

CASE REPORT OF MAGGOT INFESTATION ON DIABETIC FOOT ULCER

ABSTRACT

Myiasis is originated from the Greek word, Miya, which means fly. Fly larva are called maggots. Infestation of humans by maggots is called myiasis. Fly maggots feed on and develop in the tissues of living beings in a condition known as myiasis. The maggot (larvae) invades the skin and subcutaneous tissue is known as Maggot infestation. It was found that farmers who are working in agricultural fields are more susceptible to this infestation. Myiasis symptoms may vary according to the fly type, the number of larvae, and the location of the infected area. Many organs can be infested by these larvae and the most common form is cutaneous myiasis. The predisposing factors for cutaneous immobilization, advanced age, poor social conditions, mental retardation, diabetes mellitus, alcoholism, vascular occlusive disease, and infected dermatitis as myiasis. Myiasis is more common in tropical and subtropical countries, especially in rural regions where people are in close contact with animals. Myiasis represent the fourth most common travel-associated skin disease. A case of 55-year-old female patient was admitted with complaints of diabetic foot ulcer over left fore foot for 1 and half months and maggots were examined in the wound. The complete blood cell count [CBC] test shows that her HbA1c level was increased to 10.1%. The patient has undergone wound debridement on left forefoot and the maggots were completely removed.

Keywords: Diabetic Foot Ulcer, Debridement, Infestation, Maggot.

1. INTRODUCTION

Myiases are caused by parasitic fly larvae (maggots) identified in the International Classification of Diseases [1]. Maggot infestation or myiasis is a parasitic infestation in which fly larvae deposit eggs in the tissues of living organisms where they feed and complete their lifecycle [2]. Majority of flies that cause myiasis belong to the family *Calliphoridae* and *Cochilomyia hominivorax* and the flies belongs to the order *Diptera* [3]. Flies deliberately laying eggs in or on the tissues is called true myiasis [4]. The symptoms of myiasis differ depending on the insect's behaviour in relation to its host, i.e., obligatory or facultative myiasis [5]. In obligative myiasis, maggots are necessary to feed on living tissues [e.g. *Oestrus ovis* (*Oestridae*) and *Wohlfahrtia magnifica* (*Sarcophagidae*)] whereas in facultative myiasis flies

deliberately take advantage of wounds or degenerative necrotic conditions as a site in which to incubate their larvae[6]. The most common type of myiasis affects the skin (cutaneous myiasis Cutaneous myiasis subdivided into: traumatic or wound (Wound myiasis often occurs as an infestation of a fly larvae into wound), furuncular (larvae penetrate the healthy skin and a furuncle develops) and cavitary (larvae invade mainly the digestive and urinary tracts)[7]. Diabetic patients who had myiasis fall into the wounded skin group.

1.1 LIFE CYCLE OF MAGGOT:

A fly's life cycle is divided into four stages: Egg, Larvae, Pupa, And Adult.

i. Stage 1 –The Egg:

Female adult flies lay their eggs in wounds after fertilisation. A female fly can lay up to 300 eggs at a time. The size of eggs is about 1-2mm. The eggs can take between eight to twenty hours to hatch at skin temperature after which they enter the first of three larval stages.

ii. Stage 2- The Larvae (Maggots):

The emergent larvae are also known as maggots as they brew from the eggs. During this stage, the larvae undergo multiple changes as they grow rapidly. Before each instar stage, the larvae moult multiple times, shedding layers of their skin. The larvae feed on the fluid that is discharged from the body at first.

The hatched larvae appear creamy colour and grow up to 5 mm in length and in their first instar before shedding their skin. In the second instar stage, the larvae continue feeding at this stage and molt or shed their skin for the first time. The larvae can reach a length of 10 mm. In the third instar stage, Their colour ranges from creamy to a light brown or reddish. They molt once again at this stage. The larvae measure 15 mm to 20 mm in length by the time they reach their third instar. Once emerged they grow rapidly, within twenty four hours at human temperature they grow up to 7- 8.5 mm long.

The time difference between each stage varies; it takes roughly 3 days in warmer temperatures and eight weeks in colder climates. The larva becomes large at each moulting and instar stage until it reaches pupa stage.

iii. Stage 3 - The Pupa

The white colourless maggots or larvae develop at this stage and resemble adult flies. The pupa seeks out a suitable site for this stage of development.

The pupa is protected by the last, hard larval skin, known as the puparium, which encloses the pupa. The pupa takes four to six days to mature into an adult fly in warm temperatures.

iv. Stage 4 -The Adult

The pupa emerges from the puparium and is ready to mate at this stage. Adult flies have reached sexual maturity and have begun the mating process. The adult fly feeds on proteins secreted from bodily fluids at this stage. When a fly converts from a pupa to an adult, they fly to new locations in quest of food. After they've finished eating, they mate and look for a suitable place to deposit eggs. The entire procedure then repeats itself.

