traumatic cutaneous myiasis in polytraumatized patients is sometimes attributed to poor general hygiene in the hospital facility; however it would be more correct to consider hospital myiasis (nosocomial myiasis) as an underestimation of the infectious and parasitic risks faced by a category of particularly sensitive patients with large suppurative, necrotic wounds.
Nosocomial myiases are a type of parasitosis present in the literature regarding subjects with various clinical conditions [13, 17-19] despite the fact that in Europe it is a rarely reported event [20]. The onset of myiasis in patients recovering from various ailments in hospitals is usually viewed negatively and perceived as a sign of inadequate hygiene which can result in a hospital risking litigation. For this reason, as well as ensuring the well-being of the patient, adequate preventative measures should be taken in patients who are more susceptible.
From a clinical standpoint, the larvae of semi-specific myiasigenic flies (belonging to the genera *Lucilia, Sarcophaga, Musca*, etc.) are not responsible for clinical decline in terms of tissue destruction since they feed on necrotic tissue. However, it is important to take into consideration that the presence of larvae inevitably corresponds to the previous or simultaneous presence of adult flies which are recognized as notorious vectors

for a number of pathogenic bacterial agents that can contribute to the worsening of infections.
From an operative point of view, in cases such as these it is necessary for the larvae to be removed mechanically, followed by thorough rinsing with sterile saline and disinfectant solutions. More important than treatment of the parasite is the preventative plan implemented for patients who are at risk for sepsis or who in any case have multiple suppurative or exposed traumatic lesions. These patients should be accommodated in special isolation rooms equipped with doors which close tightly, screens on the windows and UV-A lights (which a ventilation/capture feature to eliminate dipterous flies attracted to the light source). Where possible, rooms should be outfitted with air filter and circulation systems independent from the rest of the ward so as to discourage opening windows and removing the risk of flies entering.
In conclusion, we must note that the larvae of some flies, in particular *Lucilia*, should be regarded favorably as they are sometimes used successfully to treat cutaneous ulcerations which are unresponsive to conventional therapies e.g. diabetics' feet and decubitus ulcers [21, 22]. Indeed in some countries the usefulness of certain fly larvae is recognized by the respective medical entities and they are sold by pharmaceutical companies that produce and pack the larvae under sterile conditions.
At any rate, in the above-mentioned case, because of the high septicemic risk, even employing grafts of sterile larvae would not have resulted in clinical improvement of the patient.

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