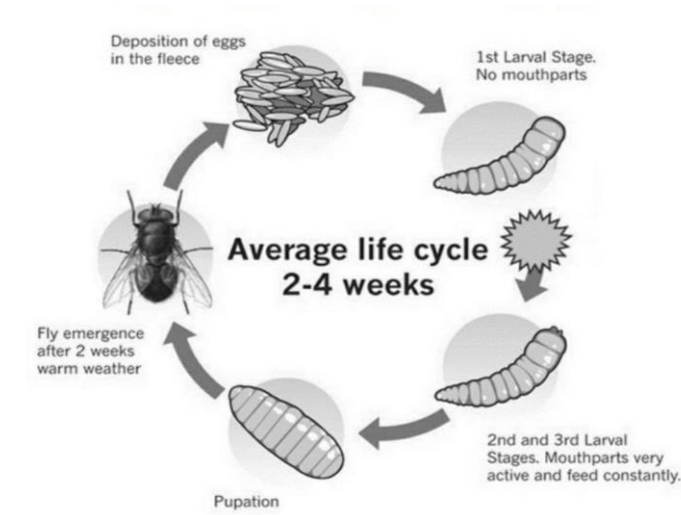


Fig. 1. LIFE CYCLE OF MAGGOT

Table 1. Appearance of mature maggot

Species	Incubation period	Appearance of mature maggot
<i>Cochliomyia hominivorax</i>	4-8 days	Typical larvae shape, 15-17mm long, bands of spines encircling anterior margin of each body segment.
<i>Cordylobia anthropophaga</i>	10-12 days	Oval shaped maggots, 11-15mm, 3 curved slits in spiracles, numerous small black spines.
<i>Cordylobia rodhaini</i>	10-12 days	Size is about 23mm long, scattered spines, 3 sinuous slits in each posterior spiracle.
<i>Dermatobia hominis</i>	5-12 weeks	Size is about 18-25mm long, pair of flower like anterior spiracles, spines in rows.

1.2 TREATMENT:

The treatment of myiasis, forcible removal of larva from the host tissue is difficult because of the larva's tapered shape and many rows of spines and hooks that it uses to grip the tissue cavity.

Surgical Debridement:

The larva is usually surgically incised and extracted under local anaesthetic. Any component of the larva left in the tissue cavity will cause an unpleasant inflammatory reaction, a bacterial infection, or the creation of a granuloma, so take care not to lacerate it. Except in cases where the larva has perished inside the lesion, surgery may not be necessary.

Antimicrobials are given systemically in addition to the surgical treatment to prevent subsequent infection.

Innovative alternative treatment strategies

The injection of lidocaine at the base of the tissue cavity in which the larva inhabits is an alternative to both surgical and suffocating procedures. The larva is forced to the surface by the swelling, where it can be readily gripped and removed. In cases involving many larvae, this approach may be limited, as the required doses of lidocaine or other anaesthetics could be toxic.

1.3 CLASSIFICATION:

The symptoms of myiasis depend on the area of the body larvae ingested eggs.

Furuncular Myiasis: The most commonly observed form of myiasis is that the maggot penetrates the skin and develops in the tissue under the skin. The common maggot infestation sites are exposed areas such as the extremities, back, and scalp[3]. When eggs get in contact with the skin, the heat of host body causes the eggs to hatch (first larvae stage) then the larvae will painlessly penetrate through minute skin openings, follicular openings, or unbroken skin. A small erythematous papule resembles like a insect bite swells into boil like lesion with diameter 10-35mm within 24 hours later it will develops and become furnucular like nodule[7].

Wound Myiasis: The most common that may cause wound myiasis are *Cochliomyia hominivorax*, *Chrysomya bezziana*, and *W. magnifica*. Wound myiasis occurs as an infestation of a fly larvae into the wound. If the maggots penetrate rather than staying on superficial layers of affected tissue, results in subcutaneous nodules.

CAVITARY MYIASIS: The common agents of human cavitary myiasis are *Gasterophilus intestinalis* and *Hypoderma spp.* Maggot infestation on the eye, nasal passages, ear canal, or mouth results to cavitary myiasis. *D. hominis* and the screw worms are causing cavitary myiasis. If the maggots penetrate into the base of the brain, meningitis and results in death.

2. PRESENTATION OF CASE

A 55-year-old female patient was admitted in hospital with complaints of diabetic foot left with 2nd metatarsal plantar ulcer (2 x 2cm) for 1 and half months and maggots were observed in the wound. Patient had cellulitis at first but it was left untreated and she went to work on farm, where her condition gradually worsened. The patient had a history of pain and fever (on and off). Also, the patient was examined and her sensation were also reduced. On general examination the patient was conscious, oriented and afebrile. Patient's had diabetes mellitus for past 1 and half years and she was on her regular medications of Tablet Teneligliptin 20 mg once daily and Tablet Gliclazide once daily 30 mg twice daily. The HbA1C levels are a gold standard test to measure long-term glycaemic management. The patient had HbA1c level is elevated to 10.1%. The patient's Random blood sugar [RBS] and Fasting Blood Sugar [FBS] level were also elevated to 362.3mg/dL and 185mg/dl, at the time of admission and started insulin therapy. The patient received treatment considering her basic disease (diabetes) with broad-spectrum antibiotics. The physician prescribed short acting insulin as Insulin Human Actrapid(20-20-0) and Premixed Insulin InsulinMixtard 30/70 (0-0-20) and Oral Hypoglycaemic agents [OHA] as Vildagliptin 50mg (1-01). The HbA1c level of the patient was also elevated to 10.1%. The patient had immediately undergone for wound debridement on left forefoot plantar 2nd metatarsal head ulcer and maggots were carefully removed and started broad spectrum of antibiotic Cefuroxime 750mg belong to the class of Cephalosporin. The Patient was discharged after 6 days and she was stable and the wound was deemed to be in good health.

3. DISCUSSION:

Myiasis is defined as the infestation of live human and vertebrate animals by larvae of the order Diptera that feed for certain time periods on the host's dead or living tissue, body substances, or ingested food[8]. Many organs can be infested by these larvae and the most common form is

cutaneous myiasis[9].The patient in this case had a type of diabetic foot ulcer which is a type of wound myiasis.Wound myiasis which is caused by the infestation of a wound with fly larvae. Current treatment for wound myiasis requires debridement with irrigation to remove the larvae from the wound or surgical removal [4].The larvae are naturally sloughed within 5-7 weeks, therefore surgical removal is not required unless the patient requests to do so[11].Myiasis has gained prominence in recent years as a safe and effective treatment for infected and difficult-to-heal wounds. This technique is called Maggot debridement therapy, or MDT[12].

In this case, the patient had had a diabetic foot ulcer for 1.5 months, along with diabetes for 1.5 years. Initially, the patient had cellulitis on her metatarsal plantar aspect of her left foot, measuring about 2 x 2 cm. Her diabetes was uncontrolled and her FBS and RBS levels were elevated by 185 mg/dL and 362 mg/dL at the time of admission. That means the patient is hyperglycaemic. Hyperglycaemia is caused by a disruption in glucose homeostasis, which leads to the activation of specific metabolic pathways, which in their abnormal state leads to vascular insufficiency, nerve damage, ulceration in the lower extremity due to plantar pressures, and foot deformity. Due to a loss of sensation, an injury to the foot induced by trauma to the affected region goes unnoticed by the patient. Resistance to infection is a major modulator of the pathophysiological image of diabetic foot lesions, and it is one of the factors mentioned above[14]

Here, the patient's HbA1c level was elevated to 10.1%. The HbA1C levels are used to measure long-term glycaemic management. The average blood sugar content of a typical red blood cell in peripheral circulation is measured over a 90-day period in this test. The more glycosylation of haemoglobin in red blood cells occurs, the higher the HbA1C level[13].The patient left the wound untreated and went to work on the farm. This leads to the infestation of maggots at the wound site. If the wound is left untreated, the first stage is when larvae penetrate into the exfoliating part and go deeper and damage the tissue[10].People who work in agriculture are more prone to maggot infestation. The physician examined maggots in her wound. To eradicate maggots from the wounds, the patient underwent surgical debridement, removing maggots from the surgical site, and started a broad spectrum of antibiotics.

4. CONCLUSIONS

Myiasis is a parasitic infestation of tissues or body cavities of mammals with dipterous larvae. Wearing protective leg coverings while working in agricultural fields can help to lower the prevalence of myiasis.As a pharmacist recommendation,the patient should maintain good cleanliness and maintain adequate debridement and daily dressing should be done. Broad spectrum antibiotics and anthelmintics are used for treating maggot infestation in diabetic foot ulcer and necessary management should be taken to control diabetes mellites. Maggot should be removed from the infected site of infestation.

CONSENT

The author has collected and saved the patient's written consent in accordance with international or university.

ETHICAL APPROVAL

The written ethical approval has been gathered and retained by the author according to international or university.

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